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THE IMPACT OF COGNITIVE NEUROPSYCHOLOGICAL IMPAIRMENTS ON CONVERSATIONAL ABILITY IN APHASIA

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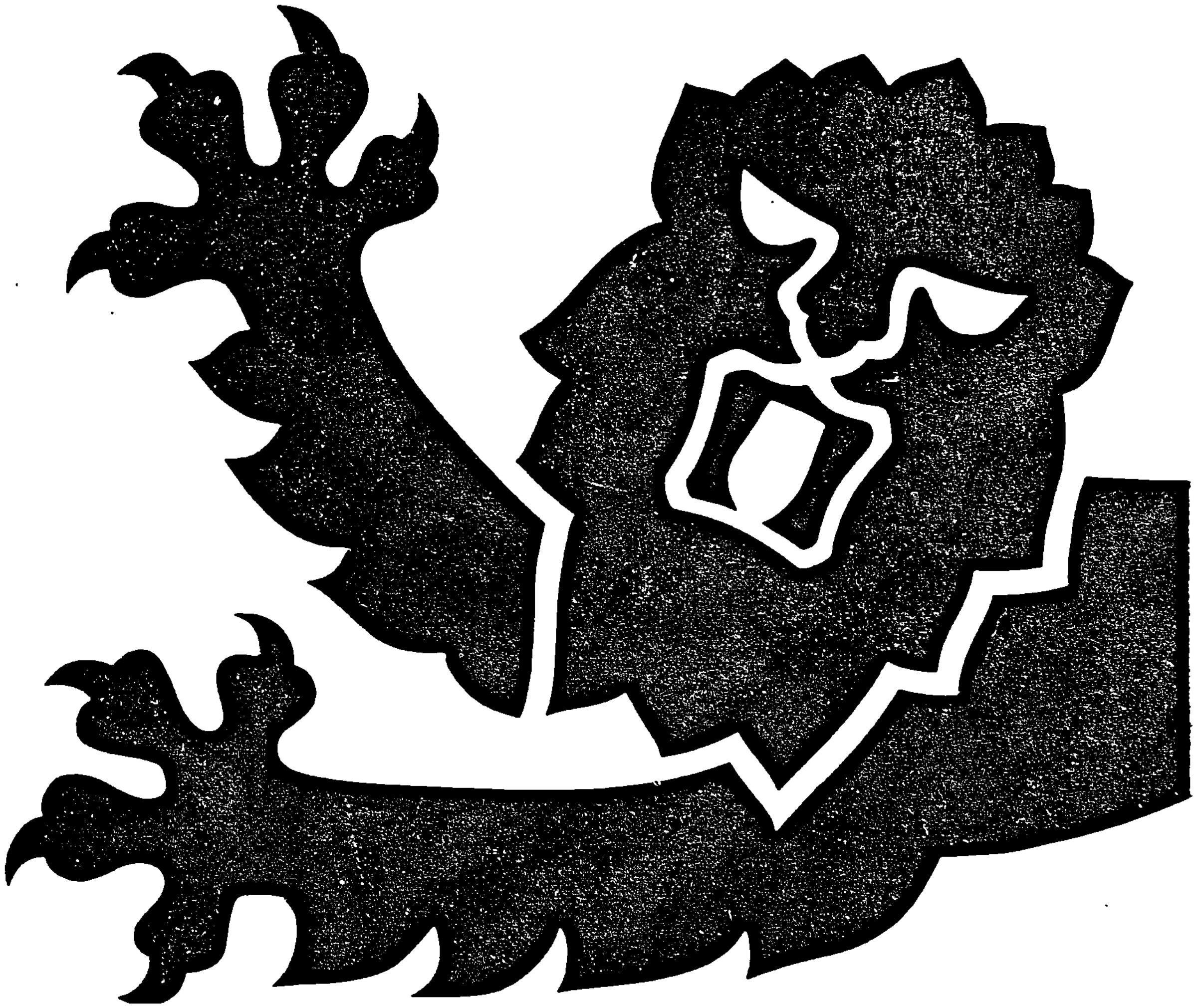

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for my parents

Abstract

Cognitive neuropsychology and pragmatics have influenced much of the recent aphasiology research. In order to capitalise on the apparently complementary strengths of these two theoretical paradigms in the management of aphasia, it is necessary to understand the relationships that exist between cognitive neuropsychological impairments and pragmatic abilities.

This thesis seeks to address the issue of the integration of the two approaches using a single case study design. First, a comprehensive cognitive neuropsychological investigation of the each of three aphasic subjects' processing of single words and sentences is undertaken. Second, an analysis of the subjects' discourse with two different interlocutors is carried out, applying the data-driven principles of conversation analysis. Throughout the second strand of analysis, attempts are made to identify the impact of any impairments found in cognitive neuropsychological investigations on the conversation.

The findings identify two important factors in determining the impact of aphasia on conversational interaction. These are:

1) the precise nature of the cognitive neuropsychological impairments ;
2) the strategies adopted by both the aphasic person and their interlocutors to deal with the consequences of the linguistic impairments.

From the findings, implications are drawn for the provision of an integrated approach to aphasia management which capitalises upon the complementary benefits to be derived from the application of cognitive neuropsychology and conversation analysis.

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Introduction

In aphasia therapy there has been an increasing recognition of the need for the assessment, the treatment and the evaluation of treatment to have a clear theoretical motivation. The study and remediation of aphasia is an interdisciplinary endeavour reflected in the application of numerous theoretical paradigms from neurology, psychology and linguistics in such work. Two theoretical paradigms which have influenced much of the recent research into both the study and remediation of aphasia are those of cognitive neuropsychology and pragmatics (Lesser and Milroy, 1993). Each of these theoretical approaches has particular strengths and limitations in their application to the management of aphasia which can be seen to be complementary in nature.

Cognitive neuropsychological assessment allows theoretically motivated descriptions of linguistic impairments in terms of language processing models and such findings can be used to motivate clearly specified goals of therapy which lend themselves well to evaluation of the efficacy of intervention. This approach fails, however, to deal with the interactional and collaborative nature of communication (Lesser, 1987).

In contrast, the pragmatic approach deals with precisely these aspects and allows an exploration of the interactional consequences of aphasia. Pragmatics has a less well-developed theoretical framework underlying assessment and therapy than cognitive neuropsychology. Thus, while it has strong validity in examining precisely the aspects of communication which need to be targeted in remediation, methods of evaluating the efficacy of therapy are less well-developed.

The complementary nature of the two theoretical paradigms is also reflected in the approaches that they lead to in therapy. The emphasis of the cognitive neuropsychological approach is treating specific linguistic deficits. In contrast, the pragmatic approach focuses on compensatory aspects, often involving the aphasic person's carer, with the remediation issue being the broader one of optimal communication.

In the aphasiology literature cognitive neuropsychological and pragmatic approaches have been treated as alternatives. While aphasia therapists may draw on various theoretical bases in the management of a specific client, the need for their systematic integration in assessment and remediation has not been addressed. It would seem, however, that for therapists to capitalise on the apparently complementary strengths of each of the two approaches it is necessary to understand the relationships that exist between cognitive neuropsychological impairments and pragmatic abilities (Perkins and Lesser, 1993).

The work in this thesis sets out to address the issue of the integration of the cognitive neuropsychological approach and the pragmatic approach by investigating the impact of the cognitive neuropsychological impairments of three aphasic subjects on conversation using conversation analytic procedures. Specific issues which are investigated in this study are:

i) the manifestations of cognitive neuropsychological impairments in the conversation through the use of both self repair and collaborative repair patterns;

ii) the way that both aphasic and normal interlocutors handle the manifestations of cognitive neuropsychological impairments;

iii) the influence of the conversational partner on the manifestation and impact of cognitive neuropsychological impairments.

From these findings, implications are drawn for the provision of an integrated approach to aphasia management which capitalises upon the complementary benefits to be derived from the application of cognitive neuropsychology and conversation analysis.

The thesis consists of eleven chapters. Chapter One provides a brief review of theoretical and methodological issues of cognitive neuropsychology and pragmatics and the way that the two approaches have been applied to the investigation and management of aphasia. The two subsequent chapters examine in more depth those aspects of the two approaches drawn upon in this study. Specifically, the models of language processing which are used as a framework for cognitive neuropsychological assessment are discussed in Chapter Two. In Chapter Three, those conversational management procedures focused on in the study are examined. The methodology of the study is presented in Chapter Four. The next six chapters present detailed analyses of the data. These are presented as single case studies with a set of two chapters for each of the three subjects; the first presenting the findings of the cognitive neuropsychological investigations; the second presenting the findings from the conversation analysis. The thesis concludes with a summary of the findings and a discussion of the implications of these to the provision of an integrated approach to the management of aphasia.

Chapter One

THEORETICAL ISSUES IN COGNITIVE NEUROPSYCHOLOGY AND PRAGMATICS

1.0 Introduction

It is a tradition of language pathology to take the development of other academic disciplines and apply them to the investigation and remediation of disordered language. It is essential that, in doing this, there is an awareness of the background from which the new developments originate and an understanding of their strengths and limitations. This chapter sets out to provide a brief review of the background of the two perspectives being applied to aphasia in this study.

In 1.1 the development of cognitive neuropsychology, its theoretical assumptions and methodological features and its role in the investigation and remediation of aphasia are examined. In the following section the focus moves to the second perspective being used in this study, namely pragmatics. It commences with a consideration of the strengths and limitations of the various orientations of pragmatics to the investigation of aphasia. It then moves on to a brief discussion of the way that these have been utilised in the assessment and treatment of aphasia and suggestions are made as to the most fruitful approach to be used in its investigation and remediation. The chapter concludes with a summary of the strengths and limitations of cognitive neuropsychology and pragmatics in their application to aphasia and following on from this the focus of the study is outlined.

1.1 *Cognitive neuropsychology and aphasia*

1.1.0 Preliminary orientation

The rise of information processing models within cognitive psychology in the 1960s and 1970s provided a springboard for the explanation of abnormal function and led to the development of cognitive neuropsychology. As Shallice (1988: 15) has reported, previous psychological theories of cognition offered no obvious way to account for impaired performance. In contrast, an information processing model can be lesioned 'conceptually' and this quality has given rise to the explanation of patients' deficits in terms of information processing theories developed from laboratory studies with normal subjects. Such an approach encourages cross-fertilisation between explanations of normal and impaired performance; normal models can be used to help understand impaired performance and findings with respect to impaired performance can offer evidence to either support or reject existing theories of normal processing. Ellis and Young (1988: 21) account for the vigour of cognitive neuropsychology in recent decades in terms of the support for theoretical conclusions from two different sources.

Aphasia constitutes one of cognitive neuropsychology's major areas of study. There has been a large body of research carried out on a variety of language impairments which has provided evidence to verify or refute a variety of theories of normal language processing and to provide further specification to these theories. Examples of such research include work on acquired dyslexias (e.g. Patterson, Coltheart and Marshall, 1985), acquired dysgraphias (e.g. Lesser, 1989a), lexical retrieval deficits (e.g. Kay and Ellis, 1987) and sentence production deficits (e.g. Lapointe, 1985).

The assumptions and methodology of cognitive neuropsychology, besides offering a resource to further develop normal models of language processing, also offer a theoretical framework on which to base an explanation of the aphasic subject's underlying language impairment and on which to develop a rationale of treatment. In 1.1.1 the assumptions and methodology of cognitive neuropsychology and their influence upon the investigation of aphasia are briefly reviewed. The contribution of cognitive neuropsychology to the assessment and treatment of aphasia is addressed in 1.1.2 and 1.1.3 respectively.

1.1.1 The assumptions and methodology of cognitive neuropsychology and their application to the investigation of aphasia

Underlying cognitive neuropsychology are a number of key theoretical assumptions upon whose validity the theoretical approach depends. Excellent discussions of them can be found in Shallice (1988), Caramazza (1984, 1986), Levelt (1989) and the interested reader is referred to these. In this section the assumptions will be outlined.

The central assumption of cognitive neuropsychology is that the components of information processing systems are self contained; the modularity hypothesis. The argument for a modular cognitive system has built up from a number of sources including computational, linguistic, psychological and physiological ones. Shallice (1988: 18) provides a brief review of these different types of evidence. Fodor (1983) has given an explicit and detailed interpretation of the concept of modularity. The properties of cognitive modules that he proposes, however, appear to be too specific for neuropsychological purposes. Further discussion of Fodor's theory of modularity is given by Marshall (1984), Shallice (1984) and the open peer commentary on Fodor's (1985) precis of his work.

A second assumption arising from the modularity hypothesis is that the behaviour observed in brain damage reflects the normal information processing system working without one or more of the impaired modules. This assumption is known as the transparency hypothesis or the subtraction hypothesis. Caplan (1981) discusses this assumption and points out its necessity if findings from impaired performance are to be relevant to normal functioning. If the lesioned brain develops radically different systems from those found in undamaged brains, this (whilst of interest in itself) would rule out the possibility of drawing inferences to normal processing. Shallice (1988: 241ff.) discusses the validity of the transparency assumption, pointing out that little is known about the nature of recovery patterns and that in brain damage it is possible that we are studying a reorganised system whose mode of operation is qualitatively different from the normal. Shallice proposes, however, that contrary evidence is provided by the occurrence of double dissociations which are not compatible with the explanation of dissociations in terms of reorganisation of function. Dissociations are given further consideration below.

The third assumption of cognitive neuropsychology subsumes both the modularity assumption and the transparency assumption. It is known as the fractionation hypothesis and involves the belief that brain damage can result in the selective impairment of components of cognitive processing. For this to happen a certain amount of functional specialisation in the brain must be assumed. Kosslyn and Van Kleek (1990), in their critique of cognitive neuropsychology, report that functional components need not be neatly implemented in the brain. They suggest various possibilities that may arise and propose that there are problems with the adoption of the fractionation assumption. Caramazza (1992), however, offers a defence to the criticisms put forward by Kosslyn and Van Kleek. He proposes that if one examines the cognitive neuropsychological literature there is an impressive array of evidence of highly selective disorders. He further states that "independently of the logical possibilities of how cognition might map onto the brain, the empirical fact is that focal brain damage frequently results in highly selective functional disorders" (1992: 89).

Overall, the assumptions of cognitive neuropsychology can be summarised as follows: brain damage can result in the fractionation of the normal modular cognitive system along theoretically significant lines and the resulting behaviour bears a transparent relationship to the processing of normal information processing.

The methodology of an approach cannot be separated from the theoretical framework being utilised as this determines the questions that are being asked. The methodology develops as a consequence of this in the attempt to provide answers to the questions being posed by the theory. The most striking methodological feature of cognitive neuropsychology is the emphasis placed upon the single case study with a rejection of group studies typical of traditional neuropsychology. It is held that case studies are much more likely to produce strong evidence for discrimination among different theories of normal function. This is because there are numerous possibilities of impaired and intact processing modules in an information processing system arising from brain damage and it is unlikely that a group of patients will have homogeneous impairments. If a group study methodology is used, the mean score for the heterogeneous group can be seen to be meaningless; what is true of the group scores may not be true for each (or indeed for any) of the individuals of which the group is comprised. In contrast, by examining the performance of a single case it is possible to look for an explanation of intact and impaired abilities in terms of intact and impaired processing modules, and thus, the findings from single case studies have come to be seen as the most powerful empirical procedure for making inferences to normal function. This methodological feature has strongly influenced the assessment and remediation procedures used by aphasia therapists as is discussed further in the following two sections.

The rejection of group studies in cognitive neuropsychological research is not universally accepted. For further discussion on the topic see the special issue of *Cognitive Neuropsychology* (1988, volume five) which considers methodological problems in cognitive neuropsychology. Caramazza and McCloskey (1988) and McCloskey and Caramazza (1988) strongly argue that single case studies represent the only appropriate methodology for drawing inferences about normal cognition from research involving brain damaged subjects. In contrast, Caplan (1988) and Newcombe and Marshall (1988) propose that group studies do have a role to play in neuropsychological research.

A further central methodological feature of cognitive neuropsychology is the special status of dissociations. A dissociation occurs when a patient performs poorly on one task but at a normal or much better level on another task. Dissociations can be used to form hypotheses about processing modules. A dissociation between task A and task B suggests that they utilise different sets of cognitive processes, with one set impaired while the other continues to function normally. The differential performance could, however, be an artefact of task difficulty (i.e. the subject is impaired in task A because it is a more difficult task than task B). A more robust form of evidence is the double dissociation in which one subject can do task A but is impaired on task B while another subject shows the complementary pattern with impaired performance on task A but good performance on task B. It is no longer possible to interpret the performance in terms of task difficulty. Instead it indicates that different processing modules are involved in the task. Thus, the identification of dissociations allows the identification of the way that the information processing system can fractionate.

As Shallice (1988: 34ff.) has reported, there is an inferential asymmetry between associations and dissociations. While it is common in neuropsychology to find associations between impairments on a number of different tasks, such associations are problematic in terms of offering evidence about underlying processing modules. It is possible that the impairment on two tasks arises because of a processing module that is shared for both tasks. Deficits often tend to co-occur for neurological reasons, however, as artefacts produced by the brain's vascular system which have no direct correlation to processing modules. If a further patient is found to show a dissociation between tasks which had previously been associated then this provides evidence against a common processing module being responsible for impaired performances on both tasks. In contrast, if an association of impairments to two tasks is found after a dissociation has been documented this does not weaken the claim that two different modules are involved. The association can be accounted for as impairment to more than one processing module. The use of dissociations in understanding impairments of language processing is central to the management of aphasia as will be discussed in the following two sections.

A further methodological feature of this theoretical perspective is that cognitive neuropsychologists are not concerned with the site of lesion in the subjects that they are studying. Caramazza (1992) proposes that anatomical information has an additional and unimportant role for the purpose of informing theories of normal cognitive processing although he acknowledges that its role in developing theories of the functional organisation of the brain is fundamental and irreplaceable. Mehler, Morton and Jusczyk (1984) reject the research strategy of focusing on the locus of a lesion and using it to define psychological factors. Such an approach assumes that functions can be ascribed to a particular location in the cortex, i.e. that processing modules are not only functionally modular but also anatomically so. Morton (1984) has questioned the justification of this assumption and Mehler et al have pointed out that the lesion is of little or no consequence to analyses of psychological processes as it is plausible that lesions in a number of different loci could disrupt the same psychological process. They propose that if a mapping between psychological and neurophysiological structures is possible, it will only come about after the key theoretical constructs are established for each level of explanation.

Shallice (1988: 213ff.) acknowledges that to hope for an advance in theories of the functional organisation of cognition on the basis of anatomical information is not promising. He states, however, that it is misguided to reject anatomical considerations as irrelevant to functional theorising. He suggests that for the single case study there are two potential ways that anatomical lesions can be of relevance. The first is that neurological information can provide cues as to the possible explanations for the subject's behaviour. Thus, he proposes that if the corpus callosum is involved one would be careful to check for behaviour for each of the hands; lesions involving the frontal lobes would alert one to examine control processes.

A second way in which Shallice sees localisation information as relevant to cognitive neuropsychology is that for certain symptom complexes the functional and anatomical arguments are interleaved. One example of this is Coltheart's (1980) right hemisphere hypothesis of deep dyslexia in which he proposes that word recognition for the deep dyslexic patient is mediated by the right hemisphere. Shallice also proposes that neurological information can provide information as to whether symptoms arise from a lesion to a module itself or whether they arise from a disconnection. Such inferences can only be made from anatomical information, however, if there is knowledge about how a specific module and its connections are represented in the brain. Such an approach also appears to assume anatomical modularity which, as has been noted above, has been questioned by a number of researchers.

Kosslyn and Van Kleek (1990) criticise the exclusive focus of cognitive neuropsychologists on behavioural dysfunction without drawing on the known physiology and anatomy of the brain when interpreting them. They argue that correct inferences about functional organisation will only arise when behavioural dysfunction is interpreted in the context of facts about the brain itself. A full response to their critique has been supplied by Caramazza (1992). Their view can be seen to arise from the assumption that:

> "such theories also require a structural realisation of the functional analysis, or in other words a mapping of the putative subsystems and their interconnections onto the brain. Computational adequacy alone is of little interest to cognitive neuropsychology without evidence that the processes are actually realised in neural hardware. The goal is to provide a theory of the functional organisation of the brain, not simply a concise or useful description of behaviour" (Kosslyn and Van Kleek, 1990: 392).

This characterisation of the scope of cognitive neuropsychology is inaccurate as is clear from the review presented above. Caramazza states that "the unmotivated appeal to anatomy and physiology to solve putative defects of cognitive neuropsychology cannot serve the cause of advancing our understanding of either cognition or the brain" (1992: 92).

The cognitive neuropsychologist's lack of concern with neuroanatomical information can be seen to strongly influence the aphasia therapist's approach to the management of aphasia. Lesser (1991) argued strongly that information from brain scanning and imaging techniques has no influence on aphasia therapy practice at the present moment. Furthermore, at the present time such information is very rarely available to the aphasia therapist in the United Kingdom.

1.1.2 Cognitive neuropsychology applied to the assessment and evaluation of treatment of aphasia

The application of cognitive neuropsychology to aphasia provides much more precise information about underlying deficits than other approaches to assessments. Byng, Kay, Edmundson and Scott (1990) in their consideration of aphasia assessment propose that it is more beneficial to go beyond thinking about language deficits in terms of different modalities, towards considering them in terms of the underlying processing problems. Instead of replacing the traditional standardised aphasia assessments with a battery of tests which is to be given by rote to every patient, they propose that of more use is a resource which can be selectively drawn upon to be of relevance to the individual client. This aligns well with cognitive neuropsychology's emphasis on single case studies. Such a resource has been developed by Kay, Lesser and Coltheart (1992) (see 4.3 below). Known as PALPA (Psycholinguistic Assessments of Language Processing in Aphasia) it consists of a set of assessments which have been designed with relevant psycholinguistic variables controlled, such as imageability and frequency. Byng et al argue that hypothesis-driven assessment should be aimed for, with preliminary hypotheses about the underlying deficits being used to guide selection of the appropriate assessments. From the results of a combination of assessments it is possible to outline the dissociation between impaired and intact processing and this can be used to guide remediation.

Assessment tools also have an important role to play in the evaluation of treatment and, as in assessment, the single case study methodology of cognitive neuropsychology is also germane to the issue of evaluating therapeutic efficacy. The same criticisms of group studies of brain damaged subjects which aim to inform models of normal cognitive processing (see 1.1.1 above) also apply to group studies examining therapeutic outcome. The problems of large group studies using randomised control trials (RCTs) have been discussed in detail in the literature (see Pring, 1986; Howard, 1986; Howard and Hatfield, 1987: 110ff.). A fundamental problem arises from the fact that RCTs assume homogeneous patient groups and homogeneous treatment; assumptions which do not stand up in such studies (e.g. David, Enderby and Bainton, 1982). The only sort of question that they can answer is whether aphasia therapy in general benefits aphasic clients as a group. This information does not help to specify to clinicians how they can change their intervention strategies to improve effectiveness. In contrast, the single case methodology of cognitive neuropsychology allows therapists to tackle much more specific questions about the efficacy of specific treatment for specific impairments in a scientifically rigorous manner. Coltheart (1983) provides a discussion of the factors that need to be taken into account in single case study efficacy studies and Byng and Coltheart (1986) illustrate these principles in practice.

1.1.3 Cognitive neuropsychology and remediation

Cognitive neuropsychology offers a theoretically motivated, detailed analysis of an aphasic patient's impaired performance which would appear to be a prerequisite to informed therapeutic practice. As Caramazza (1989) argues, one must have a relatively clear idea of the nature of the disorder before trying to devise an appropriate therapeutic strategy.

Implicit to any theoretically motivated remediation programme is a theory of how recovery is effected. Lesser (1985) makes a three-way distinction of modes of recovery; reactivation, reorganisation and compensation. Reactivation embodies the most optimistic view, with aphasia being seen not as a loss of language but as a reduction in its accessibility. Recovery in line with this theory can occur through stimulation so that the threshold at which language becomes accessible is lowered. This is the view of language taken by Schuell and other members of the "stimulation school" who see aphasia as a unitary phenomenon which varies in severity. There is now a large body of evidence against this unitary view of aphasia (see Howard and Hatfield, 1987: 72ff. for a critique of the approach). Lesser and Milroy (1993: 15) suggests that reactivation of function is perhaps most satisfactorily accounted for by the notion of redundancy of neurones in a brain system, where small lesions can be compensated for by other undamaged neurones within the same system. It is assumed that function will be identical to that which has been lost. Reactivation of recovery appears to be most plausible for an aspect of language which appears to be widely represented in the brain, such as lexical semantics, where there may still be adequate neural tissue to compensate for that which has been lost. The therapeutic approach that has developed from such a view of recovery has as its emphasis stimulation using facilitatory methods in preference to didactic means. Lesser (1985) provides a brief review of such work.

The theory of reorganisation is based on the belief that the brain retains, into and during adulthood, some plasticity. Recovery of a function occurs by being subserved by tissue in undamaged areas of the brain which were not previously involved in that function. It has been suggested that such anatomical reorganisation can occur in aphasia through utilisation of other areas in the left hemisphere or through utilisation of the right hemisphere. The therapeutic approach that has been developed from this view involves restoration of function through didactic means with the emphasis on the client relearning the knowledge that he or she has lost. Therapies have been devised which specifically aim to utilise the right hemisphere in the recovery of language (for example Melodic Intonation Therapy; Albert, Sparks and Helm, 1973).

The third theory of recovery is the least optimistic and concerns compensation or substitution. It is assumed that functional systems do not recover through reactivation or reorganisation of neural tissue. Instead the aphasic person must learn to achieve similar behaviours by alternative means. The language impairment may be circumvented by either covert or overt strategies, using mental or physical devices. The emphasis on rehabilitation for this view of recovery is to foster and train the patient to utilise compensatory strategies. Lesser and Milroy (1993: 15) propose that substitution has three identifiable subdivisions. The first involves utilising intact functions to achieve functions whose performance has been impaired by brain damage. These are known as cognitive relay strategies. The second involves substitution by prostheses which embodies the gamut of communication aids that have been utilised with the aphasic population. The final division of substitution involves functional communication strategies. This type of approach includes utilising linguistic and gestural strategies to enhance communication.

A cognitive neuropsychological approach to aphasia therapy involves the identification of the pattern of impaired and intact processing modules. The remediation issue concerns the manner in which the impaired modules are dealt with and this will be influenced by the theory of recovery which is seen as being most plausible to the hypothesised impairment. As cognitive neuropsychology defines aphasic impairments in terms of cognitive processing with no reference to anatomical information, the distinctions that have been made between reactivation and reorganisation, based on hypotheses about how functions are subsumed by neural tissues, are difficult to maintain. Thus, for example, it does not seem to be possible to decide whether work focused on semantic processing, such as that described by Nettleton and Lesser (1991), involves recovery by reactivation of neural tissue in the same system or recovery by reorganisation in which the processing is subserved by neural tissue in an undamaged part of the brain. Instead, it seems necessary to remain silent on the issue of how recovery relates to neural changes and instead to focus upon the recovery of cognitive functions. This is not to say that what occurs at the neural level is not important. At the present state of knowledge, however, it is not possible to specify how therapy motivated by cognitive neuropsychological theory is being achieved at this level. Thus, it seems necessary to devise hypotheses of recovery based on recovery of cognitive functions.

If an impairment to a processing module (or link between modules) has been identified there are three approaches of therapy that can be adopted. The first is restoration which, in the case of loss of item specific information or rules involved in processing, will involve the therapist reteaching to restore what has been lost. When the deficit appears to be one of impaired access to an intact module, then restoration may involve facilitation rather than reteaching. (This distinction between loss of information and a disturbance of access is controversial. See 2.1.2 below, also Shallice, 1987 and Rapp and Caramazza, 1991).

A second approach that can be adopted is a substitution strategy; what Lesser and Milroy (1993: 21) have called cognitive relay. In cognitive neuropsychological terms this involves harnessing intact processing routes to bypass the impaired modules and achieve the functions which are limited by the impaired module. The therapy described by Bruce and Howard (1987) illustrates this approach.

Both restoration and cognitive relay are deficit-focused with therapy targeted at remediation of specific processing impairments. In the cognitive neuropsychological aphasiology literature it is these approaches to remediation which predominate. The third approach in contrast is compensation-focused and is more usually associated with a pragmatic approach to aphasia therapy. It involves the use of prostheses and functional strategies to help the client and his or her interlocutors compensate for the impaired processing modules. This approach to therapy is discussed further in 1.2.3 below.

From the discussion of theories of recovery and therapy it may seem that once a deficit analysis of processing modules has been carried out, therapy follows clearly from this. Knowing what is wrong, however, does not, in principle, determine what should be done about it. This is a point that is often made in the literature. Different workers, however, see this as having different implications for the contribution that cognitive neuropsychology has to make to rehabilitation. Caramazza (1989) states that "the content of current cognitive theories does not constrain in any obvious way the nature of possible therapy-determined modifications of a system: A cognitive theory is *not* a theory of cognitive rehabilitation" (1989: 393). His pessimism about the contribution that cognitive neuropsychology can make to rehabilitation appears to arise from two main sources. The first is that no theory of cognitive rehabilitation has yet been developed. The second is that the models developed by cognitive neuropsychologists are grossly under specified.

In response to Caramazza's first concern Lesser and Milroy (1993: 231ff.), while agreeing that no theory of rehabilitation exists, argue that it is more realistic to expect such a theory to develop from the evidence of response to model-based cognitive rehabilitation rather than to be a precondition of it. Lesser and Milroy also acknowledge that the cognitive models being utilised are under-specified. They argue, however, that this does not provide evidence to reject the utilisation of the models to guide remediation. Indeed, they propose that the results of such therapeutic intervention have a potential as a test of the validity of present models which at the present time is relatively untapped. This would be a useful way for cognitive neuropsychologists to deal with the criticism made (e.g. Kosslyn and Van Kleek, 1990) that the models are only focusing on operations at one point in time rather than taking into account a dynamic system which evolves over time in response to damage.

It is important that the aphasia therapist recognises the limitations of the models and the fact that they are still developing. Despite this, intervention based on cognitive neuropsychology offers firmer ground for theoretically motivated therapy than any other approach. Caramazza, using the example of devising therapeutic strategies for a patient with an impaired graphemic buffer, proposes that while it may be possible to produce an informed therapeutic strategy based on a cognitive neuropsychological assessment, such a choice could also be made on mere clinical observation (in his example that the patient could flawlessly spell short words). If such clinical perceptions could so easily be utilised to guide therapy, one would expect that therapy pre-cognitive neuropsychology would have shown the same efficacy of remediation that is apparent in the literature of therapy guided by cognitive neuropsychology (e.g. Byng, 1988, Nettleton and Lesser, 1991). As Lesser and Milroy (1993: 235ff.) have stressed, the relationship of the observer's perceptions to the observer's theoretical bias is far from trivial. It is likely that clinical observation could lead therapists to appropriate treatment but these are likely to be guided by their knowledge of psycholinguistic theory. Therapy motivated by cognitive neuropsychology does not offer a magical new set of therapeutic techniques; it often utilises traditional therapy tasks. Its strength, however, is that a theoretical analysis guides the selection of a particular technique for a particular aspect of a patient's disorder. Further discussion of the development of cognitive rehabilitation is provided by Hillis (1993).

A further criticism of a cognitive neuropsychological approach to aphasia remediation is that the rehabilitation strategies associated with these models are appropriate only for the patients who have selective impairments and these are rare (Basso, 1989, Kertesz, 1990, Goodglass, 1990). However, there is evidence in the literature to refute this generalisation. While cases which do have relatively specific disorders have proved particularly useful in initially articulating the models because they are most likely to show clear dissociations of function, on the basis of work done with such patients the models are adequately specified to deal with more complex cases as is seen for example, in Nickels, Byng and Black's (1991) case report of subject AER.

A more fundamental criticism can, however, be made of a cognitive neuropsychological approach to remediation. This is that the models used to guide both assessment and remediation do not touch upon the use of language in a communicative context. As a consequence of this, the tasks utilised in both assessment and treatment are usually heavily abstracted from the communication demands that the aphasic person faces in his or her everyday communicative environment (Lesser, 1987). Thus, while a client may be shown to improve on the task being utilised in treatment, the question of whether this has an impact on his or her communicative ability is often left unanswered. Furthermore, interactive aspects of language use are not addressed by cognitive neuropsychology. In contrast, a pragmatic approach to aphasia therapy can be seen to deal with precisely these issues. Such an approach is considered in the next section.

1.2 Pragmatic theories and aphasia

1.2.0 Preliminary orientation

In contrast to the application of cognitive neuropsychology, the application of pragmatic theory to the investigation and remediation of aphasia is ill-defined. Whilst there is a consensus that pragmatic aspects of language should be assessed in language disordered populations, there is no agreed paradigm from which to view pragmatics (Prutting and Kirchner, 1987). Pragmatics can be broadly defined as the study of the use and understanding of language in context and it is this broad definition which will be employed in this study. When an attempt is made to offer a more specific definition, however, the precise nature of what is meant by pragmatics becomes blurred. This arises from the disparate and sometimes incompatible traditions of pragmatic theory and analysis drawn from many disciplines including philosophy, psychology, linguistics and sociology. As a consequence of this mixed academic heritage, pragmatics lacks an agreed terminology and descriptive framework to an extent which creates considerable difficulty in delimiting precisely the range of phenomena which might be described as pragmatic.

Levinson (1983: 378) warns that, "as always in the application of academic ideas to vital practical issues, there is the very real possibility of the premature acceptance and application of untested concepts and theories". McTear (1985: 227ff.) suggests that much published work which attempts to measure pragmatic ability suffers from poor definition of categories and insufficient consideration of the theoretical assumptions underlying the analysis. The aim of this section is to examine and evaluate the different theoretical perspectives that have been drawn upon in the investigation and remediation of aphasia. In 1.2.1 the limitations and strengths of the numerous pragmatic theories that have been utilised in such investigations are briefly considered. In light of this, in 1.2.2 pragmatic assessment and in 1.2.3 "pragmatic" remediation are discussed and implications for a better-defined application of pragmatics to aphasia management are identified.

1.2.1 The application of pragmatics to aphasia

Two broad orientations can be distinguished in the pragmatics literature; one is a top-down or theory-driven perspective seen in approaches from philosophy and linguistics; the other is a bottom-up or data-driven approach typified by conversation analysis (CA) (Milroy and Perkins, 1992; Lesser and Milroy, 1993: 107-108). Both approaches have been invoked in the examination of pragmatic abilities in aphasia. It is beyond the scope of this study to provide a review of pragmatic theories. Interested readers are referred to reviews from varying perspectives by Levinson (1983), Coulthard (1985) and Taylor and Cameron (1987). Furthermore, no attempt is made to provide a detailed critique of work applying these various theories to aphasic communication. This can be found in

Perkins and Lesser (1993) and Lesser and Milroy (1993). Instead, the focus of this section will be two-fold. The first is to highlight the major limitations of the application of theory-driven perspectives to aphasia. The second is to highlight the strengths of the data-driven approach to aphasia, the approach being harnessed in this investigation.

Top-down approaches characteristically employ a deductive type of reasoning, in which an abstract competence is modelled by idealised speakers in idealised situations. Organisational principles of some kind, such as conversational maxims (Grice, 1975), speech acts (Searle, 1979), macro- and micro-processing (Huber, 1990) are posited and an attempt is made to fit these to the data. As Milroy and Perkins (1992) stress, it is important for clinicians and researchers who attempt applications of top-down approaches which have originated from the abstractions of philosophy (e.g. Gricean implicatures, speech acts) to recognise the limitations of such approaches in handling naturalistic data, in particular naturalistic data which, because of language deficits, differs from "normal" language use. Top-down approaches which have developed from descriptive linguistics (e.g. discourse analysis, e.g. Coulthard and Brazil, 1979; text grammar, e.g. Van Dijk, 1972, Johnson-Laird, 1983), while following descriptive linguistic principles, are able to handle only limited kinds of real data. Thus, while the discourse analysts' exchange structure can successfully capture the means by which (for example) teachers, therapists and doctors control the discourse in the classroom or clinical situations, it is not immediately apparent how it can grant insights into the structure of conversation where no participant exercises overt control over the discourse. The text grammarians' focus on narratives clearly limits the usefulness of this theory to the aphasiologist who is interested in the aphasic person's ability to communicate in his or her social setting since it takes no account of interactional aspects of language use.

Perhaps one of the most important issues to consider in the application of pragmatics to aphasia is the status of pragmatic ability. Specifically, do the various top-down theories which have been drawn upon in the investigation of pragmatic ability in aphasia address the level of impairment found in aphasia? It has often been asserted (e.g. Holland, 1991; Glosser, Weiner and Kaplan, 1988) that pragmatic abilities are relatively preserved in contrast to linguistic abilities in aphasia and it is this which gives rise to aphasic subjects "communicating better than they talk". It appears that at the levels of propositional, logical and inferential structure of discourse, or larger scale 'textual organisation' pragmatic ability is likely to be preserved. Evidence for this can be drawn from the studies reviewed by Perkins and Lesser (1993). Thus, although both Penn (1985a) and Hawkins (1989) refer to the reduction of ability to apply Gricean conversational maxims effectively in aphasia, it is likely that this can be seen as a secondary consequence of linguistic impairment rather than a primary pragmatic deficit in which inferencing ability is lost. Studies of both comprehension and production of various speech acts indicate that most aphasic subjects have no difficulty with indirectness, similarly suggesting that their ability to inference is still intact, (Foldi, 1987; Weylman, Brownell, Roman and Gardner, 1989; Guilford and O'Conner, 1982; Prinz, 1980). Indeed this type of ability is one which appears to be compromised in right brain damage rather than left (Code, 1987: 87ff.). Work on the comprehension and production of text also provides evidence for the preservation of higher level pragmatic ability through macroprocessing, although performance is compromised by microprocessing which is influenced by linguistic deficits (Huber, 1990; Chapman and Ulatowska, 1989; Huber and Gleber, 1982). Again the findings in the literature indicate that these kinds of pragmatic impairments arise primarily as a consequence of right brain damage. Overall, it appears that the pragmatic abilities addressed by top-down theories are relatively intact in aphasia. Clearly, therefore, the contribution of these theories to understanding pragmatic impairments in aphasia is going to be limited.

Applying conversation analysis to the investigation of aphasia

In contrast to such theory-driven approaches, the data-driven approach of conversation analysis can be seen as distinctive in that initially it posits no set of analytic categories but inductively seeks patterns in the bodies of naturally occurring data. Analysts confine themselves as far as possible to descriptions of observable conversational behaviour, generalising from recurring details. As discussed by Taylor and Cameron (1987), in contrast to top-down approaches which propose rules that determine participants' behaviour, ethnomethodologists do not view rules as governing behaviour in such a deterministic way. Instead they would suggest that participants design their behaviour with an awareness of their accountability for it. Given that they are aware of the rules relevant to the situation that they find themselves in, they choose to follow or not to follow the rule in the light of what they expect the interactional consequences to be. If they choose not to conform to the rule they can expect their co-participants to look for the reasons why. Thus, rules have a normative force without having to be seen as internalised determinants of conduct.

A feature of the relationship that exists between rules and behaviours is that it emphasises the sequential relevance of an action. A participant's behaviour is designed in the light of what reaction he or she expects from co-participants, whether this is adherence to the relevant rule or violation of it (the latter leading to the drawing of conclusions as to the reason for the violation). Any component action is inevitably temporally situated in a sequential context. It will add to that context and within it will be interpreted. The speaker will be held accountable for the action and it will be responded to in turn. Participants succeed through the sequential progression of interaction to display their understanding of its events and of the rules to which they are orienting, thus making possible the achievement of a shared interactional world. In doing this they also make that shared world publicly observable to the investigating analyst. Because the interactants' own understanding of events is displayed in their subsequent responses to those events, the analyst can obtain a clear grasp of the ways in which the participants themselves are analysing the interaction. Conversation analysts using this empirical methodology have investigated the details of conversational organisation, including the mechanisms of turn-taking, repair and preference organisation. It is beyond the scope of this chapter to attempt to review this work; Levinson (1983: 284) provides a comprehensive summary (see also Chapter Three).

Conversation analysis has a number of hitherto under-exploited attractions for aphasiologists (Lesser and Milroy, 1993: 318ff.; Milroy and Perkins, 1992). First, in contrast to the problems faced by top-down approaches in handling naturalistic data, CA provides a set of procedures for analysing unidealised contextually situated data. This means that aphasic discourse can be approached without any prior problematic assumptions about how this relates to "normal" discourse.

Second, in contrast to top-down approaches, CA addresses precisely the level of pragmatic impairment which is found in aphasia. From a review of the relevant literature it was concluded above that the pragmatic abilities addressed by top-down theories are relatively intact in aphasia. It is clear, however, that linguistic impairments are going to have an impact on the aphasic person's pragmatic abilities (pragmatic in terms of the broad definition given in 1.2.0 above) as they do not have the same resources to draw upon in communication. As Perkins and Lesser (1993) stress, a distinction is required between pragmatic impairments which are autonomous with respect to impairments at other levels of language, and pragmatic impairments which are a consequence of the impact of linguistic impairment on the use of language in context. An examination of the findings of various studies of pragmatic functioning indicate that, in aphasia, the latter form of impairment is found, with autonomous pragmatic impairments seen as a consequence of right brain damage (Code, 1987). Therefore, an approach is required which allows the exploration of the relationship between linguistic impairment and contextual language use. A CA approach offers precisely this. It is the only approach which explicitly takes account of minutiae such as filled and unfilled pauses, overlaps and repetitions, all of which have interactional consequences dependent on their sequential placement in discourse. Top-down approaches abstract away from such "messiness" in the data. They are, however, generally very common in aphasic conversation as a consequence of impaired linguistic processing. Thus, CA addresses itself quite directly to the level of pragmatic impairment typically experienced by aphasic communicators. It does not stress the separateness of linguistic and pragmatic impairment. The analyst is free to seek explanations for communicative success or failure in structural characteristics of a client's language and in limitations imposed by linguistic impairment. Specifically, CA *provides tools to* precisely describe the communicative consequences of particular linguistic impairments.

A third major strength of the application of CA to aphasia is that it treats conversation as a collaborative achievement (Schegloff, 1982). As a consequence of this, successful communication can be seen as the joint responsibility of both the impaired and non-impaired interlocutor. Top-down theories do not deal with this fundamental aspect of language use. The collaborative orientation of CA aligns well with the interest in environmental intervention discussed further in 1.2.3 below.

CA's emphasis on sequential context offers a further strength to the investigation of pragmatic ability in aphasia. Judgements regarding the impact of language impairments on conversation are made on the basis of sequential interactional outcome. This avoids the problems observed in "top-down" assessment and analysis approaches for which subjective judgements of appropriacy are made regarding pre-determined categories of behaviour. The emphasis on sequential context provides a more objective way of judging success and failure based on the interlocutors' responses. It also allows the exploration of the way in which the interlocutors deal with manifestations of language impairments which provides invaluable information for compensation-focused therapy discussed further in 1.2.3 below.

1.2.2 Pragmatic assessments

In the last section it was argued that a data-driven approach offers the most rational means by which to analyse aphasic discourse. It addresses precisely the level of pragmatic impairment found in aphasia and directs attention to the collaborative nature of interaction. The majority of pragmatic assessments of aphasia found in the literature have not, however, drawn on this perspective. Some draw on specific top-down theories; for example, Copeland's (1989) conversational assessment draws on speech act theory. For others, the use of theories is rather eclectic. Thus, Penn (1985a) draws on concepts from a number of different theories in her profile of communicative appropriateness including Gricean maxims, indirect speech acts and self repair. Other assessment tools do not draw on any specific theory (for example, Blomert, Koster, Van Mier and Kean's (1987) Everyday Language Test). This type embodies top-down principles, however, in the setting up of categories of behaviour which are then rated.

In some of these top-down assessments, reference is made to conversational management procedures. Thus, Wirz, Skinner and Dean (1990) include a rating of whether the client is carrying out effective or ineffective repair in the Edinburgh Functional Communication Profile. Prutting and Kirchner (1987) in the Pragmatic Protocol include a section on turn-taking which includes categories such as initiation, response, repair, pause time, overlap and feedback to the listener. The therapist is required to make a judgement of appropriacy on a two point scale. These borrowings from conversation analysis fail to embrace the principles underlying the approach and therefore fail to reap the advantages of this analytic approach outlined in 1.2.1 above. Rather than looking at how the interaction is being managed by the interlocutors through an examination of the sequential consequences, the authors take CA terminology and use it to create top-down categories which are then analysed in terms of their appropriacy or presence or absence.

The numerous top-down pragmatic assessments can be seen to differ in a number of ways, including the way that information about pragmatic ability is collected (role play, e.g. Holland's (1980) Communicative Abilities in Daily Living; samples of open-ended conversation, e.g. Edinburgh Functional Communication Profile, Wirz, Skinner and

Dean, 1990; relative's report, e.g. Communicative Effectiveness Index, Lomas et al, 1989). No attempt here is made to provide a comprehensive review of the assessments. For further discussion see Perkins and Lesser (1993), Lesser and Milroy (1993: 305ff.), Manochiopinig, Sheard and Reed (1992) and the assessments themselves. The main point to be made is that, despite their differences, the findings of all of these assessments fail to provide comprehensive information regarding the level of pragmatic impairment found in aphasia. Furthermore, while claiming to be a measure of language use in context, they neglect one of the most fundamental aspects of communication, that it is a collaborative endeavour between two or more people. All aspects of communication are rated in terms of the action of the aphasic client in isolation. As a consequence of both of these restrictions, such assessments are only able to offer limited guidance to remediation.

The strengths of a conversation analytic perspective to the assessment of pragmatic abilities are found in two recent assessment approaches in the literature. Since these embody the principles which are to be used in this study, they will be considered in more detail.

***Assessment Protocol of Pragmatic-Linguistic Skills (APPLS)** (Gerber and Gurland, 1989)*

Although Gerber and Gurland (1989) do not state that conversation analysis is the theoretical perspective forming the basis of the APPLS, it is clear that it embodies CA principles. Underlying the assessment is the notion that an evaluation procedure should unite the assessment of pragmatic ability and the assessment of linguistic ability, recognising the synergy that exists between the two in natural language use. This is congruent with the proposal made in 1.2.1 that pragmatic impairment in aphasia can be seen to arise as a manifestation of linguistic impairments.

The first stage of the APPLS analysis involves coding conversational turns which contain a signal to repair. The analysis embraces CA principles by using the aphasic conversational partner's response to determine what and what is not a breakdown (i.e. whether the partner initiates a repair sequence). Thus, the success of interaction is used in preference to problematic judgements of appropriacy or communicative effectiveness prominent in other pragmatic assessments already discussed. Each breakdown is analysed in terms of whether the underlying reason for a breakdown is a 'linguistic problem' (phonological, word-retrieval, or semantic-syntactic problem) or a 'pragmatic problem' (contextually irrelevant, presuppositional-referencing problem, topic maintenance problem, topic shift problem, turn-taking problem or other). An analysis of the breakdown repair sequence is then made, noting both client strategies in revision attempts and partner strategies in signalling repairs as well as examining the length of the whole process. A note is also made of both the linguistic structure of successful conversational turns, which result in topic introduction and topic maintenance, as well as their pragmatic function. The final part of the analysis involves quantitative and qualitative summaries of the client's and partner's performance in the conversational sample. This includes a percentage score of the number of conversational turns in which breakdowns occurred. The APPLS is based upon observation with two different conversational partners in recognition of the potential influence of this factor on interaction.

One of the advantages of the APPLS procedure is that the findings of the analysis can be used to motivate remediation. This makes such an approach an especially valuable clinical tool. In particular, what is laudable about this assessment is that it looks at both the origins of the breakdown, which could lead to deficit-focused therapy targeted at the linguistic deficits of the impairment, as well as examining the repair strategies used by both partners which is useful for planning compensation-focused therapy.

The APPLS does, however, have some limitations. Although an integrated approach which takes account of the relationship between linguistic and pragmatic impairments is invaluable in offering remediation which has a functional impact, the division between linguistic problems and pragmatic problems is rather arbitrary. It seems likely that so-called pragmatic problems such as topic maintenance arise from so-called linguistic problems and that rather than employing this artificial dichotomy it is necessary to look at the possible cause-effect relationships that exist between the two. Furthermore, in order to do this it is likely that much more rigorous linguistic investigation will be needed than the distinctions made by Gerber and Gurland of phonological, word-finding and semantic-syntactic problems. The role of pragmatic assessments as measures supplementary to linguistic investigations is one which has been acknowledged by most researchers developing such tools (e.g. Sarno, 1969; Holland, 1980; Penn, 1985a).

While the APPLS embodies the CA principle of judging the success of a turn on the basis of the response of the interlocutor, a greater consideration of the sequential environment could strengthen this approach to assessment. One of the most valuable features of a CA approach to assessment of pragmatic abilities in aphasia is that it avoids having to make judgements of appropriacy or effectiveness based on an unspecified notion of what occurs in normal discourse. Instead, by examining the sequence of turns it is possible to see how the interlocutors are managing the interaction. There is no need to utilise what happens in "normal interaction" to do this. In sequences of repairs, Gerber and Gurland treat each turn as a strategy in isolation that has either succeeded or failed. It appears, however, that the sequence of turns can result in success. To detect this it is necessary to look beyond the environment of two turns. It appears that Gerber and Gurland's knowledge of repair in normal conversation (which is usually resolved within two turns of the trouble source) is influencing their assessment of success or failure. The central feature of CA methodology is that conversation is sequentially constructed and it is necessary to look at the sequential context to derive an analysis.

Checklist of Conversational Abilities (Lesser and Milroy, 1993)

Lesser and Milroy (1993: 323ff.) have also proposed that a CA type analysis has much to offer to a pragmatic assessment of aphasic conversation. They have not designed a formal protocol but instead discuss an open-ended 'bottom-up' procedure to approach varied and intransigent data using a CA methodology. They have constructed a basic checklist which they propose can be used to scan a short conversational sample to identify how the interlocutors are achieving conversation. This involves an examination of the conversational management procedures of turn taking, repair strategies, embedded sequences, opening and closing routines, and the use of discourse markers. The major questions to be asked are whether and how particular procedures are handled by the participants, and whether specific communicative problems can be attributed to an impairment, either directly or as a result of the interlocutors' responses. The authors propose that the detailed findings from this initial analysis will form the basis for compensation-focused therapy with both the client and his or her relatives or carers.

Lesser and Milroy, while proposing that a sound qualitative analysis offers a basis for intervention in enabling the therapist to identify accurately areas of strength and weakness, acknowledge that quantitative analysis has an important comparative role to play, whether this is a comparison of the client's discourse with different conversational partners or a comparison across time to evaluate efficacy of treatment. The examples of measures which they suggest are likely to be relevant for comparison include average length of turn, length of pause between or within turns, frequency of discourse markers and minimal responses relative to those of the conversational partner and relative frequency of non-verbal contributions.

While acknowledging that quantitative techniques do have a role to play in assessment of pragmatic ability, they suggest that this should be seen as supplementary to qualitative analysis as there are clear limitations to quantification. First, it is possible that in the quantification, behaviours that are formally similar but which have different functions arising from their sequential placement will be counted together. Second, there may be complex interactions which are not identified by a gross quantitative measure. For example, Crockford (1991) used a measure of the number of turns taken to complete repairs and although other measures suggested that the functional communication of one particular subject had improved, the average duration of repair sequences had actually increased. Qualitative analysis revealed that this apparent paradox arose from the change in the spouse's behaviour. She had responded to his improved conversational ability by collaborating less on repair sequences, forcing the subject to carry out his own repair work.

Gerber and Gurland (1989) and Lesser and Milroy's (1993) CA-motivated approaches to pragmatic assessment are the strongest in providing information useful to the development of intervention programmes. Remediation is discussed further in the following section.

1.2.3 Pragmatics and remediation

In section 1.1.2 it was pointed out that implicit to any theoretically motivated remediation programme is a theory of how recovery is effected. The theory of recovery implicit to a pragmatic approach to treatment is that of compensation. Thus, the pragmatic approach to treatment represents a move away from more traditional therapy focused on improving the aphasic client's production and comprehension of normal and "correct" language structures. Instead remediation is concerned with the broader issue of optimal communication, with the client using all resources available to maximise his or her communication ability. In practice this involves the aphasia therapist encouraging strategies already used which are successful, eliminating ones which appear to be counter-productive and teaching ones which the client and his or her conversational partners are not already using. There are two areas developing from this broader pragmatic orientation to remediation. The first of these involves direct work with the client to help him or her develop strategies which optimise communicative ability. The second area is concerned with environmental therapy, focused on the development of functional strategies in the client's conversational partners. This dichotomy is not a discrete one as work with the aphasic client and his or her conversational partner may be run in tandem.

In order to decide on a treatment programme of communicative strategies it is necessary to assess the way in which the client and his or her conversational partner are managing interaction. Such an assessment should yield information pertinent to the formulation of treatment plans. In the review of assessments in 1.2.2 above it was proposed that approaches based on a conversation analysis methodology offered the best guidance for rationally motivated therapy in this domain. An understanding of the way in which conversationalists are managing conversation allows us to consider suitable strategies that could be used by both the aphasic client and his or her interlocutors.

The basis for aphasia therapists to encourage development of effective strategies is the identification of those used by aphasic clients who are good communicators despite their aphasia. Penn (1985b) has developed a comprehensive taxonomy of compensatory strategies used by eighteen aphasic clients. The aim of this was to provide some insight into what compensatory strategies differentiate the performance of subjects viewed as overall good communicators from those who lacked efficiency in communication. A summary of the strategies are given in table 1.1.

Penn found that some of the clients, although using identical compensatory strategies, appeared to be differentially effective in communication terms depending on the frequency and sequential placement of the devices used. Thus, some dysfluencies were felt by the judges in the study to be enhancing communication in that they reflected normal searching and conversational management procedures. When such behaviours

Table 1.1 Summary of Penn's (1985b) compensatory strategies in aphasia

1	**Simplification strategies**
	change in word order to bring salient aspects foremost
	use of direct speech to avoid complex embedding
	pronominalisation to refer back in discourse without a clear referent
2	**Elaboration strategies**
	circumlocution
	elimination strategies ("it's not monday, but tuesday")
	post-modification and co-ordination or embedding of clauses
3	**Repetition strategies**
	self- repetition and paraphrase
	stylistic repetition to achieve descriptive function in the absence of adjectives
	repetition of all or part of conversational partner's preceding utterance
4	**Fluency strategies**
	stereotypes (e.g. "you know what I mean")
	place holders and stallers
	filled pauses
5	**Sociolinguistic strategies**
	self-correction
	comment clauses
	requests for clarification
	pausing
	topic shift at point of breakdown
6	**Non-verbal strategies**
	substitution of non-verbal for verbal behaviour
	support of verbal with non-verbal behaviour
	non-verbal behaviour yielding additional information to verbal behaviour
	non-verbal behaviour aiding verbal production
	use of alternative modalities
7	**Interlocutor strategies**
	the use of probe and yes/no questions
	conversational buffering
	input simplification/ modification
	cueing (phonemic or semantic)

occurred with high density or at unexpected junctures, however, such behaviours were regarded as inappropriate. The implications that Penn draws from the findings of her study are that for some clients it may be necessary to teach and develop new strategies, while the task may be to "undo" spontaneously acquired strategies which may in fact be hampering overall communicative competence.

While Penn's taxonomy has some useful things to say about how effective communication can be achieved by aphasic subjects, the question arises as to whether production of such devices as short conversational turns because of severely restricted syntax should be viewed as a compensatory strategy or whether it is rather better viewed simply as a symptom of the language impairment. The blurring of this distinction between strategies and symptoms can be seen in other work on pragmatic ability in aphasia. Holland (1991) proposes, for instance, that the fact that in confrontation naming the most conventional errors are semantic paraphasias is indicative to some extent that pragmatic skills are retained in aphasia. While a semantic paraphasia may be more communicatively effective than the production of a neologism, it is more a reflection of the nature of the linguistic deficit than of differing compensatory strategies.

The distinction between strategies and symptoms has an important role to play in planning intervention. While it may be possible to explicitly instruct a client in the strategy of circumlocuting to communicate a lexical item that he or she cannot retrieve, it is unlikely that telling them that the production of neologisms is not an effective strategy and that they should try for a phonemic paraphasia will be useful. Instead, to tackle such issues it is necessary to employ direct therapy at a specific linguistic level, perhaps using a cognitive neuropsychological framework to decide on appropriate therapy goals.

The distinction between symptoms of aphasia and strategies is also important to the conclusions that Penn draws with respect to the implications for therapy. She reports that clients, although using the same compensatory strategies, appeared to be differentially effective in communication. She concludes from this that not all compensatory strategies which the client develops spontaneously necessarily facilitate communication. Thus, for some clients it may be necessary to "undo" spontaneously acquired strategies which may in fact be hampering communicative competence. The use by one client of specific strategies may be seen to be less effective than their use by another client because the first uses them to a much greater extent; for example, the use of filled pauses and stereotypes to maintain fluency. The need to use a strategy cannot, however, be divorced from the linguistic deficits which are giving rise to the need for it. Therefore, it is rather simplistic to argue that unproductive strategies should be eradicated. The use of strategies must be seen in the context of the language impairments that give rise to the need for them.

Another major problem with Penn's classification is her use of appropriacy judgements for strategies. This implies normative judgement. She states "if such behaviours occurred with high density or at unexpected junctures...such behaviours were regarded as inappropriate" (1985b: 126). The problems of normative judgements for aphasic communication have already been outlined in 1.2.1 above. It is likely that the greater the level of language impairment the higher the density of so-called strategy use will be. Pertinent to this issue is the point made by Green (1984) that while therapists should try to develop those strategies that are as socially acceptable as possible, it must be stressed that to communicate with any strategy is better than no communication at all.

Finally, Penn's grouping of strategies appears to be rather arbitrary, based on surface manifestations rather than their underlying function within the interaction. Thus, for example, while repetition of all or part of the interlocutor's turn and "requests for clarification" can be seen as strategies which enhance understanding of the conversational partner's turn, they are defined separately as a <u>repetition</u> strategy and a <u>sociolinguistic</u> strategy respectively. In addition, given the evidence for the collaborative nature of communication, the separation of aphasic client's strategies (1 to 6 in table 6.1) from those of the conversational partner can also be seen as of dubious validity.

It is proposed that these three major limitations of Penn's classification can be solved through the use of a CA approach to the assessment of conversational strategies. As discussed in 1.2.1 above, such an approach allows the teasing out of the relationship between linguistic impairments and the impact on interaction. Thus, the issue of strategy versus manifestation of language impairment can be tackled. The emphasis on interactional outcome as a measure of strategy success allows the thorny issue of appropriacy to be circumvented. Finally, a truly data-driven analysis would allow the description of strategies in terms of their function in the sequential context, avoiding classification based on surface appearance. It also treats interaction as jointly negotiated, therefore avoiding the arbitrary separation of aphasic client's strategies from those of his or her conversational partners. Overall it can be seen that CA provides an invaluable tool to guide judgements regarding which conversational strategies should be encouraged, taught or discouraged.

A number of researchers have discussed therapy involving the teaching of communicative strategies to aphasic clients and their carers including Green (1984), Davis and Wilcox (1981, 1985) , Newhoff, Bugbee and Ferreira (1981), Miller (1989b) and Holland (1991). Perkins and Lesser (1993) provide a review of such work. Davis and Wilcox's PACE procedure has been widely utilised in aphasia therapy. It appears, however, to have severe limitations. While its principles may be those of naturalistic communication, the task of communicating information such as the names of objects is much closer to traditional didactic therapy than it is to imitating naturalistic communication. Howard and Hatfield (1987: 84ff.) suggest that some pragmatic therapists are confusing the aims of treatment (to improve everyday communication ability) with the means of treatment and suggest that there is a place for direct instruction in the use of strategies. Again a conversation analytic perspective can be seen to have something to offer to the issue of remediation in giving clinicians a clearer idea of what they are teaching to both clients and their conversational partners.

All researchers concerned with the identification and teaching of compensatory communicative strategies refer to the use of non-verbal means of communication (e.g. Penn, 1985b; Green, 1984; Holland, 1991). Garrett, Beukelman and Low-Morrow (1989) state that the focus on pragmatic competence opens the door for augmentative and alternative communication (AAC) approaches to communication for the individual who is unable to effectively generate messages through deficient modalities. Garrett et al (1989) report on the development of an AAC system for an adult with Broca's aphasia that consisted of a package of techniques which could be drawn on to enhance communication. This included a word dictionary dealing with his favourite conversational themes which he was able to use to cue verbal output. An alphabet card was used to provide an additional cue to the conversational partner when the client's production was unintelligible due to phonemic paraphasias and which the client himself used to cue word retrieval. A card containing breakdown resolution cues, which guide the conversational partner through a structured form of twenty questions, was also provided to help in dealing with breakdowns in the conversation. The client was also supplied with phrases to be used as conversational control strategies. This included phrases such as "I'm changing topic" as the client had problems in signalling this, and "we will stop" to indicate that breakdown resolution work should be abandoned. Finally, the client was encouraged to use writing and drawing as well as to communicate with verbal output when possible. The development of this package utilises several of the principles of CA and it would appear that a CA-motivated assessment would provide information relevant to developing this type of programme. It is clear that such an approach to treatment has greater ecological validity than Davis and Wilcox's PACE.

1.2.4 Concluding remarks

In this review the importance of critically evaluating the theoretical principles applied to the pragmatic management of aphasia has been stressed. It was concluded from the review of the relevant literature that most aphasic people appear to have intact knowledge of how to use language in context. That is not to say, however, that their pragmatic ability is intact, since it appears that pragmatic limitations arise as a consequence of primary linguistic deficits. This led to the proposal that the most useful framework to use in an investigation of pragmatic ability is one which allows the teasing out of the relationships between specific deficits and their interactional consequences. It was suggested that the best framework to achieve this is that of conversation analysis which allows the investigation of the way that aphasic clients and their conversational partners manage the interaction. The cause of conversational breakdowns can be related to specific, independently identified language impairments.

Although the application of CA to aphasia is in its infancy, its focus on both partners in an interaction aligns well with the philosophy apparent in the literature of working not only with the aphasic client but also with his or her spouse or carer. The identification and teaching of strategies is reported in the literature without explicit reference to CA (e.g. Penn, 1985b; Green, 1984). However a CA-style analysis can supplement such work by enabling the therapist to identify quite precisely both facilitative strategies which need to be taught and maladaptive strategies which need to be discouraged.

Two current assessments in the literature have utilised the strengths of a CA approach in aphasic interaction (Gerber and Gurland, 1989, Lesser and Milroy, 1993). While both report the need to consider the impact of linguistic impairments on pragmatic functioning in aphasia, neither explore this issue in any detail. This is the major focus of this study.

1.3 The strengths and limitations of cognitive neuropsychology and pragmatics in their application to aphasia

In 1.1 and 1.2 two very different theoretical perspectives and their application to aphasia have been reviewed. Each have specific strengths and limitations for the investigation and remediation of aphasia. These can be seen as complementary in nature in a number of ways. In this section their complementarity is considered.

Cognitive neuropsychology and pragmatics can be seen to differ in terms of the development of the theoretical models and their applicability to aphasic data. Cognitive neuropsychology brings with it theoretical models which, although underspecified in terms of the nature of the processing modules (as is discussed in Chapter Two), have empirical support from experimental work and the speech error data of normal subjects as well as from the investigation of aphasic subjects. Furthermore, because the performance of brain damaged patients to test and develop hypotheses about cognitive function is the basis for cognitive neuropsychology, the theoretical assumptions and methodology are designed specifically to handle impaired performance. This means that they are directly applicable to aphasic data.

In contrast, the application of pragmatics to the investigation of aphasia has no clear theoretical framework. Several theories from disparate academic backgrounds have been borrowed with little attention being paid to their limitations and some assessment approaches appear to be essentially atheoretical. The relationship between pragmatic ability in aphasic people and the non-language impaired population has not been clearly established although it has generally been proposed that pragmatic ability is intact in aphasia. From a review of the literature it is proposed that while pragmatic ability at the higher levels of propositional, logical and inferential structure of discourse appears intact for the majority of aphasic subjects, it is necessary to take account of the impact of linguistic impairments on pragmatic ability. In recognition of this it is proposed that a data driven conversation analysis approach to the investigation of aphasia is the most valuable.

In assessment of aphasia and evaluation of remediation, the development of techniques can be seen to mirror the maturity of the theoretical perspectives. Cognitive neuropsychology with its roots in laboratory psycholinguistic investigations has developed a variety of assessments and analyses which can be utilised by the aphasia therapist to formulate hypotheses of underlying impairment and to guide remediation. Furthermore, as the measures are quantitative, through the comparison of test-retest scores it is possible to evaluate the efficacy of intervention.

In the application of pragmatics, while a large number of different assessments have been developed their links with a theoretical framework are often tenuous and some assessments are essentially atheoretical. The majority of assessments do not offer guidelines about possible areas of remediation. They also do not lend themselves to quantitative measurement and this makes the evaluation of therapy efficacy difficult. Again it was proposed in the review that a CA approach would offer a framework in which to analyse communicative strategies used by both aphasic and normal conversational partners which could be utilised in the development of targets of remediation.

The two theoretical perspectives also differ in their subsequent approaches to therapy. The emphasis of the cognitive neuropsychological approach is identifying deficits in terms of processing modules and treatment tends to focus upon restoration of the impaired cognitive function or reorganisation through cognitive relay. In contrast, a pragmatic approach to aphasia moves away from the emphasis of deficit identification and treatment and instead focuses on compensatory approaches utilising communication aids and functional communication strategies, with the remediation issue being the broader one of optimal communication.

The cognitive neuropsychological approach's strength can be seen to be the well-developed theoretical framework underlying it. This, however, can also be seen to be its major limitation. The analysis of impairments in terms of the models tends to focus both assessment and treatment in terms of impairments of language processing. Thus, the tasks utilised in both assessment and treatment often tend to be heavily abstracted from the communication demands that the aphasic person faces in his or her everyday communicative environment. Synthetic tasks such as naming pictures or selecting a picture from a choice to match a heard or read sentence are commonly utilised. Thus, while the patient may be shown to improve on the task being utilised in treatment, the question of whether this has an impact on the patient's communicative ability is often left unanswered. Furthermore, the cognitive neuropsychological approach fails to pay any attention to the interactional and collaborative nature of communication.

In contrast, pragmatics (at least from a CA perspective) deals with precisely these issues and this gives the approach strong ecological validity. Assessment of communicative performance from a CA perspective utilises naturalistic data rather than relying on artificial tasks. The focus on the collaborative nature of communication can be seen to be one of its greatest strengths. The investigation of the behaviour of the aphasic client's conversational partner has important implications for remediation, an area not dealt with by a cognitive neuropsychological approach.

It is hoped that the review given in this chapter has demonstrated the potential value of the two approaches to the investigation and treatment of aphasia as well as the importance of an appreciation of the theoretical basis that is applied. The apparently complementary nature of the strengths and limitations of the two approaches makes clear the relevance of an integration of the two. While most workers in aphasiology would acknowledge the importance of an integrated approach to remediation, it is necessary to identify the most fruitful way to link these two different ways of working. The proposal made from the review of the literature that pragmatic limitations in aphasia predominantly arise as a consequence of primary linguistic deficits provides some guidance as to how this issue can be tackled. Cognitive neuropsychological assessment allows precise and accurate description of the linguistic impairments in terms of language processing models. A detailed conversation analysis allows an investigation of the impact of the identified deficits on interaction as well as allowing the investigation of the strategies utilised by the conversationalists to deal with them. An understanding of the impact of cognitive neuropsychological impairments on conversational ability would help in deciding the validity of treatment of the deficit itself, while an understanding of the mechanisms in operation to deal with the impact of such deficits could be utilised in developing functional communication strategies and deciding on the appropriacy of alternative communication aids. This is the line of investigation pursued in this study.

The following two chapters examine in more depth the particular aspects of the two approaches drawn upon in this study. In Chapter Two, the models of language processing used as a framework for cognitive neuropsychological assessment are discussed. The conversational management procedures focused upon are presented in Chapter Three.

Chapter Two

COGNITIVE NEUROPSYCHOLOGICAL MODELS OF LANGUAGE PROCESSING

2.0 Introduction

The purpose of this chapter is to articulate the models of language processing which are used to interpret the subjects' performance on cognitive neuropsychological assessments in this study. Models of language processing are constantly being developed in response to the findings of both experimental work with normal subjects and the investigation of aphasic subjects. In this chapter an overview of this work is given and, where controversies exist in the literature, an attempt will be made to indicate the stance being taken in this study.

Models of normal language processing form the basis of cognitive neuropsychology. In any applied academic discipline there is an inevitable time-lag between development of the underlying theory and its incorporation into the applied discipline. A danger arising from this is that cognitive neuropsychology uses a "snap-shot" view of models of normal language processing despite further developments which make this view obsolete. It is clearly important, therefore, to be aware of the underlying theory in the explanation of impaired function as well as failures to employ new developments based on research of normal language processing. It is beyond the scope of this study to explore this issue in great detail. An attempt is made in this chapter, however, to acknowledge possible areas where there is scope for the incorporation of new developments in psycholinguistic theory.

The chapter commences in 2.1 with a brief discussion of two controversies which pervade both single word and sentence level language processing models. These are the case for serial processing versus interactive activation and the distinction between impairments of access and degradation. The remaining three sections concentrate on models of language processing and the consequences of impairments to various processing levels. In 2.2 single word processing is discussed. Sentence production is considered in 2.3 and the chapter concludes with an examination of models of sentence comprehension in 2.4.

2.1 Controversial issues in cognitive neuropsychology

2.1.1 Modes of processing

Different proposals have been made in the literature regarding transmission of information between different levels of processing. One view is that access to each level occurs as a separate discrete stage, with processing moving on to the next stage only after the resolution at the previous stage. This serial view of processing underlies Morton's logogen model (e.g. Morton, 1969) as well as Garrett's model of sentence production (Garrett, 1975). Other workers have suggested that the processing between levels is not so discrete and that many processes can be carried out in parallel. Stemberger (1985) proposes an interactive activation model of language processing utilising the processing characteristics of the work of McClelland and Rummelhart (1981). Transmission of information (activation) between the representations at different levels of processing operates continuously from the onset of activation. As a given unit becomes activated, it begins to pass activation to all units that are associated with it in cascade (McClelland, 1979). Activation spreads to higher levels of the system as feedback which leads to partial activation of non-target units. Within a level of processing, there are inhibitory links which can be viewed as negative activation in that they decrease the activation level of the receiving unit. It is proposed that the links are weighted so that a unit with a higher resting level of activation will have a greater inhibitory effect on competing units. This gives rise to "the rich get richer" principle (McClelland and Rummelhart, 1981) which is necessary for the selection of one unit from a set of mutually exclusive alternatives. In contrast to serial models, the interactive activation models predict that several units at one level are activated in parallel and that several levels of the language system are being processed at a given moment, although higher levels are closer to completion. While most work utilising non-serial models proposes that activation can flow in both directions i.e. cascading and feedback (e.g. Stemberger, 1985; Miller and Ellis, 1987), Humphreys, Riddoch and Quinlan (1988) discuss a non-serial model in which activation only flows from higher to lower levels i.e. cascading without feedback. These can be called interactive activation models and cascade models respectively. As the majority of work has assumed two way flow of information the discussion will focus on the interactive activation mode of processing.

Serial and interactive activation models make different predictions about the effects of factors known to influence one level of processing on later levels of processing. As a serial model approach maintains that processing at one level is completed before processing at the next level begins, this predicts that such factors will be confined to one level of processing. In contrast, interactive activation models predict that the effects of such factors may be passed onto subsequent processing levels.

Three forms of evidence for and against the two modes of processing have been produced. The first is evidence from experimental studies with normal subjects. Butterworth (1989), one of the major proponents of serial processing, cites experimental studies of picture descriptions by Kempen and Huijbers (1983) and Levelt and Maassen (1981) in support of the proposal that all items must be retrieved from the semantic lexicon before access to the phonological lexicon can begin. Kempen and Huijbers found longer speech latencies for non-sentential two word responses than single word responses. They propose that this arises because initiation of a response has to wait for selection of all the semantic lexicon representations and the first phonological lexicon representation. However, while longer latencies may arise as a result of the number of items to be accessed in the semantic system, it does not seem necessary to assume that access must be completed before processing at the phonological output lexicon can begin. This finding does not appear to rule out interactive activation.

Humphreys, Riddoch and Quinlan (1988) describe some picture naming experiments with normal subjects which provide evidence for processing occurring in cascade. They found interactions between visual structural similarity (a variable assumed to influence access to structural knowledge about an object) and word frequency (a variable assumed to influence access to the phonological output lexicon) and an interaction between semantic priming and word frequency. A serial model would predict an additive effect of factors since, according to this view, processing at one level cannot start until processing at the previous level has been completed. The interaction of variables known to influence different levels therefore provides evidence to support processing in cascade and reject serial models. Bock (1987) also reports experimental evidence from normal subjects which provides evidence of interactive activation between levels of processing in sentence production (Bock and Warren, 1985; Bock, 1985).

Proponents of both types of processing have offered interpretations of speech error data. Stemberger (1985) reviews the interpretations that have been given in terms of both serial and interactive processing. Explanations of malapropisms (lexical errors which are phonologically related to the target) have been offered both in terms of serial processing (Fay and Cutler, 1977) and interactive activation (Stemberger, 1982; Dell and Reich, 1980). In favour of interactive activation models, Stemberger and MacWhinney (1984) have reported on the failure of serial models to account for inflectional errors found in the production of past tense forms of regular verbs that resemble irregular forms. A number of researchers have demonstrated that all forms of word substitutions are facilitated if there is a phonological similarity between the target and the error word. Butterworth (1981) and Baars (1980) offer a serial processing explanation of this, suggesting that a pre-articulatory output editor checks the output of the language system for correctness. The editor would be most likely to miss errors that are phonologically similar to the target. In contrast, Dell and Reich (1980) and Harley (1984) have interpreted this phenomenon as evidence for interaction between the target and error words. Whilst Stemberger (1985) concedes that the serial model's editor does offer a viable explanation, he notes that it offers further complexity to the system which an interactive activation proposal avoids.

Stemberger (1985) also discusses speech errors in which there is phoneme substitution and addition as well as feature errors. He offers an explanation for all these forms of errors in terms of interactive activation between two phonological levels of segments and features and notes that Shattuck-Hufnagel's (1979) serial model, which utilises a scan copier and checkoff monitor in the transfer of information between the phonological lexicon and buffer, is not able to account for such errors. Indeed, no explanation of these types of errors has been offered in terms of serial processing.

The final form of evidence that has been used to examine modes of processing is the language performance of aphasic subjects. Overall, the evidence for interactive activation appears to be strongest. To illustrate the different ways in which the same symptom has been accounted for using different modes of processing, one example will be discussed here in depth; namely the production of semantic errors as a consequence of an impairment at the phonological output lexicon. Caramazza and Hillis (1990) describe two subjects, HW and RGB who produced high rates of semantic error in oral naming and oral reading. These errors could not, however, be explained in terms of a central semantic impairment as neither subjects made semantic errors in written naming or writing to dictation and they demonstrated unimpaired comprehension for spoken and written words that they orally produced as semantic errors. Caramazza and Hillis therefore propose that HW and RGB have an impairment at the phonological output lexicon. In addition, it is proposed that they must have an impaired non-lexical route of reading on the basis that the functioning of this route would be expected to block the production of semantic errors[1] (Hillis and Caramazza, 1991). In line with this prediction both subjects were severely impaired in non-word reading.

The claim that an impairment at the phonological output lexicon can give rise to semantic errors implies that activation in the semantic system leads to activation of other semantically related representations in the phonological output lexicon. This is congruent with interactive activation models which propose that cascading of information begins before completion of processing in the semantic system. This gives rise to activation of semantically related representations in the phonological output lexicon. If there is an impairment in accessing representations (whether this arises from raised thresholds in the phonological output lexicon or in reduced activation reaching the phonological output lexicon) then the target item may fail to reach a sufficient level of activation to be accessed. Noise arising from differing resting levels of activation, due to a higher frequency or because a representation has more recently been accessed, may lead to a semantic associate of the target reaching a high enough level of activation to be accessed, resulting in the production of a semantic paraphasia.

Serial models vary in their ability to account for the production of semantic paraphasias as a consequence of damage at the phonological output lexicon. As discussed by Humphreys, Riddoch and Quinlan (1988) in their comparison of serial and cascade models, discrete stage models hold that semantic similarity effects will be confined to the stage of accessing the appropriate semantic representation. Howard and Orchard-Lisle (1984) demonstrate this stance. They specifically argue against the possibility that raised activation levels in the phonological representations of items which are

[1]On the basis of both experimental evidence with normal subjects and evidence from subjects with acquired dyslexia three processing routes of oral reading have been proposed. The lexical semantic route is mediated via the orthographic input lexicon, the semantic system and the phonological output lexicon. The second route involves direct access to the phonological output lexicon from the orthographic input lexicon. Finally a non-lexical route is proposed which is utilised to read novel and non-words involving grapheme-phoneme conversion using input from the visual analysis system and outputting at the phonological output buffer. See Ellis and Young (1988) for a review of the literature regarding the impact of impairments affecting the various processing routes.

semantically related to the target is a feature of normal language processing. They suggest that if this were the case one would expect a substantial proportion of semantic errors in picture naming and spontaneous speech of normal people. Workers looking at speech error data do report substitution of an intended word by another similar in meaning (Fromkin, 1973; Garnham, Shillcock, Brown, Mill and Cutler, 1981). Howard and Orchard-Lisle suggest, however, that the error rate is too small to be explained in terms of activation of semantically related phonological lexicon representations. They propose instead that such errors could arise from a selection error in the semantic system. This form of serial model thus fails to account for cases such as HW and RGB who produce semantic errors despite apparently intact semantic processing.

In contrast, Morton and Patterson (1980), in their discussion of the semantic paralexias produced by deep dyslexic patients who have apparently intact semantic processing, allow for a semantic representation activating a range of semantically related representations in the output system. They propose the idea of response blocking to account for the semantic errors in which output logogens for certain items have outputs which are blocked or have raised thresholds. Despite the full semantic code being sent from the cognitive system to the output logogen system, the appropriate output is not forthcoming and thus, as a response is required, the logogen (i.e. the lexical phonological representation) nearest to threshold activation would be selected for output. This proposal assumes that the semantic code accesses a range of semantically related representations in the phonological output lexicon.

An alternative serial model of single word processing proposed by Butterworth (1980, 1989) offers a different explanation for semantic errors in production in the absence of a central semantic impairment. Butterworth proposes that there is a semantic lexicon which functions as a transcoding device between the semantic system and the input and output lexicons. One strong prediction that this model makes is that an impairment in access to the semantic lexicon from the semantic system will give rise to output semantic errors qualitatively and quantitatively identical in spoken and written naming. Howard and Franklin (1988) suggest that the performance of their subject MK on cognitive neuropsychological assessments can be interpreted in terms of Butterworth's proposal. MK does show a semantic deficit in comprehension tasks, with a greater proportion of errors on low imageability items. His naming performance is at the low end of the normal range on standardised tests. Of interest, however, are the errors that he makes; predominantly semantic ones. Furthermore, error rates for oral and written naming are very similar, with similar types of errors being made on the same items in the two tasks. MK therefore appears to demonstrate an output semantic naming impairment that is independent of modality of naming. Howard and Franklin propose that MK has two different kinds of semantic-level problem. Semantic errors in output are attributed to misaddressing at the level of the semantic lexicon. They suggest that this disorder does not seem to be sensitive to abstractness on the basis of the observation that MK produces an impressive number of abstract words on a definition task. In contrast they propose that the comprehension problem, which is less marked than the output deficit (at least for high imageability items) and is sensitive to stimulus words' abstractness, can be attributed to a semantic system deficit. There appear to be a number of problems with this interpretation. First, as the semantic system is common to both language input as well as language output, such a deficit would be expected to have an impact on production as well as comprehension. Therefore, imageability could also be expected to influence word production. The conclusion that retrieval is not severely disturbed for abstract words, however, appears to be based on rather problematic evidence. Second, the statement that the problem in input is less marked that in output does not provide strong evidence for the proposal of two levels of deficit. Hillis, Rapp, Romani and Caramazza (1990) have argued that different tasks may require different degrees of semantic information and this may account for differential performance on tasks even though a single impairment may underlie all of them. It seems plausible to propose that synonym judgement and picture association tasks do not require the degree of semantic information required in picture naming. It therefore appears more plausible to account for MK's performance in terms of a central semantic impairment. Even withholding these criticisms of the evidence provided by MK, the semantic lexicon theory still faces major problems. If a semantic lexicon does exist then it should be impossible to have a semantic level of deficit specific to one modality of output (Howard and Franklin, 1988: 116). If in contrast, access to the phonological output and graphemic output lexicon from the semantic system are independent processes (as in the model shown in figure 2.1, p.55) then output semantic deficits will be modality specific. Evidence for this is given by Caramazza and Hillis's cases HW and RGB who show a semantic output impairment specific to the spoken modality.

In summary, while interactive activation models provide a satisfactory account of the production of semantic paraphasias arising as a consequence of an impairment to the phonological output lexicon, only serial models which allow for activation of semantically related representations in the output lexicon (e.g. Morton and Patterson, 1980) can account for the cases described in the literature.

To conclude, while some researchers continue to support the proposal of serial processing in their analysis of aphasic data, interactive activation models appear to explain more satisfactorily the evidence from speech error data, experimental findings and investigations of brain-damaged subjects. On this basis, interactive activation models will be used in this study and this will be reflected in the following review.

2.1.2 The distinction between access versus degradation impairments

A controversy exists in the literature as to whether it is possible to make a distinction between an impairment at a level of processing itself and an impairment in access from one intact level of processing to another. Rapp and Caramazza (1991) and Caramazza and Hillis (1990) argue that to distinguish between the alternatives of access or degradation impairment it is necessary to have a sufficiently detailed theory of lexical processing to be able to give substance to such notions as 'transmission of information', 'access' and 'representations'. Specifically, Rapp and Caramazza (1991) criticise the distinction by demonstrating that one of the criteria proposed by Shallice (1987, 1988) to distinguish between impaired access and degradation (namely item consistency) does not satisfactorily distinguish between impairments at the phonological output lexicon. They argue that both impairments in access to the phonological output lexicon and impairments to the lexical representations themselves could give rise to either consistent or inconsistent errors depending on the details of the model that is utilised. Unfortunately, there are problems with Rapp and Caramazza's interpretation of Shallice's criteria as general ones which can distinguish between access and representation deficits for any levels of processing. Shallice is not making a distinction between degradation to the semantic system itself and access to the semantic system from one of the input lexicons (which he refers to as transmission of information, Shallice, 1987: 121). His access impairment refers to access to the precise meaning of a word within the semantic system. It therefore appears that Rapp and Caramazza'a rejection of the access / degradation distinction, on the basis of exposing problems with Shallice's criteria of consistency, is faulty. Indeed, Funnell and Hodges (1991) provide convincing evidence to reject the factor of item consistency to distinguish between impaired access versus degraded representations while still providing convincing evidence that their subject, who has a progressive anomia in the context of dementia of the Alzheimer's type, has impaired access to the phonological output lexicon rather than degradation to the representations in either the semantic system or the phonological output lexicon.

Humphreys, Riddoch and Quinlan (1988), while acknowledging the difficulties which arise in attempting to make a distinction between access and representation deficits, state that it is not impossible. They propose the use of converging evidence from performance on a number of different tasks which tap different levels of representation and in which variables which are thought to have effects at these levels (e.g. structural similarity, imageability, word frequency, word length) are manipulated. Once a deficit with one level of processing has been identified one can then test whether the deficit is influenced by an earlier process. If the effects of earlier processes are apparent one can then hypothesise an access deficit. If the effects are confined to variables specific to the level of representation required in the task, however, it is possible to argue for a representation deficit. This principle is only operational if one assumes cascade processing. A further method of distinction between an access impairment is whether there is a constant deficit whatever the mode of input. Thus, as discussed in the next section, Franklin (1989) proposes a distinction between a central semantic impairment and an impairment in access to the semantic system from an intact phonological input lexicon on the basis of whether there is a consistent impairment on semantic tasks whether presented in written or spoken form or whether there is a modality specific impairment. It should also be possible to use converging evidence to make the distinction for impairments of the phonological output lexicon and phonological output buffer, both of which can receive input from a number of different levels depending on the task (naming, oral reading, repetition) although to my knowledge this has not been discussed in the literature.

Caramazza and Hillis (1990) state in relation to impairments between the semantic system and the phonological output lexicon that we cannot distinguish amongst a deficit in

(a) transmission of information from the semantic system

(b) access to the lexicon

(c) the lexicon itself in the form of raised threshold of activation.

It would appear possible, however, to distinguish between damage to impaired processing for a specific level of processing versus problems in accessing between two intact levels if we remain neutral on the issue of the form of this impairment in terms of (a), (b) or (c). In this thesis, an impairment in processing between two intact levels will be called an <u>access deficit</u> to contrast with <u>impaired processing within a specific level</u>.

2.2 *Single word processing*

2.2.0 Preliminary orientation

A model of cross-modal processing of single words modified by Lesser and Milroy (1993: 57) from Patterson and Schewell (1987) is given in figure 2.1. As is represented pictorially, the model is able to account for the comprehension of spoken and written words (auditory comprehension and reading comprehension) and the production of spoken and written words (speech and writing). While the model can be split up into four component parts according to input and output modality, tasks such as repetition, oral reading and writing to dictation involve the utilisation of processes from different sub-components so it is necessary to consider the model as a whole. The semantic system is central to all processing. Activation of the semantic system is achieved either spontaneously or in response to a stimulus through either the phonological or orthographic word recognition systems or the visual recognition system. Activation in the semantic system can lead to the production of words through either the spoken word production system or the written word production system.

While the focus of interest in this study is on cognitive neuropsychological deficits that have an impact on conversational ability (i.e. those deficits which impair spoken language comprehension and production) this does not mean that the processes concerned with written language can be ignored as no language task involves only one processing module. It is necessary to make inferences about impaired performance from converging evidence on a number of different tasks.

Thus, oral reading can provide information on the processes concerned with spoken word production as well as the processes concerned with written word comprehension. In this review, the emphasis will be on the auditory input system and the spoken output system, although brief reference will be made to the processes involved in orthographic input as information on this may be needed to evaluate the information regarding word production from oral reading.

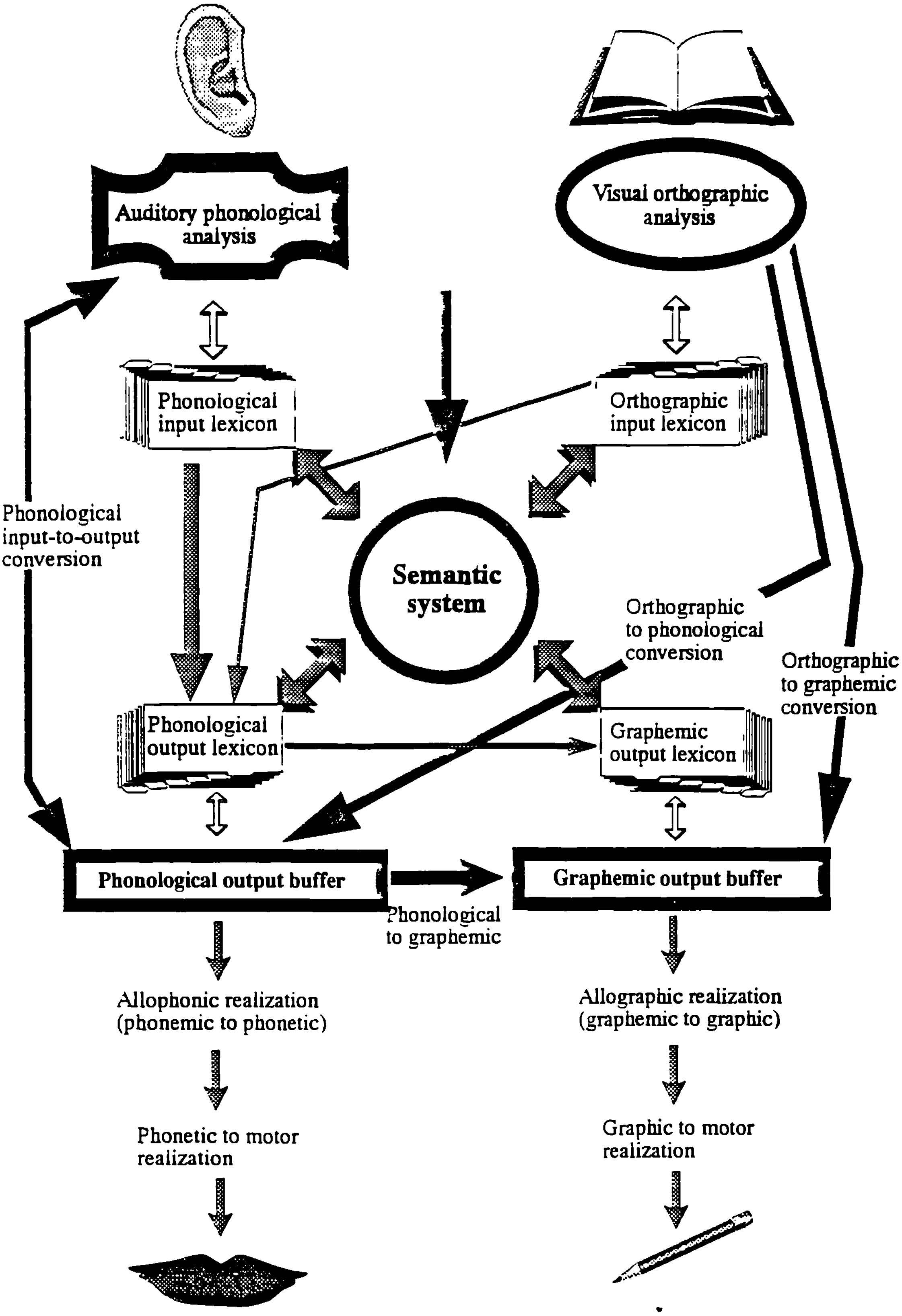

Figure 2.1 *Cross-modality model of single word processing (from Lesser and Milroy, 1993).*

2.2.1 Word recognition systems

The word recognition systems are generally thought to include at least two major components. The first is a perceptual analysis system. Garman (1990) provides a review of the psycholinguistic research investigating the nature of auditory phonological analysis and visual orthographic analysis. Franklin (1989) proposes that a disorder at the level of auditory phonological analysis results in the symptom of word sound deafness. A severe impairment in analysing speech sounds impairs performance on all auditory comprehension tasks as the aphasic person is functionally deaf for speech. In contrast, a mild impairment at this level could be expected to give rise to impairments for tasks which required accurate knowledge of the incoming phonology, but in the absence of other impairments, the aphasic person should be able to use the context to aid understanding. An impairment at this level can be identified by poor performance on phoneme discrimination tasks and repetition of both words and non-words will be impaired (pure tone deafness would also give a similar pattern of impairment). Impairment to orthographic analysis gives rise to a variety of peripheral dyslexias. Ellis and Young (1988: 195ff.) provide a concise review.

The second component is a modality specific input lexicon which can be crudely described as a store for all recognised words. The existence of modality specific lexicons, rather than an input lexicon general to both modalities, comes from the lack of cross-modal priming effects (Morton and Patterson, 1980) and is further supported by dissociable deficits shown by aphasic subjects.

An impairment at the auditory input lexicon gives rise to the symptom of word form deafness (Franklin, 1989) with the aphasic person confusing phonologically similar words, giving rise to a difficulty in correctly accessing the meaning of words. As with impairments at the level of auditory phonological analysis, context may support access to the correct word form. Impairment to the orthographic input lexicon gives rise to the symptom complex of surface dyslexia with regularisation errors in reading arising as a consequence of reliance on the non-lexical route of reading (see e.g. Newcombe and Marshall's, 1984 case JC and footnote [1], p.48).

Ellis and Young (1988: p.144 and p.193) propose that the results of the analysis of either the speech wave or the visual display of the written word are transmitted to the modality appropriate lexicon where a match is sought against the stored characteristics of known words. This in turn will lead to activation of the representation of the meaning of the heard or read word in the semantic system.

2.2.2 The semantic system

As already stated, the semantic system is central to all modalities of input and output. Within linguistics and psycholinguistics several theories of word meaning have been postulated (e.g. feature theories, e.g. Katz and Fodor, 1963; semantic networks, e.g. Collins and Quinlan, 1969; prototype theory, e.g. Rosch, 1978; meaning postulates, e.g. Fodor, Fodor and Garrett, 1975; procedural semantics, e.g. Johnson-Laird, 1977; distributed memory, Allport, 1985). It is beyond the scope of this review to discuss the proposals and evidence for the different theoretical perspectives. Garnham (1985) provides a brief review of different theories and Shallice (1988) discusses what neuropsychological evidence suggests about the way that semantic memory is locally structured.

The issue of whether there is one semantic system or multiple (modality specific) semantic systems has been heavily debated in the cognitive neuropsychology literature (see the special issue of *Cognitive Neuropsychology*, volume 5 for a presentation of both sides of the argument). The working model currently being applied to aphasia leaves this question open and thus the issue will not be reviewed here.

A further organisational principle of the semantic system which has been suggested on the basis of neuropsychological deficits is that of semantic categories. A number of brain-damaged patients have been found to demonstrate impairments specific to particular semantic categories with dissociations being found between different semantic categories (e.g. Warrington and Shallice, 1984; Warrington and McCarthy, 1987). A further dimension on which aphasic subjects performance on semantic tasks has been shown to vary is that of imageability. While the majority of subjects perform more poorly on low imageability items in semantic tasks, it is not possible to account for this simply in terms of low imageability items being more 'difficult' since cases have been described in the literature which show the opposite dissociation (Warrington, 1975; Warrington and Shallice, 1984). Franklin (1989) makes the distinction between a semantic impairment showing no imageability effect (a general semantic deficit) and an impairment affecting low imageability items (an abstract semantic deficit).

A distinction has been made in the literature between impaired access to the semantic system and a central semantic impairment. Given that the semantic system is central to all modalities of input and output, the cardinal feature that distinguishes the two is whether a semantic impairment manifests in both input and output, independent of modality. A central semantic impairment gives rise to impairment of performance on semantic tasks such as word-picture matching, synonym judgements and definition tasks whether input is spoken or written. In addition, semantic paraphasias and failures to name are found on picture naming assessments in addition to word finding failures and semantic paraphasias in spontaneous speech. Semantic errors in oral reading or repetition only occur if there are additional impairments to the direct lexical routes and non-lexical routes to these processes (see 2.2.3 below). Hillis, Rapp, Romani and Caramazza (1990) describe subject KE who demonstrates a homogeneous pattern of semantic errors across both input and output modalities. This is interpreted as evidence for damage to a semantic system common to all lexical processes.

In contrast, if the impairment is one of access from either of the word recognition systems then a modality specific semantic impairment is expected. If deficits of the appropriate perceptual analysis system and the input lexicon have been eliminated then the modality specific semantic impairment can be explained in terms of impaired access from an intact input lexicon to an intact semantic system. An impairment of this nature does not give rise to errors in output. Warrington and Shallice (1979) describe a subject with impaired access from the orthographic input lexicon to the semantic system. Franklin (1989) describes a case of impaired access from the phonological input lexicon to the semantic system, a symptom she calls word meaning deafness. Subject DRB, despite showing normal lexical decision which is indicative of an intact phonological input lexicon, on a synonym judgement task made correct judgements for only 75% of the items in the auditory version in contrast to 97% in the written version. Since the discrepancy between modalities cannot be explained by more peripheral processing impairments, Franklin proposes that DRB demonstrates an impairment in semantic access. Finally, Riddoch and Humphreys (1987) describe a case (subject JB) who shows impaired access to the semantic system from an intact structural descriptions system.

2.2.3 Word production

Production of a spoken word will usually start with activation in the semantic system arising either spontaneously or in response to an external stimulus (e.g. a spoken or written word or a visual stimulus). This will lead to activation in the modality specific output lexicon.

A controversy exists as to whether there are separate input and output lexicons. Allport (1984) reports that none of the experimental evidence necessitates an input-output distinction. Neuropsychological findings suggest, however, that the distinction may be necessary. Ellis and Young (1988: 157f.) discuss the semantic repetition errors made by "deep" dysphasic subjects which are difficult to account for in terms of one-lexicon models (although see Martin and Saffran's (1992) computational account of a deep dysphasic subject's performance which they argue is consistent with a single lexicon model). Shallice (1988: 164ff.) also discusses the controversy in relation to impaired repetition ability in conduction aphasia and concludes that, although it is not possible to refute the single lexicon proposal, the separate input-output model is the most plausible in view of the neuropsychological evidence.

Butterworth (1980) has proposed that semantics processing occurs at a different stage from that of lexical phonology on the evidence of the analysis of pauses in speech. Support for the double-lookup lexicalisation hypothesis (Lesser, 1989b) has been given by the performance of anomic patients who have apparently intact semantic knowledge. There have been several cases described in the literature whose speech production problems have been interpreted as arising from an impairment in the phonological output lexicon or in access to it. The cardinal symptom for an impairment at this level is a word finding difficulty which may manifest in a number of different ways (including the production of semantic paraphasias, failures to respond, phonemic paraphasias and neologisms) in the context of intact semantic processing. Explanations of each of these symptoms will be considered in turn. It is worth noting that a number of tasks with differing inputs involve processing at the phonological output lexicon (e.g. oral reading, repetition, picture naming). Through the use of a compilation of tasks it is possible to obtain converging evidence about the status of the output lexicon.

The attribution of semantic errors to an impairment at the level of the phonological output lexicon (or in access to it) has already been discussed in relation to modes of processing in 2.1 above and will therefore not be discussed in further detail. To summarise the main points, the production of semantic errors in the absence of impaired comprehension (as seen in Caramazza and Hillis's (1990) two subjects HW and RGB) is hypothesised to arise from an impairment in access to or within the phonological output lexicon, with the lexical representations of semantic associates reaching a higher level of activation and therefore being produced as a semantic paraphasia.

Other cases have been described in the literature where the predominant indicator of a lexical retrieval problem is one of failed and delayed word-finding. Kay and Ellis (1987) describe the case of subject EST who has severe anomic word finding difficulties and performs poorly on picture naming assessments. EST was found to have relatively intact semantic processing (at least for high imageability items, which items in the picture naming task are by definition), indicating that his anomia arises from an impairment at the phonological output lexicon. In naming 260 pictures of the Snodgrass and Vanderwart (1980) set he managed to name only 37% of the items without hesitation, with a further 10% named after some degree of hesitation or intervening utterances. For 38% of the items, he was unable to retrieve the name or any information about it, while for a further 8% of items although not producing the target he did generate some phonological information. In the remaining 7% of items, EST produced either an incomplete response with some circumlocution or a semantic error. A strong factor influencing naming success was word frequency with significantly better naming for high frequency items.

Kay and Ellis (1987) account for EST's naming performance in terms of an interactive activation model of language processing, hypothesising that there are weak or fluctuating levels of activation between the semantic system and the phonological output lexicon. The frequency effect is accounted for in terms of the resting levels of activation, with high frequency words assumed to have higher resting levels of activation, in contrast to low frequency words which are assumed to have low resting levels. For high frequency words it is assumed that the higher resting level is enough to compensate for the reduced activation from the semantic system to reach a high enough level of activation for access. For representations with low resting levels, however, weak activation from higher levels is not enough to successfully achieve access and in such cases there will be a failure to name. In line with the assumption underlying interactive activation models, however, activation from one level to another is not an "all-or-nothing" affair. Kay and Ellis propose that on some occasions there may be partial activation of a phonological lexical representation which is not enough to achieve correct production of the target but does result in partial phonological attempts in which some of the correct phonemes are accessed along with some incorrect phonemes.

One issue that has not been addressed in the literature is the identification of those features that distinguish between a deficit in access to and a deficit within the phonological output lexicon. What factors influence whether a semantic error, a failure to name or a phonological error will arise? Apparently different profiles for different cases may be an artefact of the different foci of the investigations which influences the analysis of responses. Thus, in Caramazza and Hillis's (1990) study, the focus is on semantic errors and all responses containing semantic information (whether they are semantic co-ordinates, associates, definitions or descriptions of the items) are analysed as semantic errors. In contrast, Kay and Ellis (1987) (whose focus was not on semantic errors) described some responses, which Caramazza and Hillis would have analysed as semantic errors, as demonstrating little knowledge of the target name (e.g. <u>record player</u>: "it's a... it's like a radio... it's a ...um...if you want another singing ...a round disc you put the disc in there....." 1987: 629). Another factor which will greatly influence the analysis is whether in a long response only the first behaviour is examined or whether all of the response is analysed. Furthermore, there are differences in the material used for naming which may influence the naming behaviours observed. This clearly demonstrates the importance of researchers providing clear descriptions of the criteria used in their analyses.

It does not seem possible to explain all of the differences observed between cases in terms of analysis artefact. Whilst EST provides partial phonological knowledge for 8% of the pictures he was asked to name, there is no report of such behaviour in RGB's naming responses. It is possible that different naming behaviours are observed in patients with an impairment at the phonological output lexicon because the damage can take different forms. If this were the case, an examination of these different performances could help develop proposals specifying the nature of the phonological output lexicon and the mechanisms involved in access. Lesser and Milroy (1993: 66) have proposed that impairment to the phonological output lexicon itself may give rise to the retrieval of word fragments and exploratory phonemic paraphasias based on partial retrieval of the word sought. This is different to the partial activation explanation given by Kay and Ellis. They suggest that, for EST, there are two sources of evidence to suggest that the representations in the phonological output lexicon are not impaired. First, he is able to retrieve words successfully after extensive effort and may retrieve words on one occasion that he has failed to retrieve on another. He also shows a lexicality effect on repetition with superior repetition of words than non-words, indicating that repetition is being supported by activation from the phonological output lexicon. Smith (1988) who also made a study of EST's naming responses proposed, on the basis of the production of phonemic paraphasias in his naming responses, that the impairment arose not from impaired access to the phonological output lexicon but in impaired access from the lexicon to the phonological output buffer. This account does not, however, account for the strong frequency effect on EST's naming performance.

An alternative explanation of different naming performance between cases is that it is a manifestation of different strategies being utilised by the patients to deal with the deficit. EST's production of partial phonological knowledge may arise from the strategy of utilising orthographic knowledge of the word to aid spoken retrieval of the item. He is reported to often retrieve the first letter of a word which may increase activation in the lexicon from upwards activation from the output buffer to a level where an attempt can be made even if it only represents partial knowledge. Subjects may also differ in the amount that they use the strategy of providing semantic information about the target which may be a consequence of the extent to which this has been encouraged in any therapy received.

Another aphasic disorder which has been accounted for in terms of an impairment at the phonological output lexicon is the production of neologisms (Buckingham, 1979, Butterworth, 1979). Butterworth (1985) uses the term neologism to mean any form not found in the dictionary, including distortions of a target word which are often referred to as phonemic paraphasias, a term which he sees as an explanation rather than a neutral description. Explanations have been given both in terms of serial processing and interactive activation.

Butterworth (1985) suggests from the analysis of subject KC that neologisms are a strategy to compensate for a severe word-finding difficulty, presupposing that the neologistic patient cannot check whether the words he utters are those that he intends. On the basis of gesture evidence (Butterworth and Beattie, 1978) Butterworth proposes that KC has accessed semantic knowledge and retrieved the target's representation from the semantic lexicon which provides an address to the phonological output lexicon. What happens next is dependent on the success of the address in retrieving the lexical representation. If retrieval is successful the process takes around 80msec. If he is only able to retrieve part of the target or part of some other word intended for the current utterance, gaps in the fragment will need to be filled to make it pronounceable. The resultant form will be phonologically similar to the target (a target related neologism). The average delay before these items in KC's speech is 295msec. This is a similar explanation to that proposed by Kay and Ellis (1987) to account for EST's phonological attempts at the target, with the partial information being drawn from the address. If he is unable to retrieve even partial information for a word fragment then it is proposed that there is a special device for generating neologisms. These have no relationship with the target or other words in the intended utterance. The average delay before these items is 494 msec. The increase in delay is seen as arising as he resorts to later options only when earlier ones fail. The reason for the failure and the ability on only some occasions to utilise the information contained in the address is not, however, clear.

Essential to the model underlying this explanation is a control module which checks that the output of the module is correct and appropriate.

In addition to the problems with the notion of the semantic lexicon and the single address from it to the phonological output lexicon outlined in 2.1.1 above, Ellis (1985) questions the validity of the random generating device. To assume that a new cognitive component is created as a consequence of brain damage violates one of the basic assumptions of cognitive neuropsychology; that the damaged cognitive system reflects the normal system minus certain modules (see section 1.1 above). If the device is not created following brain damage, Ellis suggests the only alternative explanations are that it lies dormant in the brain waiting to be activated in certain forms of aphasia or that it does indeed play a role in normal cognition, neither of which he feels are particularly convincing. Buckingham (1987) suggests, however, that it is present in the normal linguistic system and does indeed play a normal part in cognition on the basis of the fact that speakers know about the stock of phonemes and about the syllabically coded phonotactics for their language. He proposes that the device is this knowledge put to use to create phonological material and reviews evidence to support this proposal.

In contrast to Butterworth and Buckingham, Miller and Ellis (1987) propose an interactive activation account of neologisms with the locus of deficit arising from reduced activation from the semantic system to the phonological output lexicon. (In addition to the delay evidence and gesture evidence of Butterworth, the neologistic jargon case described by Miller and Ellis shows an influence of word frequency on production of neologisms). They propose that weak activation at the lexicon leads to weakened activation at all subsequent levels This results in some phonemes being correct because they become sufficiently activated to be discriminable against background noise but other slots being filled with inappropriate phonemes. This is essentially the explanation proposed by Stemberger (1985) to explain normals' speech errors (see section 2.1 above) and the proposal put forward by Kay and Ellis (1987) to explain EST's phonological errors (see above). However, Miller and Ellis did not find any phonetic similarity effect in phoneme substitutions which would be expected through interactive activation between the phoneme and feature levels proposed by Stemberger. Although not articulated explicitly, it appears that Miller and Ellis account for the production of neologisms which have no apparent relation to the target by very weak activation feeding down to the phoneme level. Phonemes which have fairly high levels of activation from previous access will be erroneously incorporated into the present attempt. This also accounts for the observation that repeated attempts at a target gives rise to phonological similarity between successive neologisms and between neologisms and other words in the utterance.

The phonological output buffer to articulation

Processing in the phonological output lexicon leads to activation of the phonological output buffer. There has been very little work examining the computational structure of the phonological output buffer. Caramazza, Miceli and Villa (1986: 64) propose that "the role of a buffer is to hold temporarily representations that do not correspond to the units of analysis at some point in the flow of information processing". Thus, it can be seen as a working memory system. Processing at this level is thought to comprise of selection of the appropriate phonemes and their seriation into the correct order. This is followed by preparation for the translation of phoneme assembly into its phonetic realisation. The final process involves articulation through motor realisation of the phonetic realisation.[2]

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2 Embedded within this model is a simple segmental phonological theory which is afforded psychological reality. Lesser and Milroy (1993: 34ff.) warn of the dangers of attributing psychological reality to linguistic constructs. Furthermore, segmental phonology has received numerous criticisms (see, for example Local, 1992). Alternative theoretical approaches such as non-linear phonology (see Pulleybank, 1989 for an introduction) have been proposed and this has been applied in the analysis of developmental phonological disorders (Bernhardt and Gilbert, 1992). Non-linear phonology itself has been criticised by Local (1992) who proposes a nonsegmental declarative phonology. A different phonological approach has been applied to aphasic errors by Beland, Paradis and Bois (in press) who strongly criticise the analyses of phonological errors by cognitive neuropsychologists.

None of these alternative theoretical approaches have, however, been utilised in the cognitive neuropsychological analysis of aphasic language. It is beyond the scope of this study to examine the utility of these further advances in phonological theories to cognitive neuropsychological models. Thus, while it is acknowledged that they may have some further insights to offer, the current model embodying a simple segmental phonology is retained.

The cardinal feature of an impairment at the level of the phonological output buffer is the production of phonemic paraphasias which cannot be attributed to phonetic distortions. These are also found as a consequence of impairment to the phonological output lexicon (see the discussion of EST above). It is possible to distinguish the theoretical location of phonological errors, however, on the basis of repetition performance. Repetition can be achieved by three routes as shown in figure 2.2.

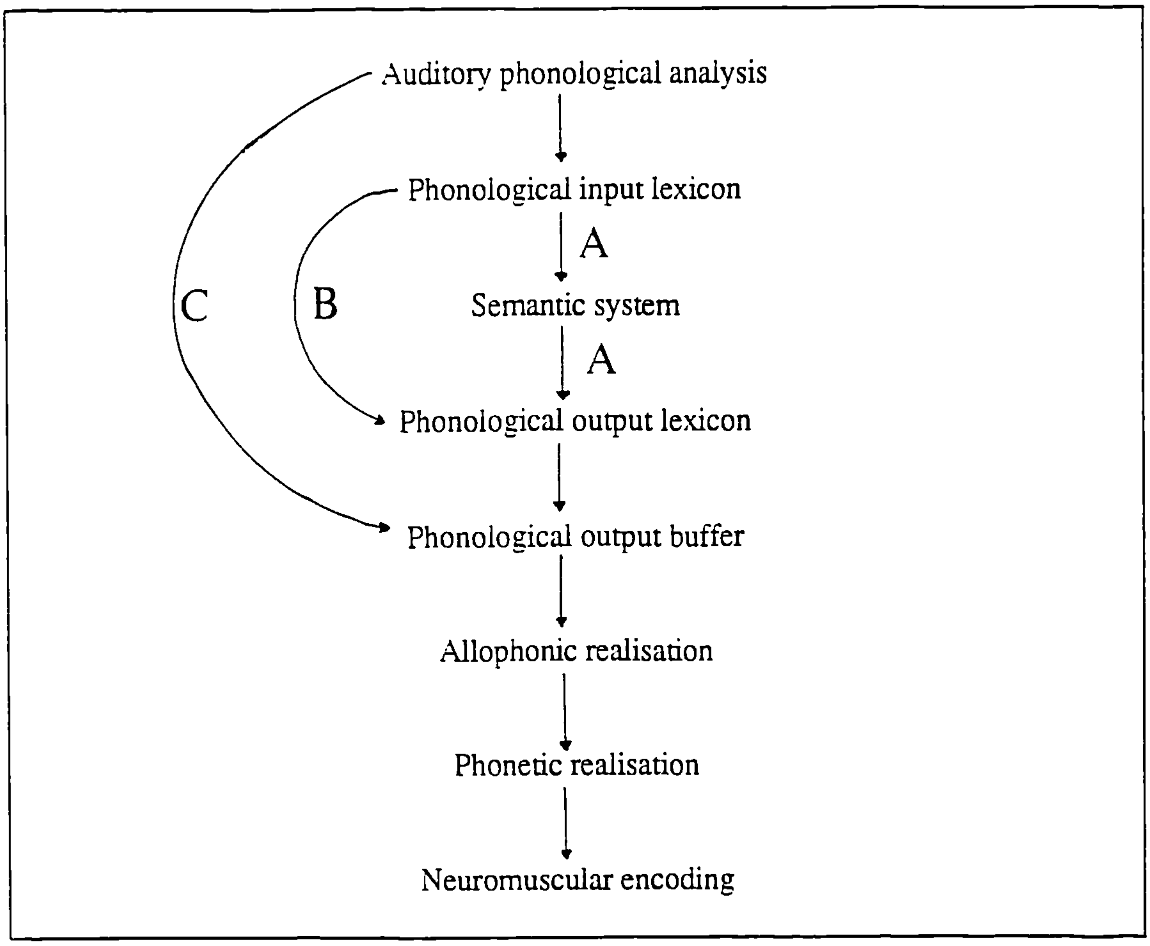

Figure 2.2 Routes of repetition for single words

Route A is the semantic lexical route, with processing from hearing the word to producing it being mediated by the phonological input lexicon, the semantic system and the phonological output lexicon. A direct lexical route has also been proposed (route B) in which repetition is mediated lexically but without access to semantic information. Evidence for this route comes from subjects with impaired access to the semantic system from the phonological input lexicon but who are able to spell both regular and irregular words to dictation (Patterson, 1986) as well as from transcortical sensory aphasic subjects who cannot understand the words that they repeat but who show the influence of the lexical factor of frequency (Berndt, 1988). A third non-lexical route of repetition (route C) must also be proposed to account for the ability to repeat new or non-words which cannot be repeated by either of the lexical routes as they do not have lexical representations. This route involves the conversion of auditory input codes from auditory phonological analysis into output phonology at the phonological output buffer. A subject with an impairment at the phonological output lexicon should still have good repetition ability because he or she can repeat via the non-lexical route in which the phonological output buffer is accessed directly from auditory phonological analysis.

For a subject with an impairment at the phonological output buffer, as all repetition processing routes involve the buffer, he or she will produce phonemic paraphasias in repetition as well as spontaneous speech and picture naming. Furthermore, while the subject with impaired access to the phonological output lexicon may still be able to read without producing phonological errors because of additional activation from the non-lexical route of reading to the output buffer, the patient with an impairment at the buffer will also produce phonemic paraphasias in oral reading.

The majority of workers (e.g. Buckingham, 1987; Nespoulous, Joanette, Ska, Caplan and Lecours, 1987; Pate, Saffran and Martin, 1987) have considered an explanation of phonemic paraphasias in terms of a serial model account of processing in which the scan-copying mechanism proposed by Schattuck-Huffnagel (1979) (on the basis of speech error data) is incorporated. As noted in the discussion of serial versus interactive activation models in 2.1.1 above, the scan copier and check-off monitor mechanisms are not able to offer an account of non-contextual substitution or addition errors found in speech error data (Stemberger, 1985). Smith (1988) found that subject JHS who produces a large number of phonemic paraphasias in naming and repetition made many non-contextual errors. As Smith (1988) has stated, in using serial accounts it would appear necessary to postulate an additional impairment in access from the phonological output lexicon resulting in an erroneous phonological form being placed in the buffer before the operation of the scan copier to account for these errors.

Smith (1988) discusses an interactive activation explanation of phonemic paraphasias utilising Dell and Reich's (1980) work on speech error data. They suggest that when a word is about to be uttered its constituent phonemes begin to be activated (from the lexicon) syllable by syllable. Activation of the first syllable will lead to its production. At the same time the phonemes of the next syllable will be receiving activation although at a lesser intensity than the first. If random noise reduces the activation of the target phoneme or increases activation to a related phoneme then the relative strengths of two phonemes competing for the same slot in two adjacent syllables may be reversed. This will result in the phoneme from the second syllable being output in place of the target phoneme. If the activation of the substituting phoneme remains high (from either slow decay of activation or continued activation from some source) it may have enough activation to be produced again in the second syllable, giving rise to an anticipatory error. Similarly if activation of an earlier phoneme remains high, one may get perseveratory errors. If, however, activation decays below that of the phoneme that it has replaced then there may be a transposition error (e.g. *pencil*-> [pɛlsɪn]). If the target and substituting phonemes share features then Dell and Reich (1980) argue that the chance of such errors increases.

Smith suggests that for patients who produce phonemic paraphasias the thresholds of individual phonemes may be unstable or more subject to the effect of random noise which would give rise to the much higher incidence of perseveratory and transpositional slips than found in speech error data of non-language impaired people. Also since slips are proposed to occur between adjacent syllables this predicts a higher incidence with increasing numbers of syllables in the word. This is also consistent with a limited capacity buffer. It has been widely reported that these patients are poorer at producing multisyllabic words (e.g. Pate et al, 1987). Smith also argues that interactive activation models are able to account for addition, deletion and non-contextual substitution errors (see discussion of Stemberger (1985) in section 2.1.1 above).

Finally, impairment in translation of phoneme assembly into phonetic realisation occurs in the clinical phenomenon of apraxia of speech. While with this level of impairment errors may be produced which sound like substitutions of phonemes, rather than arising from false selection of the articulatory target (i.e. a phonological breakdown), a range of instrumental investigations (e.g. Blumstein and Baum, 1987; see Miller, 1989 for a review) indicate that such errors arise from a disorder of motor programming and execution, with difficulty in "specifying the correct choice of space-time values, integrating these into a workable whole and maintaining control over their relative changes during execution of the action" (Miller, 1989a: 134). Caplan (1992) proposes that a number of features allow clinical identification of apraxia of speech. In very severe cases, clients may be almost totally unable to utter any speech sounds. In milder cases, apraxic speech is characterised by difficulty in initiation and groping, effortful articulation.

A number of studies have indicated that the distinction between phonetic (apraxic) errors and phonological (output buffer) errors is not a clear-cut one. It has been reported that Wernicke and conduction aphasic subjects make "phonetic" errors (e.g. Kent and McNeil, 1987, Canter, Trost and Burns, 1985) contrary to the characterisation of their impairments as phonological in nature. Miller (1989a) proposes that an interactive heterarchical model of speech production will account most successfully for the range of errors seen in apraxia of speech and in conduction aphasia. Within such a model there is no strict phonemic-phonetic division but rather they are seen as mutually interactive.

This concludes the literature review on single word processing. In the next section models of sentence production and their use in the interpretation of aphasic disorders are examined.

2.3 *Models of Sentence Production.*

2.3.0 Preliminary orientation

In language production, it is necessary to transform the many dimensions of a thought into a code which is constrained by time. This is a considerably more complex operation than the stringing together of naming responses for the things and actions involved. As Bock (1987) has stated, an idea may seem to simultaneously embody actions, role relations, modalities, locations, and myriad other features. In language production the speaker must sequentially produce elements whose identity and arrangement will evoke an idea with the same critical features in the mind of the hearer.

Garrett (1982) states that the most promising approach to an explanation of language production lies in models which represent processing as the product of a set of independent processing systems, each of which has a determinate internal structure. The uttered form of a sentence is achieved through the principled interaction of these component systems. Garrett has proposed such a model developed from errors made in speech production. The logic behind this approach is that if two elements of a sentence are both involved in an error then these two elements must be simultaneously available at the stage of processing at which the error occurs. Conversely, if the two elements are never involved in an error together then they must be processed at different points in the sentence production process. A review of Garrett's model and its motivation from speech error data is given by Bock (1987).

Garrett (1984) acknowledges that the model is underspecified in terms of the internal structure of the independent processing systems. His model is, however, empirically motivated and it is not possible to go beyond the level of specification reached on the basis of the speech error data used. Other researchers, using evidence from experimental work (Bock, 1987) and from aphasic language production (Lapointe, 1985), have offered revisions and developments of Garrett's model. Bock's revisions arise from the need to account for the findings of experimental work suggesting that feedback between levels of processing should be incorporated into the model. Lapointe provides an elaboration of the internal structure of the syntactic processing system. In this section a model of sentence production will be proposed based on the developments of Garrett's work by Bock and Lapointe. The proposed model is shown in figure 2.3 overleaf. This will be used as a framework to discuss the consequences of impairments to various levels of processing described in the aphasiology literature.

2.3.1 Processing from the message level representation to the functional level representation

The first level of representation in the proposed model of sentence production is known as the message level. It represents the speaker's idea that he or she wishes to translate into language. This gives rise to generalised priming of a set of semantic representations, which results in an increase in their level of activation. The representations are tagged with thematic role markers which provide an abstract representation specifying the role of each person or thing in the situation with respect to the other people or objects involved. Semantic representations for verbs marked for the mapping between thematic roles and grammatical relations (including different forms of the same verb (e.g. active and passive forms) as these engender different functional relations, Bock, 1987) will be included in the primed and tagged set. Lapointe (1985) also proposes that among the semantic relations expressed by verb forms are those of attitude, voice, aspect, tense and agreement. Functional integration involves an attempt to link primed semantic representations together according to the functional relations (i.e. the mapping between thematic roles and grammatical relations) specified by the verb, beginning by filling the subject role in English. There are two important factors which influence this integration.

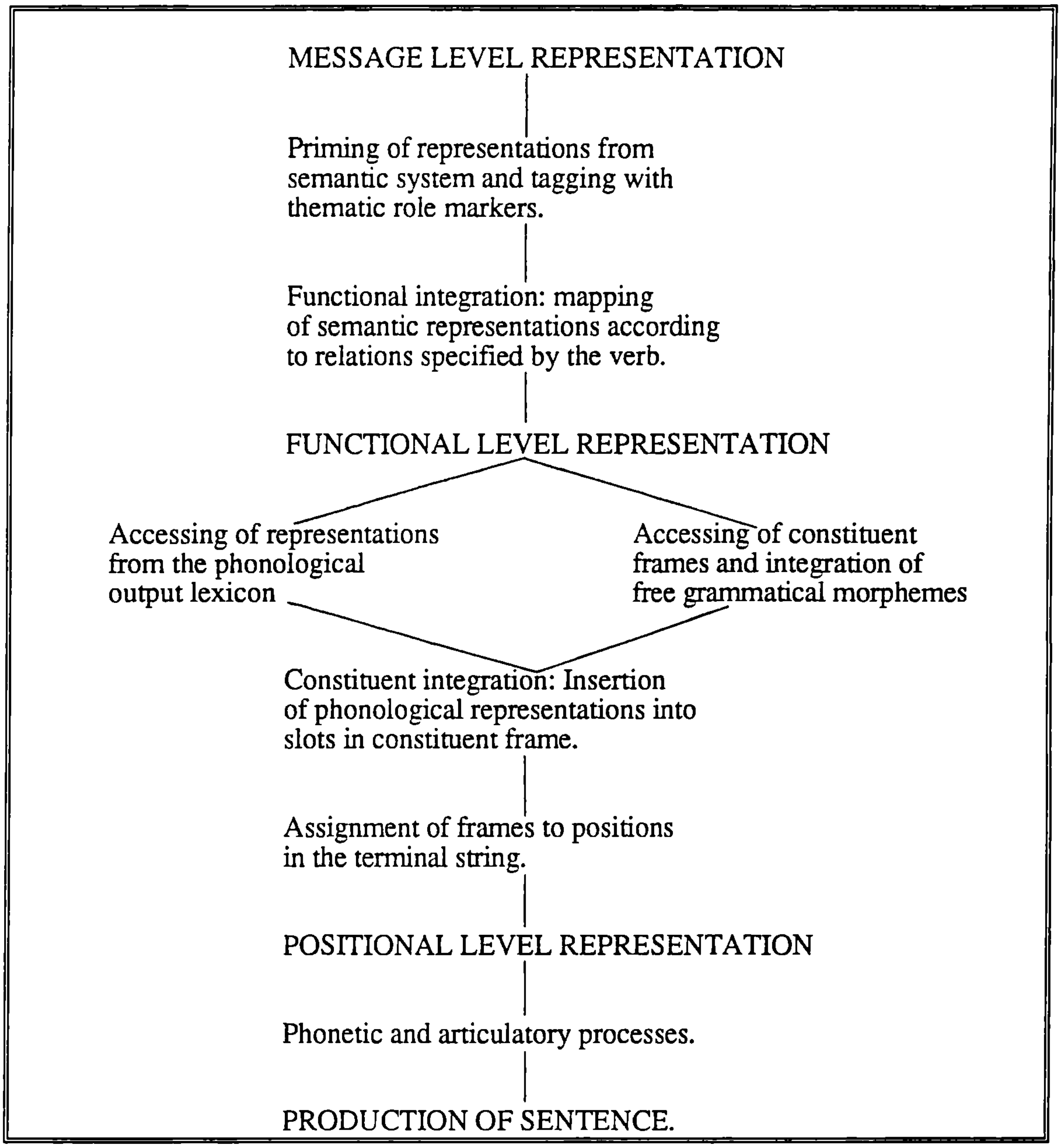

Figure 2.3 A model of sentence production

The first is the level of activation reached by the items which have thematic roles that can be realised in the subject position. The second is the level of activation of different verb forms (e.g. active or passive voice). These will have different resting levels of activation and possibly be primed to differing extents. The first verb that is linked to its appropriate subject head (i.e. the semantic representation that matches the verb's functional relation specification) will be the one that governs the elaboration of the sentence. These influences can be understood by illustration with a simple example:

In describing an event such as one in which a bee (thematic role of agent) stings a man (thematic role of patient), the agent may either be realised as the subject of the active form of the verb (the bee stung the man) or the object of the passive verb form (the man was stung by the bee). The verb form thus specifies the thematic role that can be realised in the subject position. The form which actually occurs is influenced by whether man or bee is more accessible (i.e. has higher levels of activation). The more accessible representation will tend to be assigned the subject position. However, the level of activation of the competing verb forms also influences the syntactic form of the sentence. As the active form has a higher resting level of activation than the passive form, it has a higher probability of selection overall. Reversal errors such as "the man stung the bee" will not occur because the nouns have been tagged with their thematic roles and such errors would violate these thematic role assignments.

Evidence for the influence of accessibility on the mapping of thematic roles to syntactic structures is provided by the experimental work of Bock and Warren (1985). As discussed in the literature review on semantic processing (section 2.2.2), processing of the semantic system is influenced by the imageability or concreteness of the items. Experimental work has suggested that greater concreteness of a concept increases the likelihood that any randomly selected predicate will accept that concept as an argument (e.g. Jarvella and Sinnott, 1972). In addition, Bock (1987) suggests that the semantic specifications of concrete nouns may make their semantic representations more accessible than abstract words. With regard to sentence production, it should be easier for a verb to take a more concrete noun as its subject than a less concrete one as the highly activated words should be integrated into a functional representation faster than less activated words. Bock and Warren (1985) found a reliable tendency for more concrete concepts to appear as subjects rather than direct objects in active and passive sentences. Furthermore, Bock (1986) also found that nouns were more likely to be used as heads of subject phrases when they had been semantically primed.

In Bock's revision of Garrett's model, the functional level representation determines the word order of the sentence. It is not clear from Garrett's original working model whether word order is determined at the functional level representation (as Bock proposes) or at the positional level representation (in the creation of the phrase structures). Caplan (1987), in his review of Garrett's model, states that the functional level representation contains information about thematic roles but this sentential semantic information is not related to the form of the sentence (i.e. the word order). This is a different interpretation to that of Bock who suggests that different forms of the verb (in their semantic representations) are represented in the creation of the functional level representation and thus the grammatical form is determined in the functional level representation. This is supported by experimental work showing the influence of semantic factors on sentence form, reported above.

Impairments in processing to the functional level representation

As the focus of this discussion is language impairments, no consideration will be given to the possible impairments of conceptual processes involved in creating a message level. Starting from the assumption that processing to the message level representation is intact, three impairments in processing to the functional level representation are possible. The first is impairment in accessing the semantic representations needed to encode the message level. The second is impairment in creating a structure that encodes the relations between the elements by tagging of the primed semantic representations with their thematic roles. The final problem that could arise in production of the functional level representation is in functional integration. This involves the linking of primed semantic representations together according to the functional relations specified by the verb (which specifies the mapping between thematic roles and grammatical relations). Each of the processes which may be disrupted will be considered in turn.

The impact of impaired semantic processing has already been discussed in relation to single word processing in 2.2.2 above. When impairment to semantic representations occurs one may either find the production of unrelated verbal paraphasias where selection from the semantic system has been totally unconstrained or a semantic paraphasia where selection has been imperfectly constrained (Schwartz, 1987). This need not disrupt the structural complexity of the sentences produced as there are lexical representations available for functional integration. An impairment in this process will thus manifest itself in sentences which are grammatically appropriate but which fail to convey the intended message of the aphasic speaker because of the production of semantic paraphasias. The degree of mismatch between the two will be influenced by the severity of the aphasic subject's semantic impairment. In the examination of a subject's sentence production, an impairment in the retrieval of semantic representations may not be immediately obvious from conversational speech if the errors made are close semantic ones. On a more constrained task such as picture naming or picture description, however, the semantic paraphasias are likely to become more noticeable. Other assessments which require semantic judgements, such as PALPA picture word matching and synonym judgement assessments (see 4.3.1), should also identify an impairment at this level.

An impairment in the tagging of semantic representations with the appropriate thematic roles will have severe consequences for sentence production; without a representation of the relationships between the representations, it is not possible for mapping between thematic roles and grammatical relations to occur. Impaired sentence production, whereby the aphasic person fails to realise predicate argument structure appropriately with omission of arguments and a lack of sentence structure, is a likely manifestation of this impairment. Similar consequences may arise when the aphasic person is able to provide a thematic role representation but is impaired in the mapping of thematic role information to grammatical relations.

Saffran, Schwartz and Marin (1980) were the first workers to suggest that agrammatic subjects impaired sentence production could be accounted for in terms of either a loss of the basic linguistic notions of thematic roles or an impairment in the mapping of thematic roles onto grammatical relations. The patients that they studied had either holophrastic output or output which was structurally ill-formed. On a picture description task the subjects' ordering of noun phrases was interpreted as carrying no semantic significance. Instead, it was proposed that it reflected a strategy of using factors of animacy or potency to order the sentence constituents.

There have been a number of challenges to Saffran et al's proposals. Caplan (1983) re-analysed the data and concluded that the patients do appreciate that language encodes thematic roles and are able to map these semantic functions onto grammatical structure. He suggested, however, that they appear to have added a set of principles dealing with the intrinsic animacy of nouns to the set dealing with mapping of thematic roles onto the word order conveyed by a sentence. Caplan thus proposes that Garrett's functional level is intact in agrammatism, with impairment of the positional level underlying the disorder. Menn and Obler (1990) in their cross-language study of agrammatism report that there are very few word order errors in their data overall. They propose that such errors may be best explained in terms of an impairment in the placement of lexical phonological representations in planning frame slots rather than in terms of an impairment in processing thematic relations.

In partial answer to the criticisms of Saffran et al, it is important to note that from the findings of the literature it appears unlikely that agrammatism can be explained as a unitary phenomenon (e.g. Caramazza and Berndt, 1985). Thus, while an impairment in processing of thematic roles will not account for all patients it may be a valid explanation for some. In response to Menn and Obler's comment that there are few word order errors, Saffran et al report that the impairment only emerges when the agrammatic is forced to describe relations between objects that are alike in animacy. Furthermore, utterances may be aborted because of impaired mapping ability before a possible reversal error is made or the subject may only produce holophrastic phrases.

This may explain why word order errors have not been noted in agrammatic subjects' spontaneous speech.

Further support to Saffran et al's proposal that sentence production deficits in agrammatic subjects can be accounted for in terms of loss of the notions of thematic roles or impairments to the mapping of these roles onto grammatical functions comes from therapy studies described by Jones (1986) and Byng (1988). The aphasic subjects described in these studies were hypothesised to have impairments of the procedures which map thematic roles onto grammatical relations. Both therapy studies involved teaching the subjects to identify thematic roles for written sentences and although therapy focused on comprehension, improvements in both sentence comprehension and production were found for the subjects. This has implications for parallelism (Howard, 1985) as it suggests that mapping of meaning relations is a process central to both production and comprehension.

2.3.2 Processing from the functional level representation to the positional level representation

The creation of the functional level representation initiates two further processes; the generation of constituent frames, and the activation of phonological lexical representations. These are co-ordinated to form an ordered representation of lexical forms by constituent integration processes.

It has been proposed that the constituent frame (corresponding to a phrase structure description of the sentence) includes closed class words, bound morphemes and a representation of phrasal stress (Garrett, 1980). Thus, these features are created as part of the frame in contrast to the open class lexical items which, after retrieval of their phonological form, are assigned and inserted into positions in the constituent frame. This distinction is motivated by the occurrence of stem-morpheme exchanges in which the stems of open-class words exchange, leaving their affixes behind (e.g. "I waited him to warn" when "I warned him to wait" was intended, Stemberger, 1985). The stranding of inflectional affixes is a regular feature of such exchanges. It thus appears that these elements are specified prior to the open-class words, indicating that the syntactic features of the planning frame are set out before lexical items are inserted. Segmental errors on the affixes are very rare (i.e. in the above example the past tense marker in the exchange error is realised correctly as [əd] rather than as [d]). This indicates that segmental phonological structure is not specified until some point after open-class items have been specified.

Lapointe has offered a more detailed specification of the processes which mediate between functional level and positional level (the syntactic processor). He proposes that at this stage of processing it is necessary to access from a store of pre-packaged fragments of morphosyntactic structures. These fragments consist of minimal lexically-headed phrases containing a slot for the lexical head stem, slots for free closed class words and various grammatical markers and positions indicating where other fragments are to be attached. This proposal differs from Garrett's working model (1982) in that Lapointe suggests that the phrasal frames do not contain function words although they do contain inflectional morphemes. The evidence for this distinction between free and bound closed class vocabulary is that it accounts for the omission/substitution patterns observed in English agrammatic speech (also Italian agrammatic speech, see Lapointe and Dell, 1989). While auxiliary verbs and other syntactically independent verbal elements are found to be omitted, inflectional morphemes are substituted for simpler forms. Lapointe was only studying verb phrases. Saffran, Berndt and Schwartz (1989), however, report a dissociation in the omission of bound and free-standing grammatical morphemes in their subject ME which applied over a range of phrasal structures. This lends support to the possibility of a general processing distinction between the two.

In constituent integration, whereby the phonological representations are inserted into the planning frame, the accessibility of the phonological representations is thought to have an influence. Thus, Bock (1987) proposes a phonological accessibility hypothesis which states that the serial order of words is sensitive to the ease of retrieval of their phonological forms. As discussed in single word processing, retrieval of the forms from the phonological output lexicon is influenced by word frequency (section 2.2.3), with high frequency words having higher resting levels of activation. Kelly (1986) found that in conjoined phrases there is a tendency for high frequency words to precede less frequent words. In conjoined phrases (e.g. 'men and women') the syntactic roles of the words are identical and thus there are no semantic or syntactic consequences of the order actually employed. In English, however, there are relatively few places where meaning-preserving inversions are possible. For most word inversions one gets a difference in the grammatical function assignments. Thus, the reversal is accompanied by a change in syntax in order to preserve the basic meaning (as in active and passive sentences). Bock (1985) found that phonologically inhibited words tended to follow words that were not inhibited in transitive sentences, thus influencing the sentence form. This suggests that there must be some interaction between processes which control the assignment of grammatical functions (functional integration) and those that control the assignment of phonological forms to serial positions in the constituent frame (constituent integration). This is the main feature in which Bock's proposal deviates from Garrett's original model. Garrett reports in his 1982 paper that his working model does not provide for the possibility of feedback connections from lower to higher levels. However, in considering the findings of Levelt and Maassen (1981), who found that ease of lexicalisation affects the choice of syntactic frame (which they interpreted as evidence of feedback from positional level to functional level representation), Garrett acknowledges the need for changes in the working model.

Bock (1982) noted that in certain constructions which generally permit alternative ordering of post-verbal elements, positioning of the pronoun in a final position is either never used (i.e. it is ungrammatical) or it is used so rarely that it sounds 'odd'. Thus, she suggests that while 'John fed the meter a dime' and 'John fed a dime to the meter' are common alternatives, 'John fed a dime to it' hovers on the edge of acceptability. Svartvik (1966) also notes that final pronouns are extremely rare in passive constructions. Bock suggests that the rarity or ungrammaticality of these constructions with a final pronoun can perhaps be accounted for in terms of the relative accessibility of pronouns. She points out that pronouns have very high word frequencies and are thus more accessible. This may so regularly bias production of the structures in which the pronoun directly follows the verb or initiates the sentence that the alternatives, where a pronoun is involved, become unacceptable. In this account, Bock fails to acknowledge that pronouns are closed class grammatical items and thus are thought to be retrieved and processed in a way which differs from open class lexical items. The status of closed class grammatical and open class lexical items has been an area of much debate in the literature. While Lapointe's model assumes that accessing the phonological forms of functors is different from accessing the phonological forms of open class lexical items, there have been suggestions that different performance is simply an artefact of the high frequency status of closed class grammatical morphemes. This appears to be the view ascribed to by Bock, although the problems of agrammatic subjects with so called function words suggests that this may be too simplistic a view. Which ever proposal is correct, however, it is possible that pronouns are inserted earlier in the sentence structure in order to allow more time for retrieval of the phonological forms of lexical items and their insertion into the constituent frames. Quirk, Greenbaum, Leech and Svartvik (1985) in a sample of 17,000 noun phrases in the Survey of English Usage found that the overwhelming majority of names and pronouns function as subjects of clauses or sentences. This is empirical evidence of the tendency to produce pronouns in structural positions early in the sentence.

Bock discusses the evidence for two ways in which lower level processing can influence the outcome of higher level processes. The first is that there is direct feedback from lower to higher levels. The second is that there are parallel races among representations from the higher and lower level coupled with lower level selection among the competitors. Levelt and Maassen (1981) proposed the feedback account. Difficulties encountered during the constituent integration could result in a signal being sent back to the functional level, thus instigating preparation of a different functional structure. The signal need not be considered to be an active one. It may arise from failure to complete constituent integration (because of difficulty in accessing the phonological form of a lexical item), resulting in the decay or inhibition of the current functional representation. The parallel race model assumes that more than one functional representation, perhaps created by different forms of the same verb, may be created. The first to finish constituent integration or enough integration to allow articulation to begin should be the one that controls the form of output. Bock (1987) reviews the evidence for the two alternatives and concludes that either or both may be operative in sentence formulation, serving to resolve the conflicts between grammatical forms and lexical forms.

Constituent integration is made more complex by Lapointe's elaboration of Garrett's working model as he has proposed that function words need to be integrated into the constituent frames rather than being an integral part of them. He proposes that the syntactic processor consists of three sub-components: a control mechanism, a store locator and a stem inserter. In addition, he proposes that there is a fragment store containing information about the phrasal elements, a function word store and an address index containing addresses of cells in the fragment and function word stores where the specific information is located. The control mechanism accepts information about the functional level representation and, via the address link and the locator, accesses appropriate fragments and function words and integrates them. In addition, it directs the stem inserter. The stem inserter is responsible for inserting the phonological representations of the major lexical stems, which have already been selected, into the appropriate slots in the combined fragments produced by the control mechanism.

Once co-ordination of the constituent frames with the phonological representations of the lexical items has occurred, the frame elements must be assigned to positions in the terminal string thus yielding the positional level representation which then guides the elaboration of the sentence's detailed phonetic form.

Impairments in processing to the positional level representation.

There are several possible impairments in the processes involved in creating the positional level representation which could give rise to a disorder in sentence production. The consequences of an impairment to each of these processes will be given in turn.

The phonological forms must be retrieved from the phonological output lexicon in order that they are made available for insertion into the planning frames. Impairment in accessing phonological forms has already been discussed with respect to single word processing (section 2.2.3 above). Byng and Black (1989) suggest that an impairment in this process may manifest itself in sentence production as a difficulty in realising predicate argument structure, omission of arguments occurring where the phonological form of the lexical item expressing an argument cannot be accessed. It has already been proposed that difficulty in realising predicate argument structure may also arise as a consequence of an impairment of the processes which map thematic roles. It should, however, be possible to distinguish between the two. Where a mapping disorder underlies the problem, the literature indicates that the disorder will manifest in performance on comprehension tasks (Byng, 1988). Furthermore, failure to map thematic roles will result in the total omission of arguments, including the function word items of the phrasal frames because an impairment in the creation of the functional level representation is likely to result in failure to generate the phrasal frames for those thematic roles which are not mapped onto grammatical role. In contrast, if an aphasic subject is impaired only in accessing the phonological representations, the phrasal frames would be expected to be created with the function word vocabulary (e.g. pronouns, auxiliary verbs, determiners) included. Thus, in output one may expect some evidence of an attempt to realise an argument through the production of function word vocabulary, even if the phrase realising the argument is abandoned because of the failure to access the phonological representations of the open class lexical items. Furthermore, an impairment in this process could also be identified through assessment of single word processing such as picture naming.

Bock's revision of Garrett's working model suggests that there is interactive activation between levels of processing, with the ease of retrieval of phonological forms influencing the assignment of grammatical functions. Saffran, Berndt and Schwartz (1989) found that the non-agrammatic subjects in their study had reduced sentence complexity scores in contrast to the normal control subjects despite little evidence of morphological deficits. They suggest that Bock's demonstration that factors such as ease of lexical retrieval influence structures generated by normal speakers might offer a plausible explanation for these aphasic subjects' simplified syntactic structure, with lexical or phonological limitations influencing the choice of syntactic structures.

Bock (1982) has suggested that there is a tendency to produce pronouns early in a sentence as they are easier to access (see above). Several researchers have reported that 'fluent' aphasic subjects rely to a greater extent than normal subjects on pronouns and proforms in referring. Berko-Gleason, Goodglass, Obler, Green, Hyde, and Weintraub (1980) examined the pronoun use of moderately severe Broca's and Wernicke's aphasic patients in a picture story test. The subjects with Wernicke's aphasia produced the highest proportion of pronouns in their narratives while patients with Broca's aphasia had a smaller proportion than the normal subjects. Nichols, Obler, Albert and Helm-Estabrooks (1985) found that both Wernicke's and anomic aphasic subjects produced more pronouns without antecedents than the normal control subjects. Buckingham (1979) in his paper looking at the responses of posterior fluent aphasics argues that reliance on pronouns is a linguistic manifestation of a lexical retrieval deficit. This can be interpreted in terms of the proposed model. For the aphasic person who has impaired access to the phonological output lexicon, the use of a pronoun in place of a lexical item whose phonological representation cannot be accessed avoids a failure in lexical retrieval. Pronouns are closed class vocabulary and thus, according to the proposed model, are accessed at a different stage in sentence production. An impairment in accessing phonological representations should not, therefore, influence the production of pronouns. In addition, it has been proposed in the literature that language impaired subjects may use pronouns to avoid complex syntactic structure. Thus, expansion of clause structures may give rise to the simplification of phrase structures for a subject with limited syntactic abilities (Crystal, 1987, Perkins, 1989).

A further process involved in the creation of the positional level of representation is the creation of the phrasal frames. Lapointe (1985) has been the most specific in the elaboration of this part of the model. If his proposal is accepted, then it appears that there are several levels of processing which could be impaired. In the creation of the phrasal frames, one has to access the phrasal fragments which, Lapointe proposes, contain the inflectional morphemes but not the function words. There is also the need to access the function words required and to integrate these into the phrasal fragment. Lapointe's elaboration of Garrett's model is based upon the errors of verb form use made by agrammatic subjects. Although he only deals with verb phrasal frames, as has already been discussed above, Saffran et al (1989) report a subject who shows a generalised dissociation between production of bound and free grammatical morphemes.

Lapointe suggests that there is a store of phrasal frames which are arranged in a hierarchy of morpho-semantic complexity. Greater resources are required to access the more complex frames from the store. Lapointe proposes that in agrammatism there are not enough resources to retrieve information from cells located deep in the stores as would be required in the normally functioning speech system. Thus, in an attempt to access a complex frame, limited resources may result in accessing a less complex frame which in turn gives rise to verb form substitutions.

Lapointe proposes that there is a store for function words which is also arranged in terms of a hierarchy of morpho-semantic complexity. He suggests that there is a priority of accessing phrasal frames over access to the function word store so that where there are inadequate resources to access the requirements dictated by the functional level representation, the resources available will first be applied to accessing the phrasal frames. Lapointe's proposal thus accounts for the substitution of verb forms (due to the access of less complex phrasal frames) but the omission of auxiliary verbs observed in agrammatism. Extending the model to other phrases one would expect omission of function words (e.g. determiners) but substitution of inflectional markers. The manifestation of problems in creating the phrasal frames are thus likely to involve closed class items, with the omission of free-standing function words and the substitution of inflectional markers.

Saffran, Berndt and Schwartz (1989) found that the agrammatic subjects in their study showed a significant reduction in the use of both free and bound grammatical morphemes. Furthermore, two subjects showed patterns which support Lapointe's suggestion of a general processing distinction between affixes and free-standing grammatical elements. Subject ME was the most deviant speaker in the sample in the use of free-standing function words. His use of verb inflections, however, was nearly at the level of normal controls. In contrast, subject AT ranked towards the bottom of the agrammatic group in use of verb inflections but ranked as the least impaired in the use of function words. In the summary of findings of the cross-language study of agrammatism, Menn and Obler (1990) found that most types of free grammatical morphemes were liable to omission. Bound grammatical morphemes were rarely omitted in those languages where it is possible to tell the difference between omission and substitution of shorter forms. Instead, substitutions were common. The authors conclude that the dissociation between the omission of free grammatical morphemes and the substitution of bound grammatical morphemes suggests that there may be differential treatment of the two classes in normal syntactic production.

A further process which may be impaired in the creation of the positional level representation is the integration of the two processes where the phonological representations are inserted into the phrasal frames. Although there have been no single case studies describing a case with such an impairment, Menn and Obler (1990) suggest that errors of word order in sentence production could, in principle, be accounted for in terms of errors in the insertion of lexical items. Garrett (1980) reports on stranding errors of normal subjects where stem morphemes are exchanged (cf. p.79 above). These exhibit a relatively strong distance constraint with 70% originating within the same phrase. As processing below the functional level is construed as being in terms of single phrases, this supports the proposal that the stem morpheme exchanges occur in the integration of the lexical phonological forms with the phrasal frames. Garrett (1984) has commented on the fact that no reported cases of aphasia are characterised by a dramatic surge in the frequency of any of the exchange errors found in normal speech including stranding errors. Given the phrasal constraints on such errors, Menn and Obler's explanation of word order errors (specifically reversal errors in reversible sentences) does not seem plausible.

2.3.3 Limitations of the model of sentence production

The model discussed is still very primitive and fails to deal with a number of features of sentence production. At this point, two issues will be highlighted. The first is that the model does not account for the realisation of information which is not encoded in predicate argument structures. The second is that the model does not account for the realisation of arguments as embedded clauses.

In sentence production we are able to encode information which is not dictated by the verb such as where, when, or how an action took place. Byng and Black (1989) discuss this issue and propose that current linguistic theories (Chomsky, 1985; Jackendoff, 1983) and some psycholinguistic theories (Garrett, 1980, 1984) suggest that such information is not mapped onto syntactic structures by the same set of procedures that translate predicate argument structures. Non-arguments are realised by certain syntactic categories and in particular positions of the sentence, irrespective of the particular predicate that they combine with. Furthermore, the syntactic principles that determine the linear order of phrases in a sentence do not equally apply to arguments and non-arguments. Non-arguments are dependent on lexical information of the predicate. Byng and Black suggest that these linguistic differences may be reflected in the psychological separateness of the procedures that construct particular aspects of semantic and syntactic representations or translate between these two levels. This could be reflected in differential impairment in the realisation of predicate argument information or non-argument information. A finding of a double dissociation between these two would help in the further specification and development of the model.

A relatively common feature of sentences is that they contain embedded clauses, where an argument is realised by a clause which itself has a predicate argument structure. This is an aspect of sentence production that the simplified model does not touch upon. However, there must be the ability for a predicate argument structure to be developed and incorporated into another predicate argument structure. The model is not yet at a stage of development whereby it can deal with such complex features. Saffran, Berndt and Schwartz (1989) found that the non-fluent, non-agrammatic subjects that they investigated had a significantly reduced sentence complexity score in comparison to the normal control subjects. They propose three hypotheses for this finding. The first is that the subjects are impaired in syntactic operations per se. The second is that the deficit is of a conceptual nature which limits the complexity of the messages ultimately expressed. The final proposal that they make is that lexical phonological limitations affect the choice of syntactic structure.

2.4 *Models of sentence comprehension*

2.4.0 *Preliminary orientation*

While there are parallels to be drawn between the processes involved in sentence production and sentence comprehension, there are some important differences which prevent us from being able to account for sentence comprehension simply in terms of a reversal of the processes involved in production. Models of sentence comprehension have been based to a greater extent on linguistic theory than psycholinguistic evidence of the proposed processes. Lesser and Milroy (1993: 34ff.) discuss the need to be wary of equating linguistic theory with psychological reality and in any discussion of models of sentence comprehension and the interpretation of the breakdown of sentence comprehension in aphasia in terms of these models, it is important to bear this caution in mind. Berndt (1991) and Black, Nickels and Byng (1991) have provided a model of the processes thought to be involved in sentence comprehension and their work will be used to guide the discussion in this section on sentence comprehension and impairments to it.

Berndt (1991) notes that it is important to emphasise that any working model postulating distinct levels of processing may lead to the mistaken impression that these processes must be carried out in succession. However, there is considerable evidence to suggest that auditory comprehension normally involves immediate interpretation of semantic and syntactic elements as the sentence is being processed (Marslen-Wilson and Tyler, 1980) and some models of sentence comprehension place virtually no limitations on how information from different levels might interact (Frazier, 1988 provides a review).

2.4.1 *Auditory phonological and lexical processing*

Auditory comprehension of sentences begins with the analysis of an ongoing acoustic event into linguistic elements. As Berndt (1991) points out, the details of these processes and the methods used to study them have not focused specifically on sentence level processes. Auditory phonological analysis and lexical input processing have already been discussed in section 2.2.1 in relation to single word processing. Impairment in these processes will clearly result in degraded sentence comprehension as parsing and semantic processing procedures are receiving an impoverished input.

As Linebarger (1990) states, it is not easy to investigate appreciation of syntactic structure in isolation from the meanings of lexical items, as the latter deficit is going to give rise to impaired performance on comprehension tasks. However, Schwartz, Marin and Saffran (1979) describe the investigations of a demented patient who, despite a severe lexical impairment, was able to employ a strategy that revealed her preserved ability to assign thematic roles on the basis of syntactic structure and the lexical properties of the predicates involved.

2.4.2 Syntactic Parsing

The initial analysis serves as a basis for the construction of a syntactic representation which specifies the linear order of elements and the major structural relations between them. Closed class morphemes play an important role in sentence parsing as it almost certainly provides cues about syntactic structure; particularly information about the grammatical category of open-class items (Berndt, 1991). Word order and sub-categorisation frames of lexical items are also thought to play a part in sentence parsing. As Caplan (1987: 306) has stated, the rules specified in any parser must bear a close relationship to a particular theory of syntax, because the output must be a structure specified in that theory.

The majority of research into impairment of sentence comprehension has focused on subjects who show relatively good comprehension at a single word level and are able to perform well on sentence comprehension tasks with non-reversible sentences which can be understood through semantic knowledge of the open class lexical items and world knowledge, but who perform poorly on sentence-picture matching tasks involving semantically reversible sentences. A myriad of different theories have been put forward to explain what has been called "asyntactic comprehension". It seems unlikely, however, that there is one impairment which will account for the numerous deficits. As with sentence production and single word processing, the evidence indicates that a number of different impairments to different processes can occur which give rise to impaired sentence comprehension.

The frequent co-occurrence of asyntactic comprehension with agrammatic speech led a number of investigators to propose agrammatism as a central disorder of syntactic knowledge (or the propositional mechanisms responsible for syntactic processing) having consequences for both production and comprehension. Caramazza and Berndt (1985), however, rejected this proposal on the basis of double dissociations that have been found between agrammatic production and asyntactic comprehension. This does not rule out the possibility of there being a common underlying impairment for the comprehension and production impairment of some aphasic subjects (see the discussion of Byng, 1988 below). It does suggest, however, that a central impairment is not able to satisfactorily account for the performance of all cases of asyntactic comprehension.

Linebarger (1990) reviews the explanations that have been proposed to account for asyntactic comprehension. The explanations fall into three groups each of which have different variants. These are shown in table 2.1 (overleaf).

Thus, a distinction can be made between the group one and two explanations which propose that syntactic processes are impaired and group three explanations which propose that syntactic processes are intact but that impairment arises from a failure to exploit this analysis. The group three explanations are considered in 2.4.3 below.

Table 2.1 ***Explanations of asyntactic comprehension (from Linebarger, 1990).***

1.	**Syntactic deficit**
a)	*Loss of syntactic knowledge base*
b)	*Loss of parsing routines*
2.	**Prevention of syntactic analysis by unavailability of crucial input.**
a)	*Loss of crucial information (e.g. failure to access closed class items)*
b)	*A memory deficit*
c)	*Loss of efficiency of parser*
d)	*General loss of efficiency*
3.	**Failure to exploit syntactic analysis (mapping hypothesis)**
a)	*Interpretative mapping deficit*
b)	*Mapping failure due to memory or resource limitations*

A number of researchers have proposed that asyntactic comprehension arises from a syntactic deficit. Early work proposed a total failure in syntactic processing. Thus Caramazza and Zurif (1976) accounted for the asyntactic comprehension deficit of both agrammatic and conduction aphasic groups in their study as arising from a failure to use syntactic-like algorithmic processes. They proposed that the aphasic patients compensate for this impairment by the use of heuristic strategies.

More recent work has suggested that there is a partial syntactic deficit. Grodzinsky (1984, 1986) and Caplan and Hildebrandt (1988) have both proposed that the linguistic level of representation that is impaired in asyntactic comprehension is the S-structure in Chomsky's (1981) Government and Binding (GB) theory although their proposals are rather different. Grodzinsky (1986) proposes that the problem is one of co-indexing traces at S-structure. Caplan and Hildebrandt's (1988) account is more complex. They conclude that there is an overriding common factor in all aphasic patients' comprehension impairments which is interpreted as a reduction in the computational resources needed for syntactic comprehension i.e. of parsing workspace. In addition to this, they also identified specific patterns of impairment, some of which correspond to the predictions of GB theory and which are interpreted as specific impairments in the parsing process. Four patients are described as having a specific impairment in the co-indexation of empty categories, while four more severely impaired patients are proposed to have an impairment in the ability to co-index overt referentially dependent noun phrases. It is beyond the scope of this review to discuss the proposals of Grodzinsky or Caplan and Hildebrandt in detail; see Caplan (1987), Berndt, (1991), Lesser and Milroy, (1993: 95ff.), Lorch (1989) for brief discussions and critiques.

Moving on to the second group of explanations given by Linebarger (1990), the first variant of this is that syntactic analysis cannot be carried out because of the loss of crucial input. One possibility is that inability to access closed class grammatical morphemes underlies syntactic impairment. Under the strongest version of the closed class hypothesis it has been proposed that co-occurrence of asyntactic comprehension and agrammatic production is the manifestation of a modality-neutral impairment to the processing of closed class grammatical morphemes (Bradley, Garrett and Zurif, 1980). A number of studies have shown that agrammatic subjects are able to perform at a high level on grammaticality judgement tasks which depend on the analysis of closed class elements (e.g. Linebarger, Schwartz and Saffran 1983). This finding argues strongly against the hypothesis that agrammatic comprehension reflects a simple insensitivity to closed class grammatical morphemes. It is also important to acknowledge that closed class elements are an extremely heterogeneous group and there may be dissociations between different sub-divisions of them.

A further variant of the explanation of asyntactic comprehension as a consequence of the prevention of syntactic analysis because of the unavailability of crucial input is that a memory deficit underlies the inability to carry out syntactic analysis. Subjects are unable to maintain a phonological trace of the input long enough to parse syntactically complex sentences. A number of researchers (e.g. Caramazza, Berndt, Basili and Koller, 1981) have proposed that asyntactic comprehension observed in conduction aphasic subjects results from an impairment to verbal working memory. Kolk and Van Grunsven (1985) have suggested that memory limitations might also undermine sentence comprehension in agrammatic patients. The short term memory (STM) hypothesis remains contentious. As Berndt (1991) points out, the lack of a coherent model of memory requirements of sentence comprehension seriously hinders its consideration. Saffran (1990) provides a useful review of the literature in this area.

The third version of the second group of explanations is that there is a loss of efficiency in the parser which gives rise to asyntactic comprehension. Linebarger, Schwartz and Saffran (1983) proposed a trade-off hypothesis in which they hypothesised that the loss of efficiency causes the parser to compete with semantic interpretative operations. Thus, while it is possible for asyntactic comprehenders to perform syntactic analysis, this is at the cost of semantic interpretation. In this case, patients confronted with a comprehension task might not even attempt syntactic analysis (although retaining the capacity to perform the necessary computations on tasks that make fewer semantic demands) but instead restrict themselves to open-class lexical heuristics.

The final version of the second group of explanations that Linebarger reports is that asyntactic comprehension might arise from a loss of efficiency not specific to the parser. Grodzinsky, Swinney and Zurif (1985) raised the possibility that agrammatic comprehension might result at least in part from a disruption to domain-general rules for automatized, rapid exhaustive searches of memory.

2.4.3 Mapping processes in sentence comprehension

The grammatically interpretable constituent structure (available as a result of sentence parsing) yields to a semantic interpretation of the lexical and structural information available; the listener must comprehend the meaning of the major lexical items and interpret their roles in a functional argument structure. Thus, there is a mapping process taking as input the syntactic representation and giving as output a semantically interpreted proposition. Berndt distinguishes two possible ways of approaching the mapping processes, dependent on the theoretical perspective taken. From the perspective based on transformational grammar, some set of procedures is needed to align the two levels of representation. From a perspective based on lexical-functional grammar, the information about how functional roles map onto grammatical roles is available as part of the lexical representation of the verb. Finally, the semantic "content" of the phrases must be combined and integrated to form a full semantic representation of the sentence, specifying the precise nature of the event or state expressed by the sentence, and the precise identity of the participants that play certain roles in that event or state.

Several authors have suggested that it is not an impairment to syntactic processing which gives rise to asyntactic comprehension (as is assumed in the group one and two explanations). It has been suggested by a number of authors that the good performance on grammaticality judgements offers evidence of preserved syntactic abilities. This has been shown in both off-line tasks (e.g. Linebarger, Schwartz and Saffran, 1983) and on-line ones (e.g. Shankweiler, Crain, Gorrell and Tuller, 1989). This task requires sentence parsing (see Linebarger et al, 1983 for further discussion) and, therefore, provides counter evidence against the claim that asyntactic comprehension represents a loss of syntactic knowledge. The methodology of grammaticality judgement has received criticism (see Berndt, 1991 for a review of some concerns). Further evidence of retained structural capacities in aphasia comes, however, from on-line experiments using reaction times for word recognition. One example of such work is that carried out by Tyler (1989) examining an agrammatic subject, DE. She found that, as for the normal subjects, DE's latencies in identifying the probe word showed the same position effects as normal subjects for semantically interpretable, syntactically well-formed sentences but not for semantically anomalous, syntactically well-formed sentences. His monitoring latencies in the anomalous condition were faster than in a scrambled word condition with no syntactic structure, indicating that even for the anomalous condition, DE is able to extract some syntactic information. Tyler interpreted the results as indicating that DE may be able to use syntactic knowledge in processing local phrases but not in construing a global representation of the sentence.

Researchers that have rejected a syntactic deficit as underlying asyntactic comprehension have instead proposed that the subjects are impaired in mapping from syntactic to semantic representation i.e. assigning thematic roles appropriately (e.g. Schwartz, Linebarger and Saffran, 1985). Byng (1988) describes a therapy programme for two aphasic patients which targeted the mapping procedure. For patient BRB therapy was directed solely at comprehending thematic relations but this resulted in improvements in both comprehension and production, thereby supporting the hypothesis that there is a central mapping mechanism common to both input and output of language (see 2.3.1 for further discussion). Schwartz, Linebarger, Saffran and Pate (1987) report a study which investigated agrammatic subjects' ability to make judgements on the semantic coherence of sentences, manipulating whether (in terms of Chomsky's (1981) GB theory) there are moved arguments from D- structure position to S- structure position in the sentences. They found that the patients had serious problems assigning thematic roles correctly in the sentences which had moved arguments (such as passive forms) in contrast to performance with sentences in which the thematic roles correspond to surface structure elements (such as active sentences). Schwartz et al accounted for this by suggesting that the set of procedures for mapping between thematic roles and grammatical roles is made more difficult when the relationship between a D-structure ordering and an S-structure ordering is not "transparent".

Grodzinsky (1990) criticises the authors' interpretation of such a disorder as not syntactic. He states:

> "the distinction they make between "hard" (complex) and "easy" (simple) constructions is in fact syntactic. Indirect versus direct theta-role assignment is a consequence of whether or not a transformational operation has occurred, resulting in a representation that contains a trace linked to an antecedent NP that receives a theta-role through the link." (1990: 70).

Linebarger (1990) suggests that an alternative possibility is that a mapping failure arises from memory or resource limitations similar to those proposed to prevent syntactic processing, rather than from a specific inability to perform the mapping operation.

2.4.4 Limitations of the model of sentence comprehension

The discussion of the literature relating aphasic subjects' impairments in sentence comprehension to models of sentence processing clearly demonstrates that impaired comprehension is not a unitary disorder. It is important to remember, however, that while the models in their current state of articulation allow some specification of the processing impairments, they are extremely under-specified. Black, Nickels and Byng (1991) propose, for instance, from an investigation of normal subjects' performance on a picture-sentence matching test, that some reversal errors do not seem to be errors of sentence comprehension but appear to arise as a consequence of "later" processing involving the translation between language and pictures. The normal subjects' performance appeared to be influenced by the conceptual properties of verbs. In addition, Black et al explored in detail the underlying sources of poor performance on a picture matching assessment for three aphasic subjects who all made significantly more reverse role errors than lexical distractor errors. From detailed investigations, they argue that their apparently similar errors arise from different and multiple causes. Their findings demonstrate the need for careful consideration of the tasks used to draw conclusions regarding levels of processing impairments and their processing demands.

Finally, a further obvious but very important point to be made regarding comprehension is that while aphasic subjects may be clearly impaired on decontextualised assessments, they may be successful in using contextual information to compensate for this in everyday communication.

2.5 Concluding remarks

In this chapter, three models of language processing have been discussed and the various patterns of language breakdown found after brain damage have been reviewed with reference to these models. The cognitive neuropsychological assessments used in this investigation to explore the subjects' patterns of processing impairments in terms of these models are outlined in Chapter Four.

The focus of this thesis is on the relationship between identified cognitive neuropsychological impairments and the impact that these have on the aphasic speaker's conversation. The important questions to be asked are first, whether all impairments that are identified in cognitive neuropsychological assessment have a detrimental impact on conversation and, following on from this, how does the way that both interlocutors deal with manifestations of impairments influence the magnitude of the impact? CA is the analytic tool which is to be used in this investigation to address these questions. In the next chapter, the CA literature of particular relevance to this study is considered and its implications to the investigation of aphasic discourse examined.

Chapter Three

CONVERSATION ANALYSIS AND ITS APPLICATION TO APHASIA

3.0 Introduction

In Chapter One, it was argued that CA offers the most fruitful framework for the investigation of aphasic discourse and in this study two major conversational management procedures have been selected for close examination. The first is that of turn taking, including the production of minimal turns; the second is the organisation of repair. These are not the only potential areas of interest in the application of CA to the investigation of aphasia. Indeed, as noted in 1.1.2, Lesser and Milroy (1993: 324ff.), include in their conversational checklist an examination of embedded sequences, the use of routines and the utilisation of discourse markers. In this study, however, the focus on the relationship between language impairment and conversational ability makes an examination of repair particularly relevant. Furthermore, both turn taking and repair are central areas of investigation given the emphasis in this study on the collaborative nature of conversation.

The organisation of turn taking and the production of minimal turns are reviewed with reference to both normal and aphasic discourse in 3.1. In 3.2 the organisation of repair in normal conversation is discussed and an examination of psycholinguistic approaches to repair and how this relates to the CA approach is made. The section then moves onto a consideration of the limited work examining repair in aphasic conversation. In 3.3 Clark and Schaefer's (1987, 1989) CA-style model of contributions to conversation is discussed and it is suggested that this model grants particular insight into the organisation of repair in aphasic discourse.

3.1 Turn taking

3.1.1 The organisational principles of turn taking.

As Sacks, Schegloff and Jefferson (1974) report, there are numerous features of turn taking which need to be accounted for in a model of turn taking organisation, which is fundamental to conversation. Overwhelmingly, one interlocutor speaks at a time; while occurrences of more than one speaker at a time are common, they are brief; transitions from one turn to the next with no gap or overlap are common; turn order, turn size, length of conversation, what parties are going to say and the relative distribution of turns are not specified in advance. Sacks et al propose that the mechanism that is able to account for all of the above properties is a set of rules with ordered options which operate on a turn-by-turn basis. These rules can be seen as a sharing device for the right to take the "floor". The basic unit of this local management system is the turn constructional unit (TCU) which makes up turns at talk and which is determined by features of surface linguistic structure including syntactic and prosodic features. The end of a TCU constitutes a point at which speakers may change, the transition relevance place (TRP). It is the projectability of TRPs which accounts for the common occurrence of split-second speaker transition. Local, Kelly and Wells (1986) have identified a number of phonetic features including pitch, tempo, loudness, vowel quality and duration phenomena which appear to cluster at turn-endings and are used by recipients as indicators of turn completion. Local (1986) has also identified a range of prosodic phenomena. Non-verbal cues have also been shown to play an important role in predicting possible turn completions. Ellis and Beattie (1986:181) review the evidence for the role of posture, gesture and gaze and argue that such cues are critical in explaining why interlocutors do not more frequently self-select at possible TRPs. The fact that smooth split-second turn transition occurs in telephone conversations, however, where no non-verbal cues are available, suggests that other factors must also be operating.

Within turns at talk, it is possible for the current speaker to select the next speaker by using a variety of techniques such as interrogatives, address terms and tagged assertions. The rules proposed by Sacks et al and modified by Levinson (1983: 298) are as follows:

(C is current speaker, N is next speaker)

Rule 1 - applies initially at the first TRP of any turn.

(a) If C selects N in current turn, then C must stop speaking, and N must speak next, transition occurring at the first TRP after N-selection.

(b) If C does not select N, then any (other) party may self-select, first speaker gaining rights to the next turn.

(c) If C has not selected N and no other party self-selects under option (b) then C may (but need not) continue (i.e. claim rights to a further turn-constructional unit).

Rule 2 - applies at all subsequent TRPs.

When rule 1(c) has been applied by C, then at the next TRP Rules 1(a)-(c) apply, and recursively at the next TRP, until speaker change is effected.

These rules are able to account for all of the features of turn taking listed above. Overwhelmingly, one speaker talks at a time as the system allocates single turns to single speakers and turn transfer is co-ordinated around TRPs. These factors are also able to account for the occurrence of transition without gaps or overlaps. The occurrence of brief overlaps are also systematically accounted for. If in a multi-party conversation more than one speaker self-selects by the application of rule 1(b), there will be overlap which is usually resolved by one of the speakers dropping out. Another basis for overlap derives from the projectability of possible TRPs. Sacks et al suggest that variation in articulation of the projected TCU will on occasions produce overlap between a current turn and a next. Similarly, predictable overlaps also arise over optional elements which can specifically go after possible completion without intending continuation such as terms of address and tag questions. The rule governed occurrence of overlap thus enables a distinction to be made between inadvertent overlap and interruption which violates the turn taking rules. As seen in the following excerpt taken from Levinson (1983: 320), the overt attention paid to interruption demonstrates participants' orientation to the basic expectations provided by the rules of turn taking:

Collins	Now // the be:lt is meh*
Fagan	is the sa:me mater*ial as // this
Smythe	Wait a moment Miss Fagan

On the basis of the rules it is possible for silence to be differentially assigned as either (i) a gap before a subsequent application of rules 1(b) or 1(c), or (ii) a lapse on the non-application of rules 1(a), (b) or (c), or (iii) a selected next speaker's attributable silence after the application of rule 1 (a). Thus, it can be seen that the interlocutors' treatment of silence in conversation will be contingent on its sequential placement.

While making specific predictions about turn taking and the occurrence of overlaps and silence, the rules also allow for the observable variations found in conversation; there is no fixed turn length given the variety of forms that TCUs can take and the continuations of turns allowed by the application of rule 1(c). Additionally, turn order, length of conversation, number of conversationalists and the subject of conversation are not specified in advance but are variable. These diverse variations arise from a local management system, i.e. one which operates on a turn-by-turn basis.

Turn taking in aphasic conversation

While language impairments may be expected to interfere with the split second timing of turn taking for aphasic people, Lesser and Milroy (1993) report that aphasic speakers seem, on the whole, to handle turn taking relatively well. Schienberg and Holland (1980) studied the turn taking of Wernicke's aphasic subjects and proposed that turn taking behaviour remains intact in aphasia. This indicates that despite the comprehension impairments of Wernicke's aphasia, enough syntactic and prosodic knowledge is retained to accurately predict TCUs and TRPs.

Aphasic turns at talk often contain a large number of filled and unfilled pauses which may give rise to transition relevance points and thereby increase the chance of the aphasic person losing the floor. Research has shown that aphasic people may exploit some of the turn taking mechanisms in order to hold onto their turns. Ahlsen (1985) found that a raised hand was utilised by the aphasic subjects whom she studied as a turn-holding signal to avert interruption, the hand being dropped to signify completion of the turn. Conway (1990) also described an aphasic subject who altered her body posture, sitting forward to signal that her turn was still in progress and relaxing this position when she had finished her turn at talk.

Edwards and Garman (1989) describe the discourse of a fluent aphasic patient who produced excessively long and semantically opaque turns at talk. They suggest that this "press of speech" may arise from not being able to satisfy the lexical demands of the message level in a sufficiently precise way because of a lexical retrieval deficit. They propose that the subject is carrying to an extreme, a pattern of behaviour characteristic of normal speakers who experience temporary word-finding difficulties. They too tend to run on until interrupted.

Clearly, an examination of turn taking is of relevance to an evaluation of conversational ability in aphasia. In 4.5.1, the investigation of the mechanisms of turn taking used in this study will be outlined.

3.1.2 Minimal turns in conversation.

Tokens such as 'mm hm', 'yeah' and 'aha' pervade conversational interaction and have been a focus of discussion and controversy in the literature. A variety of different terms have been used to describe them which reflect the differing views in the literature of their function in conversation.

Duncan and Fiske (1977) treat the tokens as a sub-set of 'back-channel signals' which also includes clarification requests, completions and brief restatements. The authors report a consensus in the literature that back-channel actions do not constitute speaking turns. The function of back channels is seen as one of indicating attentiveness to the speaker's message as is captured in Tottie's (1990: 2) definition:

> "Backchannels in conversation, i.e. the sounds emitted by the current non-speaker, which grease the wheels of conversation but constitute no claim to take over the turn."

Schegloff (1982) has questioned the assumptions implicit in this view of such tokens. His main concern is that the tokens are treated as an aggregate removed from their context of occurrence. He argues that it is not possible to tell from the aggregate why issues of attention are generically relevant to conversation; why such issues are addressed by tokens such as 'mm hm' rather than other forms of talk which equally exhibit orientation to what has gone before; and why such issues are addressed at particular points in the interaction. He proposes that only by examining particular occurrences of the tokens in their sequential environment will it be possible to yield answers to some of these questions.

From an examination of tokens in their sequential environment, Schegloff proposes that one of the most common functions of such tokens is to exhibit, on the part of the producer, an understanding that an extended unit of talk is underway, and that it is not yet complete. This use as a continuer embodies a particular sort of understanding about the state of talk by declining to produce a fuller turn at talk in the position where extended talk by another is going on. In the continuer function of such tokens, by declining to produce a fuller turn the participant is passing the opportunity to do something in particular with that turn. Schegloff asks whether there are any kinds of actions which have some 'general relevance' in conversation, i.e. that are not made relevant by the particulars of someone's immediately preceding talk or behaviour. One candidate is other-initiated repair. As any unit of talk can be a trouble source, then after any talk can be a place for repair to be initiated. Thus, 'mm hm' etc., in passing the opportunity to take up a full turn at talk, can be seen to be passing an opportunity to initiate repair. From this, the basis seems clear for the ordinary inference that the talk which they follow is being understood. It is not that there is a direct semantic convention in which such tokens amount to a claim of understanding. The passing up of the opportunity to use devices to repair prior talk can, however, be seen to betoken the absence of such problems.

Schegloff proposes that there is a difference between this function and the continuer function of these tokens. With respect to the understanding of what a prior speaker has said, such tokens express a claim of understanding. Such a claim may turn out to be incorrect; and passing one opportunity to repair is compatible with initiating a repair later. The status of a continuer is not, however, equivocal. It does more than claim an understanding about the state of talk but embodies in itself particulars and acts upon it. I would propose, however, that the continuer function can also fulfil what could be called the "acknowledgement function" as other repair is always potentially relevant. The acknowledgement usage does not, however, always embody the continuer usage.

Schegloff's emphasis on studying these tokens in their sequential environment is supported by the work of Jefferson (1984). In line with Schegloff, she argues that there are distinctions between these tokens which are usually treated as an undifferentiated class. The discussion so far may have suggested that these tokens only occur in isolation. One function found by Jefferson for 'yeah' was its use to exhibit a preparedness to shift from recipiency to speakership for some speakers. In contrast 'mm hm' exhibits what Jefferson calls passive recipiency which can be equated with Schegloff's continuer usage.

A particularly interesting and central feature of passive recipiency discussed by Jefferson is the exploitation or subversion of the token's properties to avoid movement to speakership where it is appropriate. As noted above, Schegloff reports that the status of the continuer is not equivocal. In its use it passes up the opportunity for a fuller turn and in so doing passes the floor back to the conversational partner and, therefore, elicits further talk. Jefferson calls this the perverse passive. It is illustrated in this extract of conversation taken from Jefferson (1984: 209).

40 G: .'hhhhhh I'm not going to uhm, hh maybe queer a dea:l just by wanting this
that and the othe r (you know)
[
42 B NO:.
43 G (0.2)
44 G: 'hhhh s:So: uhm,h (.) tha:t's the story.
45 B: Mm hm,
46 (0.2)
47 G: An:d uh (0.6) uhm,hhh (1.0) 'hhhh u-Then I have a ma:n coming Tue:sday
to see.abou:t uh remo:deling the kitchen the way I want it you know? and
the butlers pa:ntry

An example of the perverse passive can be seen in turn 45. In her previous turn, G has marked the completion of the telling with that's the story. This is an appropriate place for B to take a full turn. Instead, she produces mm hm which results in G taking another turn. The self repair suggests that G was perhaps not expecting the floor to be returned back to her so quickly. The use of the perverse passive in aphasic conversation is discussed below.

Another interesting issue which arises in Jefferson's analysis is that the recipiency/ speaker shift distinction of "mm hm" / "yeah" is not used by all interlocutors. In the small number of interactions that she uses as evidence, it appears that when people use both of these tokens the distinction holds. However, one interlocutor in particular was found to use mainly "yeah" and for this person the use of tokens did not predict the shift to recipiency. Tottie (1990) reports on the difference in the use of these tokens in American and English conversations. Tottie's analysis was in terms of back channels which includes, in addition to the tokens under consideration here, sentence completion, requests for clarification and brief restatements. In section 3.3 it will be argued that such tokens are more complex than back channels, and have a function in repair work to establish mutual understanding. Tottie reports, however, that there were very few instances of such items; and two of her comments are relevant to the discussion here. First, the most commonly used tokens differed between conversations. Second, there was a striking difference in the quantities of tokens produced. In the American conversation there were more than 16 backchannels per minute, compared with only five per minute in the British conversation.

Gender has also been implicated as an influence on the use of these tokens; Coates (1986) reports that a number of studies have shown that women use a greater proportion of them. While Tottie (1990) also notes that in the conversations that she studied it is the female partner who produces the largest number of backchannels, she points out that in one of the conversations the male speaker is an extremely prolific backchanneler, thus demonstrating the importance of considering individual variation.

While the limitations of quantitative studies which treat tokens as a class removed from their sequential environment are acknowledged, the identified effect of gender, speech community and individual differences in the use of these tokens indicates that quantitative studies can provide a useful supplement to a sequential analysis which is sensitive to function.

The turn status of minimal turns

Duncan and Fiske (1977), who treat 'mm hm' etc. as a form of backchannel, note the consensus in the literature that backchannels do not constitute speaking turns. Schegloff (1982) proposes, however, that the turn status of such tokens is not invariant, and in line with conversation analysis methodology he suggests that the issue should be approached empirically by asking whether the participants in the conversation treat the occurrence of a particular token as a turn. One possible method is to see whether there is a 'floor-fight' when the tokens are produced in overlap with one speaker dropping out, and Schegloff provides examples of requests for clarification (which are one of Duncan and Fiske's backchannels) which win out in floor fights. This will be discussed further in section 3.5. For tokens such as 'mm hm', although they are often produced in overlap, there is no evidence of a floor fight which could be taken to be indicative of such tokens not having full turn status. The absence of a floor-fight could, however, also be a consequence of the brevity of these tokens.

Schegloff discusses the turn-status of a particular occurrence of 'mm hm' which is reproduced below in its sequential environment (Schegloff, 1982: 92):

(iii)

1	B:	hhh And he's going to make his own paintings.
2	A:	mm hmm.
3	B:	And- or I mean his own frames.
4	A:	yeah.

In line 1 paintings is an error, which is repaired in line 3 by self (the speaker who produced the trouble source). What Schegloff focuses upon is that A has passed an opportunity to carry out the repair in line 2:

> "A silence by A in that position may well have called attention to the presence of a repairable; the 'mm hm', in specifically not doing so, is doing something. 'Mm hm' is more than 'not a turn'; with respect to the repair issue, it is very much like one." (1982: 92)

I proposed earlier that for all of these tokens the repair issue is always relevant as any unit of talk can potentially contain a trouble source which requires repair work, and indeed Schegloff (1982) proposes that such tokens are in some sense part of the organisational domain of repair. For this reason, all tokens will be treated in this study as having turn status, and in 3.5 a model of contributing to conversation which incorporates this treatment of such tokens is discussed.

Another point (which does not emerge prominently in the literature) is that these tokens can function in the environment after yes/no questions. Schegloff (1982) indicates that these are perhaps their most common usage. He argues that when yes occurs after a full question it is a full turn rather than a 'passing up' signal. He assumes that researchers analysing these tokens as back channel responses would not analyse their use as a response to a yes/no question as a backchannel. In their treatment of requests for clarifications as backchannels, however, Duncan and Fiske (1977) treat such a head nod or "mm hm" as a back channel. Further discussion of requests for clarification is given in 3.2 and 3.3 below, but what is of relevance here is that some researchers analyse as a backchannel the response to a request for clarification which takes a yes/no question format.

The distinction between such tokens in their function as responses to questions and in other environments is not clear-cut. While the use of a yes/no question clearly makes a yes/no response (or a response which is interpretable as either yes or no) sequentially relevant, there are also other turn types for which the occurrence for a confirmation/disconfirmation in the next turn is also sequentially relevant. To illustrate this the following extract from a conversation between an aphasic subject (AD) and his daughter (RE) is pertinent:

(iv)

35 AD and where abouts on the M A1 would you be going onto the A1

(2.1)

36 AD coming home

37 RE coming home

38 AD yeah

39 RE just from the M62

In T35 AD asks a question. RE does not respond and after a 2.1 second silence AD adds additional information. RE repeats this in T37. It is only after AD has produced yeah that RE produces the answer which was made relevant by AD's question in T35. The yeah functions to confirm RE's repetition as correct. In just the same way as a yes/no question makes a confirmation or rejection relevant, so does the repetition in T37. For the conversation to progress the confirmation/disconfirmation is relevant.

Certainly the literature offers abundant evidence that these tokens have a diversity of function dependent upon their sequential placement in the interaction, and cannot easily be considered as undifferentiated backchannels. Below, the implications of this diversity of function for the analysis of aphasic conversation is discussed.

Minimal turns in aphasic conversation

Lesser and Milroy (1993: 220f.) comment that in view of these tokens' interactional function, limited linguistic substance and lack of semantic content, it is not surprising if aphasic speakers make extensive use of them. Given the impact of the variety of possible linguistic deficits an aphasic speaker's ability to produce a full turn at talk, the use of minimal turns would allow interactive participation in a conversation while effectively placing the onus of the conversation on the conversational partner. In a pilot study examining videos of conversations between pairs of aphasic subjects, Fleming (1989) found that the weaker participant in each dyad used a large number of minimal turns which appeared to have the function of passive recipiency proposed by Jefferson (1984). By producing these tokens, the subject was able to take an active role in the conversation while minimising the need to produce conversational turns which would make a greater demand on the his or her limited linguistic resources.

In this thesis, the focus of interest in minimal turns is whether aphasic subjects use them as an avoidance strategy to taking full turns at talk. Thus, while such tokens do occur in longer turns (as is seen in the use of yeah to mark topic shift and movement into speakership as outlined by Jefferson, 1984), I shall focus in subsequent chapters on their use in isolation. Furthermore, as the major interest is in whether aphasic subjects are utilising these tokens to avoid taking fuller turns, they will be treated as an aggregate. While the fact that the function of such tokens varies with the sequential context is acknowledged, such a treatment provides a useful measure of the extent to which the burden of conversation is shared by the aphasic speaker and his or her interlocutor. In line with this aggregate approach, tokens in response to questions will be counted collectively with other tokens. While some researchers may treat such tokens occurring in the latter environment differently, as noted above, the distinction is not clear cut. Furthermore, when asked a yes/no question the response can often involve more than the production of 'yes' or 'no'. Thus, the production of a confirmation or rejection in isolation can also be seen as passing the opportunity to take a fuller turn at talk.

3.2 Repair in conversation

3.2.1 The organisational principles

Repair addresses recurrent problems in speaking, hearing and understanding (Schegloff, Jefferson and Sacks, 1977). It can broadly be defined as the work carried out on anything in the interaction which provides an obstacle to the production of a sequentially implicated next turn. In Schegloff et al's seminal work on repair, they stress that repair involves more than "correction" i.e. replacement of an error with that which is correct. Repair is contingent neither on error nor on replacement. As can be seen in the following example, repair occurs where there has been no audible error:

(v)

59 LP is your leg (1.0) are you much is your leg much better now

LP self-repairs twice despite no audible error. Conversely, errors are made in conversation which are not attended to by anybody in the interaction. It would appear that error and ambiguity are sometimes ignored on the assumption that matters will become sufficiently clear as the discourse proceeds. As Schegloff (1987a) discusses, there do not seem to be systematic relationships between the types of trouble source and the form taken by the repairs addressed to them, and work in conversation analysis suggests that repair organisation can be understood without having a clear concept of error. Furthermore, replacement is not a necessary feature of repair. In the following example from Schegloff et al (1977: 363) in which self repair arises from a word search, there is no error item being replaced:

(vi)

Olive: yihknow Mary uh:::: (0.3) what was it. Uh:: Th<u>om</u>pson

Schegloff et al propose that there is a distinction to be made between the initiation of a repair and its outcome. These phases in the repair organisation can be carried out by different people. Thus, repair can be initiated by the speaker of the trouble source (self-initiated repair) or by another party (other-initiated repair). In either case, the carrying out of the repair may be done by either self or other. Repair sequences can thus take four possible forms (all excerpts from Schegloff et al, 1977):

1. Self initiated self repair:

(vii)

N: she was givin me a:ll the people that were go:ne this yea:r I mean this quarter y'know

2. Self initiated other repair:

(viii)

B: He had dis uh Mistuh W- whatever k- I can't think of his first name, Watts on, the one that wrote// that piece,

A: Dann Watts

3: Other initiated self repair:

(ix)

B: Oh Sibbie's sistuh hadda ba:by bo:way.

A: Who?

B: sibbie's sister

4: Other initiated other repair:

(x)

Lori: But y'know single beds'r awfully thin tuh sleep on.

Sam: What?

Lori: Single beds.// They're-

Ellen: Y'mean narrow?

Lori: They're awfully narrow // yeah.

Self and other initiation of repair are distinct types but they operate within the same domains and their respective placements are ordered relative to each other. Other initiation is nearly invariably withheld until the trouble source turn's possible completion; frequently it is withheld until after possible completion. In addition, self and other initiation have different courses. Self initiation of repair can be and usually is combined with doing a candidate repair. In contrast, other initiation often locates the trouble source, to yield self repair in the next turn. Thus, the organisation of repair provides centrally for self repair which can be arrived at by the alternative routes of self-initiation and other initiation, routes which themselves are organised to favour self initiation. The different forms of repair are not, therefore, structurally equivalent or equipotential. The participants' opportunities to carry out repair lead to a preference for self repair over other repair and a preference for self-initiation over other-initiation.

Where least preferred other repair does occur, it is often modulated with the use of uncertainty markers or by the use of various types of question format. Schegloff et al propose that modulation occurs because when the hearing or understanding of a turn is adequate to allow production of "correction" by other it is adequate for a sequentially appropriate next turn. Thus, if other repair is confidently held, it should not be done. Only if there is some uncertainty should it displace the sequentially implicated next turn.

Schegloff et al propose that there is a natural ordering for construction types based on their relative "strength" to locate a repairable. Empirical evidence for this ordering is provided by examples of a preference for stronger over weaker initiators, such that weaker ones get self-interrupted in mid-production to be replaced by stronger ones and if more than one other-initiated sequence is needed, the other-initiators are used in order of increasing strength. The initiators in the order given by Schegloff et al from weaker to stronger are given below:

1. "Huh?" "What?"
2. Wh- question words.
3. Partial repetition of trouble source plus a question word.
4. Partial repetition of a trouble source.
5. "y'mean" plus a possible understanding of prior turn.

Schegloff et al conclude that repair is organised to deal rapidly and efficiently with a trouble source, either within the turn in which it appears (self-initiated self repair), within the next turn (self-initiated other repair, other-initiated other repair) or within the third turn (other-initiated self repair). In addition Schegloff (1987a) discusses another form of repair that occurs in the third turn in which, after turn one, the following turn is produced as sequentially appropriate based on and displaying the understanding reached of turn one. This is marked in the third turn (by the speaker of the first turn) as a misunderstanding by the production of repair.

Participants are oriented to the sequential implicativeness in the organisation of conversation. Next turn (besides being available for sequentially implicated next turn) is also the systematically available position for initiation of repair on a trouble source (as already outlined in 3.1.2). When repair occurs, it results in the sequential implicativeness of current turn being displaced for at least one turn. Furthermore, as other initiated repair in next turn is itself sequentially implicative, the sequential implicativeness of current turn is yet further displaced (Schegloff, 1979). Jefferson (1987) describes other repair as exposed correction which is isolated and made interactional business in its own right. Between these alternative uses of next turn position there is a structural preference for keeping next turn position free for sequentially implicated next turns and this is served by self initiation of repair by the current speaker of the trouble source in current turn before next turn position. Schegloff (1979) proposes that the interest in getting repair initiated in same turn and before next turn results in repair being initiated in same turn before the next possible completion of the sentence or other turn constructional unit in which the trouble source occurs. Thus the "integrity" of the sentence (in syntactic terms) is systematically subordinated to the sequential requirement to repair within same turn.

An important issue which has emerged from the literature is that, as Schegloff has noted, "some types of repair... may not be the product of a "performance frailty" in respect to the production of the sentence but may be affirmatively enjoined features of certain sequential and interactional operations" (1979: 272, note 15). He reports that first sentences in topic-initial turns or in topic shift position very regularly have self repair in them and where self initiated repair is not found then the next turn will frequently involve the initiation of other repair. The nature of the trouble source in these repairs is often obscure and the repair itself is regularly concerned with the item that initiates the new topic.

Jefferson (1974) also discusses the use of repair as an interactional resource, giving examples of self repair which is being exploited to signal the interlocutors' stance to the situation or to produce allusive talk in interactionally delicate bits of conversation. Similarly, the recycled turn beginnings described by Schegloff (1987b) are repairs that arise for an interactional reason (because of overlap with other speaker) and cannot be interpreted in relation to identification of error.

3.2.2 Psycholinguistic analyses of repair

The phenomenon of repair has been of interest to psycholinguists for the insight that it offers to the processes of monitoring in language production. The focus of such studies has been on self repair, with no attention paid to repair organisations involving other-initiation or other repair. One example of such work is a study carried out by Levelt (1983) who examined 959 spontaneous self repairs produced in an experimental setting in which subjects were required to describe visual arrays of coloured dots, connected by lines. Levelt makes the distinction between repairs which involved monitoring for error (whether it be lexical, syntactic or phonetic errors) and repairs which involved monitoring for the best way to express a message (including changing the message or designing a more appropriate message for the context). The latter form of repair demonstrates the importance of the concept of recipient design to the occurrence of repair. Repairs will occur despite no linguistic "error" because conversationalists design their talk so that the interaction can continue as smoothly as possible.

Levelt (1983) also makes the distinction between overt repairs where morphemes are changed, added or deleted and covert repairs characterised by either just an interruption by an editing term, or repetition of one or more lexical items. The occurrence of covert repairs is taken as evidence of pre-articulatory monitoring. As discussed in the last section, however, in certain sequential contexts repair has an interactional function. In these contexts covert repair cannot be linked to detection of errors through monitoring whether pre-articulatory or post-articulatory.

Schegloff (1991) points out that Levelt's findings, with respect to the organisation of repair, have an equivocal status. The experiment created a speech exchange system in which the turn taking organisation denied anyone else the right to talk except the subject. Hence, within the bounds of the experiment in which the self repairs were collected, there was no possibility of a sequence in which other could initiate repair. This means that while Levelt describes positions in which repair is initiated within a turn in terms of their relationship to that which is being repaired, placement is not formulated (and cannot be formulated given the constraints of the turn taking organisation) relative to the structure of the turn in which it occurs. In conversational turn taking, however, the possible completion of the ongoing turn and the possible start of next turn by another has consequences for the placement of self repair and the preference for it (see Schegloff, 1979; Schegloff, 1987b). Schegloff (1991) argues that until a parallel analysis on self repairs from ordinary interaction is carried out, to see whether the findings are the same as found in the laboratory setting, we will not know the status of Levelt's findings. The limitations of this study emphasise the problems of studying language from a non-interactional perspective.

3.2.3 Repair in aphasic conversation

Repair organisation is particularly relevant to an evaluation of aphasic conversational abilities, given the difficulties which routinely arise from language impairments such as word-retrieval problems, semantic and phonemic paraphasias and disturbances of grammatical production. Repair has, however, been a relatively neglected topic in the language pathology literature, with more emphasis on specific error types than on their consequences in interaction and how interlocutors deal with them.

Attention has been paid to the importance of aphasic patients' ability to recognise and self-correct errors that they have made (e.g. Wepman, 1958; Spiegel, Jones and Wepman, 1965; Marshall and Tompkins, 1982). Schlenk, Huber and Willmes (1987) examined 'prepairs' and repairs in a range of aphasia syndromes and used the findings to make proposals about the nature of language monitoring. In the majority of such studies, analysis of self correction has been on non-interactional tasks such as picture descriptions and other assessment measures. Thus, the same reservations about what they tell us about self repair in aphasic interaction hold as those which Schegloff (1991) outlined for Levelt's work on self repair with non-language impaired interlocutors (see 3.2.2 above). These studies do not touch upon the role of interactional repair. Furthermore, as already outlined, repair involves more than "correction".

Milroy and Perkins (1992) propose three salient questions in the investigation of repair in aphasic discourse. First, are aphasic repair mechanisms different from those found in normal discourse? Second, if they are, what are their organisational principles? Third, how successful are these in dealing with trouble sources and avoiding irretrievable breakdown?

As outlined in 1.2.1, there has been very little work applying CA principles to aphasic discourse. Two separate pilot studies do, however, go some way towards addressing these questions. Conway (1990) applied a four-way repair classification, derived from Schegloff et al (1977), to compare the use of various repairs in the turns of two aphasic subjects to those of their relatives in a conversation. An examination of the proportion of repairs confirms the overwhelming preference for self initiated self repair for both the aphasic subjects and their relatives. However, while the next largest proportion of repairs produced by the relatives was other-initiated self repair (in line with the preference for self repair proposed by Schegloff et al, 1977) for the aphasic subjects it was self -initiated other repair. It appears that this pattern of repair is not a common one in the conversations of normal subjects. This can be predicted by the preference for self repair. If a speaker identifies an error it is likely that he or she will deal with it him or herself. Only in the cases where self cannot achieve the repair will self-initiated other repair occur, such as in the case of word searches. Given the language impairments of aphasic subjects the larger proportion of this form of repair is not surprising; while the aphasic subject can identify the need for repair, because of language impairment he or she may not be able to effect the repair him or herself.

Barnsley (1987) has suggested that aphasic repair is not easily describable in terms of the repair organisation proposed by Schegloff et al (1977) where trouble sources are repaired within a maximum of three turns. Aphasic conversationalists often take much longer to resolve problems, and successful outcomes often seem better described as collaboratively achieved than as any combination of "self" or "other" as is seen in the following excerpt from Barnsley's data:

(xi)

T	and what does your husband do?

A	in er (.) er (3) what else can I say to you? Stowing it on the er (.) he was always fine

T	uh huh was it a factory?

A	no (.) the next (.) what's next? (2 syllables) you know like (1) what are they doing in the er [tɒl dei] the people who like in South Bank was years and years down there

T	you mean steel works?

A	that's it that's where he worked

If indeed aphasic repair strategies differ from normal ones, as both these studies suggest, we can address the second and third questions posed above, concerning their characteristics and effectiveness. Lubinski, Duchan and Weitzer-Lin (1980) characterised the repair work observed in conversation between an aphasic subject and spouse as a "hint and guess" cycle in which the aphasic partner gives hints which allow the non-language impaired partner to make guesses at the understanding that he or she is trying to reach. In the review of assessments of aphasic pragmatic ability in 1.2.2 the scope and limitations of APPLS (Gerber and Gurland, 1989), which considers repair in aphasic discourse, were discussed. In the present research study, the characteristics and effectiveness of repair in aphasic discourse are investigated in more depth. In the next section, a model of communication which integrates CA findings on minimal turns and repair and which provides a suitable framework for this investigation is outlined.

3.3 A model of conversational contributions

Clark and Schaefer (1987, 1989) have proposed a model of contributing to conversations which has been developed on CA principles and which incorporates the repair organisation proposed by Schegloff et al (1977). Embodied within a range of discourse models from different academic backgrounds is the assumption that conversation proceeds utterance by utterance, the speaker's job being to issue understandable utterances, and the listener's job to understand them (Clark and Schaefer, 1989: 260 supply a range of references to approaches which embody this principle of unilateral action). Clark and Schaefer propose a more explicitly collaborative model whereby interlocutors work together to establish that the listener has understood what the speaker meant. To this end contributions to conversation have two constituents; the presentation phase where an utterance is presented by the contributor (interlocutor A), and the acceptance phase which is initiated by the listener (interlocutor B). The acceptance phase involves the interlocutors working together to establish that B has understood A's presentation sufficient for current purposes. The model, thus, sets up the need for the conversational partners not simply to mark where a presentation needs repair work before it can be accepted; it also requires positive evidence of understanding to be given. The acceptance phase can be achieved in a number of different ways. The form that it takes is dependent on the state of interlocutor B's understanding after A's presentation. Clark and Schaefer (1987) propose a hierarchy of four states of understanding:

State 0: B didn't notice that A uttered a presentation.

State 1: B noticed that A uttered a presentation but was not in state 2.

State 2: B correctly heard A's presentation but was not in state 3.

State 3: B understood what A meant by the presentation.

If B is in State 3, the acceptance phase can be completed in the next turn. However, if he or she is in State 1 or 2 acceptance cannot be completed immediately, but collaborative work must be carried out until it is established that B is in state 3. (If B is in state 0 then the presentation has failed, and A should recognise this from B's failure to initiate an acceptance phase).

The type of initiator of the acceptance phase that B uses depends on the state of understanding reached and should demonstrate to A the state of understanding so that A can carry out collaborative work with B, necessary to achieve completion of the acceptance phase. The ultimate aim of the acceptance phase is to establish that mutual understanding has been reached. The number of turns taken to establish this depends on the state of understanding reached. The authors propose that implicit to their proposed model is the principle of least collaborative effort (Clark and Wilkes-Gibbs, 1986) by which participants try to minimise the total effort spent on a contribution in both the presentation and acceptance phases. There is a trade-off in effort between initiating a presentation and refashioning it. Generally, the more effort spent on designing the right presentation, the less effort is needed for acceptance. This is congruent with the preference for self repair to prevent displacement of the sequentially implicated next turn (Schegloff, 1979) discussed above. However, factors such as time pressure, errors and ignorance of what the interlocutor will accept anyway, may give rise to less than perfectly designed presentations which require collaborative work before reaching the mutual belief that B has understood the presentation well enough for present purposes.

The principle of least collaborative effort predicts that B's initiation of the acceptance phase should precisely reflect the state of understanding reached, enabling A to identify the nature of the trouble source that needs to be dealt with in order to complete acceptance and thereby focus repair work as precisely as possible. As discussed above, Schegloff et al (1977) propose a natural ordering of the forms taken by other-initiation of repair, based on their relative "strength" or capacity to locate a trouble source. Clark and Schaefer (1987, 1989) have incorporated this idea of strength into an ordering of acceptance phase initiators. The hierarchy proposed in their 1987 paper shows the initiators on a continuum from those which mark immediate acceptance and those which give rise to collaborative repair work before acceptance is achieved. In their 1989 paper they treat the two forms of initiators as discrete. The acceptance phase initiators shown in table 3.1 incorporate the forms proposed in both papers while retaining the continuum proposed by Clark and Schaefer (1987).

The acceptance phases are shown in order of decreasing strength. In order to adhere to the principle of least collaborative effort, B should choose the strongest initiator that is consistent with the state of understanding reached. This ensures that the acceptance phase is completed in the minimal number of turns required. Only the strongest initiators (moving on to a next relevant contribution or the production of an acknowledgement token) can achieve completion of acceptance in the next turn. Since each acceptance phase initiator is itself a presentation that requires acceptance, contributions may be hierarchically structured with presentations embedded within higher level acceptance phases. The organisational principle which stops this process spinning out indefinitely states that every acceptance phase must ultimately end with a speaker presupposing acceptance by continuing with the next relevant contribution.

***Table 3.1 Initiators of the acceptance phase** (Clark and Schaefer, 1987, 1989)*

i) B shows that he has reached state 3 by: a) Moving on to next relevant contribution. b) Producing an acknowledgement token. c) Showing continued attention non-verbally.
ii) B shows that he has reached state 2 but is not sure if he is in state 3 by: Demonstrating understanding reached.
iii) B shows that he has reached state 2 but is not in state 3 by: a) Requesting clarification through a question (and possible partial repeat). b) Demonstrating that he is in state 2 by repetition of all or part of the presentation
iv) B shows that he has reached state 1 but is not sure if he has reached state 2 by: Displaying hearing through repetition or partial repetition.
v) B shows that he has reached state 1 but is not in state 2 by: Requesting a repetition of the presentation.

The strength of this model is that it offers an integrated framework for both immediate acceptance with positive evidence of understanding and collaborative acceptance involving repair work. The need to provide positive evidence of understanding, as well as to mark the points where repair work is necessary, means that the notion of contribution helps define what counts as 'trouble' and what counts as 'repairing trouble'. Clarification requests which have been treated as backchannels in the literature (Duncan and Fiske, 1977; see 3.1.2 above) are seen to be a form of acceptance phase initiator; indeed they are the strongest form of initiator of collaborative repair (type B in table 3.1). The use of this strong initiator of collaborative repair often results in fast, efficient repair work. This association with efficient resolution of repair may account for their treatment in the literature as backchannels.

The principle of least collaborative effort central to Clark and Schaefer's model appears to be operating in aphasic conversations, in that the linguistically impaired partner is more likely to need to embark on collaborative work with his or her interlocutor to achieve acceptance of a presentation. Less overall (collaborative) effort is required if the unimpaired partner contributes to the repair work to achieve acceptance of a presentation than if the aphasic partner works in isolation to try and design an immediately acceptable presentation. Indeed, this may be a task which is beyond his or her linguistic abilities. The model is thus able to account both for the quick and efficient acceptance of presentations in normal conversation, and for the collaborative sequences that seem to be characteristic of aphasic conversation as illustrated in excerpt *(xi)* in 3.2.3 above. The application of Clark and Schaefer's model in this study to investigate the organisational principles underlying repair strategies in aphasic discourse is discussed further in 4.5.4 below where examples of the various initiators of the acceptance phases are given.

In this chapter, the conversational management procedures that have been selected for close examination later in this thesis have been explored in relation both to normal and aphasic conversation. In the next chapter, the broader methodology employed in the study is presented.

Chapter Four

METHODOLOGY

4.0 Introduction

The methodology of this research project as a whole is discussed in this chapter. First, the aims of this research are identified and the research design is outlined in 4.1. The remainder of the chapter deals with how the research aims are to be met. In 4.2, brief subject histories are provided and in 4.3 the assessments and analyses used in the cognitive neuropsychological investigation are described. Finally, the conversation analytic procedures are described in 4.4.

4.1 Research aims and design

4.1.0 Research aims

In the summary of the strengths and limitations of cognitive neuropsychology and pragmatics in their application to aphasia (1.3), it was argued that the two approaches are complementary in nature. Thus, the relevance of an integration of the two approaches in the management of aphasia is established. The major aim of this study is to investigate the manifestations of cognitive neuropsychological impairments in the conversation of three aphasic subjects. It is expected that the findings will provide information relevant to an integrated approach to the management of aphasia which takes account of both linguistic and communicative functioning in assessment, treatment and evaluation of treatment. This will be achieved through the following procedures:

1) A detailed exploration of impaired and intact linguistic abilities using cognitive neuropsychological assessments and analyses;
2) An examination of the manifestations of the cognitive neuropsychological impairments through the use of both self repair and collaborative repair patterns;

3) An examination of the way that both aphasic and normal interlocutors handle the manifestations of impairments through an analysis of turn-taking and collaborative repair;

4) An examination of the influence of conversational partner on the manifestation and impact of cognitive neuropsychological impairments by a comparison of the subjects in conversation with a relative and with the researcher.

4.1.2 Research design

As outlined in 1.1.1, a basic methodological feature of cognitive neuropsychology is the use of single case studies as these are seen as the most powerful empirical procedure for making inferences to normal functioning. A single case study approach can also be seen as appropriate to the use of CA in the investigation of conversational ability in aphasia. The focus on sequential context and the collaborative negotiation of interaction makes a group study design inappropriate as such studies necessitate the removal of data from its sequential context. Thus, a single case study design is particularly appropriate to this investigation. Such a design permits exploration of the precise pattern of intact and impaired processes using cognitive neuropsychological investigations for each subject. Furthermore, a single case study design is also of value in the examination of the way that interlocutors deal with the manifestations of cognitive neuropsychological impairments.

4.2 Subjects

Contact with the aphasic subjects in this study was made through speech and language therapists in the Newcastle area. The main requirements that were specified in the selection of subjects were:

1) that the aphasic person was at least six months post-onset of cerebro-vascular accident (CVA);

2) that they lived at home with a spouse;

3) that a word finding difficulty was their most prominent language impairment;

4) that they had no history of hearing loss;

5) that single word comprehension was relatively intact (i.e. that they scored 38/40 or more on PALPA auditory word-picture matching);

6) that both the aphasic person and their spouse were willing to participate in the study.

Where possible, the aphasic subjects' spouses were used as control subjects for both the cognitive neuropsychological investigations and as the conversational partner. Unfortunately, because of the difficulties in collection of conversational data with the spouse for two of the subjects (see 4.4.1 below), different conversational partners were used. For the third subject, while it was possible to use the husband as a conversational partner, he was not available for use as a control subject for the cognitive neuropsychological assessments.

Brief histories of the three subjects participating in the study are given below. For a description of their language impairments, readers are referred to the appropriate cognitive neuropsychological assessment chapter (Chapters Five, Seven and Nine respectively)[3] .

Subject EN is a housewife who lives at home with her retired husband. They have four adult sons, one of whom lives locally. EN had nine years of education and had worked at a glass factory before having her children. She is left-handed.

In May, 1989, at the age of 65, EN suffered a left cerebro-vascular accident (CVA) and was admitted to hospital with a right hemiplegia and aphasia. She received physiotherapy and speech and language therapy and this continued on a weekly basis after discharge from hospital. Six and a half months after the CVA she fell and broke

[3] Information available regarding the nature of language impairments at time of onset varied for the three subjects and as such details are not considered pertinent to the aims of the present study they are not included.

her hip. As a consequence of this, she was immobile and reliant on a wheelchair during the course of the study.

Investigations relating to this research project commenced in February 1990, eight and a half months after EN's CVA. At this time she was not receiving speech and language therapy input because an ambulance dispute prevented her from being able to attend the hospital. EN was visited by the researcher at home on a weekly basis, over a period of nine weeks.

The control subject for the cognitive neuropsychological assessments for EN was her husband, who was 66 years old at the time of study. He had nine years of formal education and had worked as a miner before retiring. EN's conversational partner, BC, was a cousin who lived locally. He was 71 years old at the time of the study and had nine years of formal education. He had a manual job in a local factory before retiring.

Subject AD is a retired police officer. He lives at home with his wife. They have three children, all of whom they see regularly. He had received nine years of formal education but after this had taken a number of correspondence courses relating to his profession. He is right-handed.

In October 1990, when he was 68 years old AD suffered a left CVA. He did not lose consciousness, the major symptom being jargon speech and the inability to understand what was said to him. He was attended by the local GP but not admitted to hospital. Five months after his stroke, his GP referred him to speech and language therapy.

AD's involvement in this study commenced in June 1991, eight months post onset. At this time he was receiving speech and language therapy for one hour a week. He was visited by the researcher at home on a weekly basis, over a period of ten weeks.

The control subject used for the cognitive neuropsychological assessments for AD was his wife. She was 70 years old at the time of the study and had nine years of formal education. AD's conversational partner was his daughter, RE. She was thirty-six years old at the time of the study. She has a family and works part-time teaching flower arranging at a community college.

Subject JJ is a warden for a sheltered housing complex for elderly people. She lives in a house within the complex with her husband and adult son. She has one other son who is away at University. JJ received nine years of formal education. She is right-handed.

JJ suffered a left CVA in December 1990 when she was forty-two years old. The CVA was thought to arise as a result of Lupus erythematosis and resulted in aphasia but no paralysis. She was seen by the speech and language therapist on a regular basis as both an in-patient and an out-patient.

JJ's involvement in this study commenced in September 1991, nine months post onset. At this time she was receiving speech and language therapy on a fortnightly basis. She was visited by the researcher at home on a weekly basis, over a period of nine weeks.

JJ's husband was used as the conversational partner. He was 42 years of age at the time of the study and works as an accountant. It was not possible to use JJ's husband as a control subject for the cognitive neuropsychological assessments as he works and therefore was not available for testing. Instead a female control subject, who matched JJ for age and years of formal education was used.

4.3 Cognitive neuropsychological assessments and analyses

4.3.0 Preliminary orientation

In this section, the cognitive neuropsychological assessments and analyses used in this investigation are described. The majority of assessments used were from the PALPA battery (Psycholinguistic Assessments of Language Processing in Aphasia; Kay, Lesser and Coltheart, 1992) although supplementary assessments were used from other sources.

While the majority of assessments were presented to the three aphasic subjects and the matched control subjects, some assessments were only presented to two of the subjects. This situation arose for two main reasons. First, the differing nature of the subjects' cognitive neuropsychological deficits meant that further investigations were only appropriate for some of the subjects. Second, some of the assessment materials became available later in the study after the completion of data collection with one of the subjects.

The section has three divisions. In 4.3.1, the assessments of single word processing are described. This is followed by the description of the analyses of sentence production and sentence comprehension in 4.3.2 and 4.3.3 respectively.

4.3.1 Assessments of single word processing

For each assessment, a brief description of the task is given. The implications that can be drawn regarding impaired performance in relation to the model of single word processing discussed in 2.2 are then outlined briefly. Finally, control subjects' performance is reported. Kay, Lesser and Coltheart (1992) provide details of mean scores of the normal subjects and standard deviations. They suggest that if aphasic subjects fall below two standard deviations from the mean on an assessment this can be identified as impaired performance. Unfortunately, this is not statistically valid as standard deviations can only be used when the population is normally distributed. The distribution of PALPA control subjects' scores is not normal as a ceiling effect results in a skewed distribution. As a consequence, in judging whether a subject's performance is impaired, the range of PALPA control subjects is used when available. When this is not available the range of the three control subjects of this study is used. If the subject's performance falls below the range of the control subjects, their performance is considered impaired.

Assessments of phonological and auditory lexical input processing

PALPA assessment 1, same-different discrimination using nonword minimal pairs: This assessment involves the presentation of 72 monosyllabic, CVC nonword pairs, half of which are the same and half of which are minimally different according to voice, manner or place of articulation. Differences occur either in initial or final positions of pairs or in pairs that are metathetically related. The subject is required to respond with "same" if he or she think that the pair are identical or "different" if they are not. Lip reading is prevented during the presentation.

Good performance on this assessment indicates that auditory phonological analysis is intact. Poor scores may be due to impaired auditory phonological analysis or impaired hearing (see 2.2.1 above).

PALPA control subjects had a mean number of correct responses for same judgements of 35.70 and for different judgements of 35.09. The scores of the matched control subjects ranged from 68/72 to 72/72.

PALPA assessment 2, same-different discrimination using word minimal pairs: This test is equivalent to assessment 1 except that monomorphemic words are used. Half of the words are high in word frequency (mean = 182.06) and half are low in word frequency (mean = 6.44). Presentation is exactly the same as for assessment 1.

Performance on this assessment also provides information on auditory phonological analysis. A comparison of performance on this assessment with assessment 1 using non-words shows whether impairment is compensated for by lexical information.

PALPA control subjects had a mean number of correct responses for same judgements of 35.54 and for different judgements of 34.83. The matched control subjects' range of performance was from 66/72 to 71/72.

PALPA assessment 5, imageability and frequency auditory lexical decision: This assessment consists of a list of 160 words and non-words which are presented auditorily to the subject. Half of the words are high frequency, half low frequency; half of the words are high imageability, half low imageability. The non-words are derived from the words by changing one or more phonemes, while preserving phonotactic regularity. The subject is required to produce "yes" when the item is a real word and "no" when it is a non-word.

Poor performance on this task can arise from impairment to auditory phonological analysis. In this case performance on PALPA assessments 1 and 2 would also be expected to be impaired. If performance on this assessment is impaired in the context of good performance on the minimal pair judgement tasks this can be taken to indicate impairment of the phonological input lexicon. As for PALPA assessments 1 and 2 sensori-neural hearing loss may impair performance.(See 2.2.1 above).

The mean performance of the PALPA control subjects was 76/80. The range of the matched control subjects was 74/80 to 80/80.

Assessments of central semantic processing

PALPA assessments 47 and 48, spoken word-picture matching and written word-picture matching: The same materials are used for these two assessments with the items ordered differently and the presentation of the target in auditory and written versions respectively. The assessments consist of 40 items. The subject is presented with a choice of five pictures from which he or she has to point to the one which corresponds with the word presented either auditorily or in written form. Each set of pictures consists of the target (e.g. carrot), a close semantic distractor (e.g. cabbage), a distant semantic distractor (e.g. lemon), a visually related distractor (e.g. saw), and an unrelated distractor which is semantically related to the visually related distractor (e.g. chisel).

Equivalently impaired performance on both of these assessments indicates that the patient has a central semantic impairment (see 2.2.2 above). Impaired performance on just one of the versions of this task is indicative of either an impairment of input processing (which can be investigated using PALPA assessments which examine input processing; see above). If this is ruled out, it suggests that the patient has a modality specific access impairment to the semantic system (see 2.2.2 above).

The PALPA control subjects had a mean number of correct responses of 39.29 with a range of 35/40 to 40/40 on assessment 47 (spoken version) and a mean number of correct responses of 39.47 with a range of 35/40 to 40/40 for assessment 48 (written version).

PALPA assessments 49 and 50, auditory synonym judgement and written synonym judgement: The same materials are used for these two assessments with the items ordered differently and the presentation in auditory and written modalities respectively. These assessments consist of 60 pairs of words, half of which are high imageability and half of which are low imageability. Half of the pairs of words are synonymous (e.g. marriage - wedding) and half are different in meaning (e.g. lantern - wedding). In the auditory version, the subject is required to say "yes" if the items mean nearly the same thing and "no" if they do not. On the written version the subject is required to tick the items if they mean nearly the same thing and cross them if they do not.

If the subject is impaired on both assessments this may indicate a central semantic disorder. Examining performance for high and low imageability items demonstrates whether performance is more impaired for low imageability items. As with assessments 47 and 48, impaired performance on just one of the versions of this task is indicative of either an impairment of input processing (which can be investigated using PALPA assessments which examine input processing) or if this can be ruled out, it suggests that the subject has a modality specific access impairment to the semantic system. (See 2.2.2 above).

PALPA norms on these two assessments are not currently available. The range of the matched control subjects was from 58/60 to 60/60 on both versions. All errors were made on low imageability items.

Assessments of phonological and lexical output processing: Repetition

PALPA assessment 9, imageability and frequency repetition: This assessment involves the repetition of 80 words and 80 non-words. The items used are those already described for assessment 5 with frequency and imageability controlled. In presentation, lip-reading is prevented. The words and non-words are tested separately (block design).

Poorer performance on non-word repetition than word repetition indicates impairment to the non-lexical route of repetition involving auditory phonological analysis (which can be further investigated using the assessments described above) and the phonological output buffer (which can be further investigated by looking at the influence of word length on repetition and naming, see next assessment and the Lesser syllabic naming test below). A significant effect of imageability on word repetition indicates that the patient is utilising the semantic route of repetition. A frequency effect may indicate an impairment involving the phonological input lexicon or phonological output lexicon. Comparison of performance on lexical decision (see above) and output tasks using different inputs such as reading and naming assessments controlling frequency (see below) should help to decide between these possibilities. (See 2.2.3 above).

The mean score of the PALPA control subjects is 78.81 for words and 75.94 for non-words. None of the matched control subjects made errors in the repetition of words. The range of performance on non-words was from 74/80 to 80/80.

Experimental repetition assessment: This assessment is a revised version of the test devised by Smith (1988). It consists of 95 words and 95 non-words matched for the number of syllables and phonological structure. For the words and non-words there are 20 monosyllabic items, and 25 each of two, three and four syllable items. Number and position of clusters in words and non-words are matched between these groups. Words are selected without inflectional affixes. The data sheets are presented in appendix A. Words and non-words are presented separately. Each group is presented in the random order presented in appendix A.

An effect of number of syllables on performance indicates an impairment in access to or at the level of the phonological output buffer (see 2.2.3 above). This can be further investigated using other output tasks which manipulate this factor (see Lesser syllabic naming test, below). Better performance of words than non-words indicates that the lexical routes of repetition are offering support to repetition performance.

The matched control subjects' performance ranged from 94/95 to 95/95 on the words and 88/95 to 91/95 on the non-words.

Assessments of phonological and lexical output processing: Oral reading

PALPA assessment 31, imageability and frequency reading: This assessment involves the oral reading of the 80 words already described in PALPA assessment 5, with frequency and imageability controlled and with words across groups matched on a one-to-one basis as far as possible for letters, syllables and morphemes.

An imageability effect on this assessment indicates the use of the semantic route of reading (see footnote[1], p.48). A frequency effect may indicate an impairment involving the orthographic input lexicon or the phonological output lexicon. Comparison of performance on lexical decision (see above) and output tasks using different inputs, such as repetition and naming assessments controlled for frequency, should assist in deciding between these possibilities.

The mean of the PALPA control subjects was 79.4. The range of the matched control subjects was 79/80 to 80/80.

PALPA assessment 36, nonword reading: This assessment consists of 24 items with six of three-, four-, five- and six-letter non-words. All of the items are monosyllabic.

Impaired performance on this task indicates that there is an impairment to the processes involved in the non-lexical orthographic-to-phonological conversion routine. As the phonological buffer is involved in this route, an impairment at the level of the buffer would be expected to impair performance. This possibility can be further investigated by examining performance on other output tasks involving both words and non-words. (see 2.2.3 above).

The PALPA control subjects' mean score was 22.88. This assessment was not administered to the matched control subjects.

Assessments of phonological and lexical output processing: Oral naming

Analysis of naming assessments: In the discussion of the findings of naming assessments (2.2.3), it was argued that different aspects of naming performance between different studies may arise as an artefact of the focus of the investigation. It is, therefore, necessary to set out clearly the analytic criteria used so that comparisons between studies can be made. The same criteria were applied to the analysis of performance on the three naming assessments used in this investigation.

Performance on the naming assessments was audio recorded, in order to allow detailed and accurate analysis. The presenter made a verbalisation as each of the pictures were shown to the subject (e.g. "what's this?") so that the time of the initial naming response could be recorded from listening back to the tape. Two analyses were carried out. First, responses were analysed into one of the categories defined in table 4.1. Where a long multiple response was produced, the final response was analysed. When final responses were produced which were acceptable alternatives to the target name (e.g. hen for chicken) these were excluded from the analysis. As the distinction between an acceptable alternative response and a semantic error is not always clear-cut, three independent judges unfamiliar with the naming assessments were asked to make yes/no judgements as to the acceptability of these naming responses. When two of the three judges gave a positive response these were then classified as alternative acceptable responses.

Second, an analysis of the behaviours observed in responses was carried out in order to capture the qualitative nature of performance, particularly for the subjects who produced multiple responses. In this analysis, all behaviours within a multiple response were analysed. The behaviours analysed are shown in table 4.2:

Table 4.1 Classification of naming responses

Correct within five seconds:	Responses are included in this category if the intended name is produced within five seconds of being shown the picture. The selection of five seconds is arbitrary but provides some measure as to whether subjects have delayed lexical retrieval. Normal subjects would be expected to name within this time scale.
Delayed correct:	Responses are included in this category if the target name is produced after a delay of five seconds or longer from being shown the picture.
Semantic errors:	Responses are included in this category if they are semantically related to the target item. This includes lexical items with superordinate, subordinate or co-ordinate relationship to the target item.
Phonological errors:	Responses are included in this category if a response contains at least 50% of the target's phonemes.
Neologisms:	Responses are included in this category if they are non-word responses containing less than 50% of the target's phonemes.
Failure:	Responses are included in this category if the subject fails to produce a final response and/or indicates that he or she is unable to retrieve the name.

Such detailed qualitative analysis of naming responses provides information valuable to the formation of hypotheses regarding the locus of cognitive neuropsychological impairment. As the interpretation of naming responses has already been discussed in depth in 2.2.3 above it will not be discussed further here. This second level of analysis was carried out on all three subjects' performances for the revised Kay naming test but only on the other two naming tests where this was felt to provide supplementary information useful to deciding the locus of impairment.

Table 4.2 Classification of naming behaviours in naming responses

Pauses:	Any response containing filled or unfilled pauses of one second or more were included in this category. This includes pauses after being shown the picture but before responding. There is no differentiation made in the length or number of pauses in an individual response.
Semantic associates:	Responses containing any word which is semantically related to the target (whether this is the final part of the response or whether it is produced within a longer response) were allocated to this category.
Circumlocutions:	This category included responses where information about the target is produced which conveys some meaning of the target.
Phonological errors:	This category included responses containing partial phonological attempts and phonemic paraphasias.
Neologisms:	Responses are included in this category if they contain non-word responses containing less that 50% of the target's phonemes.
Writing strategy:	Responses are included in this category if the subject attempted to use orthographic information to aid access, either in the form of gestural writing or oral spelling.

In order to illustrate the complementary nature of the analysis of the final response and analysis of naming behaviours in the naming responses, two sample responses will be presented and classified:

ENVELOPE-> (3) post (1) letter post (2) envelope

ESCALATOR-> ['skɛlɪpə 'skɛlɪpə] (5) escalator

In the analysis of naming responses, both of the above responses are classified as delayed correct responses. In the analysis of naming behaviours in naming responses, pauses and semantic associates are found in the response to ENVELOPE and pauses and phonological attempts are found in the response to ESCALATOR. The second analysis allows identification of qualitative differences in the responses which has important implications for the interpretation of the locus or loci of impairment.

An understanding of the locus or loci of impairment is further aided by the examination of the effect of variables such as word frequency, word class and word length. Three naming assessments were used in this investigation which involved manipulations of these factors. They will be described in turn.

Revised Kay naming test: This assessment is a shortened version of the Kay naming test (unpublished). It consists of 75 black and white line drawings. The names are divided equally into three frequency bands (frequency measures from Francis and Kucera, 1981; occurrences per million). High frequency items have a word frequency greater than 100, medium frequency items have a word frequency between 25 and 86, low frequency items have a word frequency of 15 or less. A list of the items, their word frequencies and sample pictures are provided in appendix B.

The analysis system described above was carried out on the data. All three matched control subjects named all the items correctly within five seconds, except for one acceptable alternative response from control subject two (wireless for radio) and control subject three (hen for chicken). There were no multiple responses produced.

Verb and noun naming test: This assessment is a revised version of Habgood's (1989) assessment. It consists of 64 line drawings, half of which are to elicit naming of nouns and half of which are to elicit naming of verbs. The two sets of items are divided into two frequency bands (frequency measures from Francis and Kucera, 1981; occurrences per million). High frequency items have a word frequency greater than 50, low frequency items have a word frequency of 15 or less. The items used, their word frequencies and sample pictures are presented in appendix C. The verb and noun pictures are presented in separate blocks.

The performance of the control subjects on this assessment is shown in table 4.3. This shows that the verb pictures have poor name agreement. The alternative correct responses produced by the matched control subjects are presented in appendix C. There was only one case, however, for which the control subjects did not produce an immediately correct response within five seconds.

Table 4.3 Performance of matched control subjects on verb and noun naming test

Response types	Subject 1 Nouns	Subject 1 Verbs	Subject 2 Nouns	Subject 2 Verbs	Subject 3 Nouns	Subject 3 Verbs
Correct > 5 seconds	32 (100%)	26 (96%)	31 (100%)	28 (100%)	32 (100%)	29 (100%)
Failures	0	1 (4%)	0	0	0	0
Acceptable alternatives	0	5	1	4	0	3

Lesser syllabic naming test (unpublished): This assessment consists of 60 black and white line drawings. Half of the items are monosyllabic names, the other half are polysyllabic names (three or four syllables). Each of these halves are divided equally into three frequency bands. Higher frequency items have a range of 39 to seven. Medium frequency items have a word frequency of one or two for both polysyllabic and monosyllabic names. Low frequency items are names which have no reported frequency count in Francis and Kucera (1981). The list of items, their word frequencies and sample pictures are provided in appendix D. The monosyllabic and polysyllabic pictures are presented as separate blocks.

This assessment was not administered to subject EN or her matched control subject as it was not developed at the time of assessment. Control subject two produced correct responses within five seconds for all except one of the low frequency monosyllabic items. Control subject three's responses were all correct within five seconds

4.3.2 Sentence production analysis

Investigation of the subjects' sentence production was based upon analysis of two bodies of data. The first of these was the conversation held with the researcher. Collection of this data is described in 4.4 below. The second body of data used for analysis was a narrative of the fairy story "Cinderella" (as used by Saffran, Berndt and Schwartz, 1989). The subjects were asked to tell the story of Cinderella. The researcher produced only comments of general encouragement. The narrative was tape recorded and transcribed using English orthography with pauses noted in brackets and phonetic transcription of phonemic paraphasias and neologisms made. The procedure proposed by Saffran et al (1989) was used to segment the narrative into utterances. Control data for the narrative was collected only from control subjects two and three. The data of control subject two was therefore used for comparison to both subject EN and AD as she was most closely matched for age to both of the subjects.

The analyses carried out on the data are motivated by the model of sentence production that has been outlined in 2.2 above.

Analysis of semantic processing

Information about semantic processing is provided by the single word assessments described in 4.1.2 above. In addition, the conversation and narrative were examined for evidence of semantic paraphasias (i.e. the replacement of a target word with one closely related in meaning such as dog for cat). Semantic paraphasias may be difficult to detect in conversation particularly when they bear a close semantic relationship to the intended word and may only be detectable if they become the focus of repair work (see section 4.4.3 below on replacement repairs). Detection is, however, easier in the narrative task where there are a number of specific nouns and noun phrases which are required to be accessed (e.g. ugly sisters, ball, mice, stepmother).

Analysis of clausal complexity

As discussed in 2.3.2, even aphasic subjects who are not agrammatic differ from normal control subjects in that they produce simpler clausal constructions with less clausal embedding. Saffran, Berndt and Schwartz (1989) suggest that this may arise as a consequence of limitations in lexical retrieval.

An analysis was carried out on the Cinderella narrative in which the proportion of main clauses with subordinate clauses (adverbial clauses or clausal arguments) and the proportion of clauses with no embedding was calculated. In addition, a scan of the conversational data was made in order to examine the use of clausal embedding in this context. Table 4.4 displays the proportions of embedding produced by the matched control subjects

Table 4.4 Proportion of embedded clauses produced by the matched control subjects

Main Clauses	Control subject two	Control subject three
No subordination	25 (68%)	20 (50%)
+ embedded clause(s)	8 (21%)	14 (35%)
+ adverbial clause(s)	4 (11%)	6 (15%)

Analysis of realisation of predicate argument structure

This analysis is a modified version of the analysis of Byng and Black (1989). A count was made of the number of one, two and three argument predicates and the number of problematic predicate argument structures produced. When examining the predicate-argument structures of subordinate clauses where one of the arguments is ellipted the subject was credited with having produced that argument. In addition, ellipted arguments from the subject position were credited as being realised, given that ellipsis in this position is a phenomenon of normal subjects.

Table 4.5 shows the proportion of different predicate-argument structures produced by the control subjects.

Table 4.5 Predicate argument structures produced by matched control subjects in the Cinderella narrative

Structure type	Control subject two	Control subject three
Predicate + 1 argument	12 (23%)	16 (24%)
Predicate + 2 arguments	33 (63%)	48 (71%)
Predicate + 3 arguments	7 (13%)	4 (6%)

Phrase structure analysis

The motivation for this analysis was to see whether the subjects were omitting or substituting any of the closed class grammatical morphemes required for noun, verb, adjective or preposition phrases. The complexity of phrase structures produced was noted and any evidence of a trade-off of phrase structure complexity with increasing clause structure complexity was sought.

A specific analysis of the proportion of referring expressions realised as pronouns and as full noun phrases was carried out. As discussed in 2.3.2, excessive use of pronouns has been identified as a strategy to deal with impaired lexical retrieval and increased syntactic complexity. This analysis was carried out on both the conversational data and the Cinderella narrative. The proportions produced by the matched control subjects are shown in table 4.6 below.

Table 4.6 Proportion of noun phrases realised as pronouns and full noun phrases by the matched control subjects in the Cinderella narrative and LP in the conversations with the aphasic subjects

Referring expressions	Control 2 (narrative)	Control 3 (narrative)	LP (conv. with EN)	LP (conv. with AD)	LP (conv. with JJ)
Full NPs	53 (58%)	56 (59%)	52 (37%)	52 (37%)	62 (47%)
Pronouns	39 (42%)	39 (41%)	87 (63%)	87 (63%)	70 (53%)

4.3.3 Assessments of sentence comprehension

PALPA assessments 55 and 56, auditory sentence comprehension and written sentence comprehension: These two assessments use the same material in different order and with different modality of presentation of the target sentence. There are 60 items with four main sentence types: reversible and non-reversible (which are tested in both active and passive forms), gapped and converse relations. Examples of each of the sentence types are given in appendix E. Inclusion of both verb and adjective predicates allows comparison on this dimension. For each sentence, there is a choice of three pictures: the target and two distractors. Included within the distractors are pictures in which the subject and object are reversed and lexical distractors for the subject, object, verb or adjective. The subject is presented with the target sentence (in auditory or written form) before being shown the picture choice. He or she is required to point to the picture that he or she thinks matches the sentence. One repetition of the sentence is allowed on the auditory version.

Comparison of performance between the two assessments allows the evaluation of the influence of modality of input on performance. The pattern of errors provides information about which constructions the subject finds difficult (see 2.4.2 and 2.4.3 above). Examination of performance on PALPA assessment 57, auditory comprehension of verbs and adjectives from the sentence set (see below) allows the investigation of whether poor performance can be accounted for in terms of impaired comprehension of predicates in isolation (see 2.4.1).

The range of performance of the PALPA control subjects on the different sentence types of this assessment is shown in table 4.7. Their mean score on the spoken version was 57/60 and on the written version was 56.83/60.

Table 4.7 Range of performance of PALPA control subjects on PALPA assessments 55 and 56 (auditory sentence comprehension and written sentence comprehension)

Sentence types.	Range on Assessment 55 (auditory version)	Range on Assessment 55 (written version)
Reversible sentences	17/20 - 20/20	16/20 - 20/20
Non-reversible sentences	13/16 - 16/16	14/16 - 16/16
Sentence with subject gap	6/8 - 8/8	5/8 - 8/8
Sentence with non-subject gap	5/8 -8/8	6/8 - 8/8
Converse relations	5/8 -8/8	5/8 - 8/8

PALPA assessment 57: Auditory comprehension of verbs and adjectives from the sentence set: This assessment has two forms, each with 41 items. The subject is presented with a word and then a definition. Half of the definitions are correct (e.g. pulling: drawing something towards you), the other half are incorrect (e.g. approaching: going away from). The words comprise the verbs and adjectives that are used in assessments 55 and 56. The subject is required to say "yes" if the definition is correct and "no" if it is incorrect.

Poor performance on this assessment provides information relevant to drawing conclusions about impaired performance on assessments 55 and 56 (sentence - picture matching). The range of scores for the PALPA control subjects is from 38/41 to 41/41.

PALPA assessments 58 and 59, auditory comprehension of locative relations and written comprehension of locative relations: These assessments examine the comprehension of locative prepositions in phrases. The same items are presented in both assessments in a different order, using a different modality of input. The assessment consists of 24 items. For each item there is a choice of four pictures: the target, a reversal and two other distractors. There are eight items with animate referents (e.g. <u>chicken</u>), eight items with inanimate referents (e.g. <u>bucket</u>) and eight items with abstract referents (e.g. <u>circle</u>). The subject is presented with the target phrase (in auditory or written form) before being shown the picture choice. He or she is required to point to the picture that they think matches the sentence. One repetition of the sentence is allowed on the auditory version.

These assessments provide information about the subject's comprehension of preposition predicates and can be compared with performance with verb and adjective predicates tested in PALPA assessments 55 and 56. The comparison of performance on animate, inanimate and abstract items allows conclusions to be drawn about the influence of the semantic factor of animacy on their performance.

The range of the PALPA control subjects on the spoken version was from 15/24 to 24/24 (mean score of 22.11) and on the written version was from 14/24 to 24/24 (mean score of 21.84). The control subjects performance is therefore widely spread on this assessment.

PALPA assessment 60, pointing span for noun - verb sequences: This assessment provides a measure of processing abilities in phonological short term store which is considered to be relevant to sentence comprehension. As it only requires a pointing response, it is a useful assessment to use with subjects who have speech production difficulties. The assessment uses four uninflected verbs and four nouns in pseudo-sentence arrangements of from two to seven words, which are semantically anomalous but carry prosodically supported sentence structures (SV, SVO). The subject is familiarised with the array of eight pictures which represent the nouns and verbs. They are then required to listen to the strings and then point to the pictures in the same order as they have been presented. Only one presentation of each string is made.

If subjects perform poorly on this task, it may be that phonological short term memory problems are responsible for impairment on sentence comprehension assessments (PALPA assessments 55 and 56) (see 2.4.2 and 2.4.3 above). A further measure of short term memory is provided by PALPA assessment 12 (sentence repetition).

There are no PALPA control norms for this assessment. However, the matched control subjects all reached a span of 6 items with the range of scores from 11/14 to 12/14.

PALPA assessment 12, sentence repetition: This assessment uses a subset of the sentences used in the sentence comprehension assessments (55 and 56) for repetition (36 items). The subject is simply asked to repeat the sentence after the examiner.

Impaired performance on this assessment can arise for a number of different reasons including syntactic, lexical or short term memory problems. Examination of the types of errors made can help to distinguish between these possibilities.

The PALPA control subjects made no errors on this assessment.

4.4 *Conversation analysis*

4.4.0 Preliminary orientation

In this section the analytic techniques applied to the conversational data in this investigation are considered. In 4.4.1 data collection and transcription are described and in sections 4.4.2 to 4.4.4 the analyses applied to the data are discussed. The analytic framework was developed following a detailed examination of the first subject's conversations (subject EN) which were scanned for patterns which were pertinent to the investigation.

The analyses carried out on the conversation are all motivated by the principles of CA outlined in 1.2.1 and Chapter Three. In the examination of the relationship between cognitive neuropsychological impairments and conversational ability some quantification of the findings has been made. In particular, quantification of the proportion of major turns made by interlocutors as well as the proportions of turns exhibiting different forms of self repair has been undertaken in order to allow a comparison between interlocutors and between the same interlocutors in different conversations. It is acknowledged that quantification is not an approach which is commonly accepted by conversation analysts because of the lack of attention paid to sequential context when tokens are counted. In the discussion of minimal turns in 3.1.2, it was argued that quantitative analysis can provide information supplementary to qualitative sequential analysis. In her analysis of discourse markers, Schiffrin (1987) uses a combined approach. Furthermore, sequential factors were taken into account in the quantitative analyses in this study. For example, in the quantification of success of different patterns of self repair, success was determined by the response of the conversational partner in the next turn.

4.4.1 Data collection and analysis

In order to investigate the effect of familiarity of partner on the aphasic subjects' communication, two conversations were collected for each aphasic subject; one with a relative of the subject and one with the researcher.

The two conversations can be seen to differ on a number of dimensions. The relatives' conversations involved an exchange of chat taking place in the subjects' homes. The conversations with the researcher were also informal and took place in the subjects' homes on the researcher's first or second visit after contact had been established through the subjects' Speech and Language Therapists. The nature of these latter conversations was such that the researcher elicited information from the subject resulting in conversations very much oriented towards the aphasic subject with virtually no information about the researcher being broached. Drew and Heritage (1992) discuss the asymmetry between the participants in a variety of institutional interactions which they suggest arises from the question-answer pattern of interaction which characterises many of them. A common finding in the literature "is that institutional incumbents (doctors, teachers, interviewers, family social workers, etc.) may strategically direct the talk through such means as their capacity to change topics and their selective formulations, in their "next questions" of the salient points in the prior answers" (Drew and Heritage, 1992: 49). In the aphasic person - researcher conversations, this pattern resulted in a greater demand for major turns being made from the subjects than in the conversation with the relatives where control of the conversation could be seen to be more negotiable with equal control of the floor.

Besides these asymmetries with respect to control of the conversation, the two conversations can also be seen to differ in terms of the amount of personal mutual knowledge between the interlocutors, with a large amount between the aphasic subject and relative and a limited amount between the aphasic subject and researcher. Experience of communication with aphasic subjects is also different for the two conversational partners. The relatives have experienced talking to their aphasic relative for several months but have had no other experience of talking with aphasic people. In contrast, while the researcher is talking to the aphasic subject for the first or second time, she has the experience of talking to a wide range of aphasic subjects.

All recordings were made using a Sony TCD3 tape recorder. The recording of the conversation with the researcher was made on the first or second visit. The recording was made towards the beginning of the session before cognitive neuropsychological assessment had begun. The subjects were asked if they minded having the tape recorder on during the visits. The researcher then talked with the subject. For two of the subjects the spouse participated in the conversations at the start before leaving to allow the subject and researcher to start "work". The conversation was continued until around 15 minutes of dyadic conversation had been collected.

The conversation with the relative was made in the absence of the researcher in order to minimise the effects of the observer's paradox (see Milroy, 1987: 59-60). The researcher stressed that she simply wanted a recording of a conversation that would have taken place anyway rather than a staged recording of the aphasic subject being "interviewed" by their relative. It was suggested that the tape recorder was left out in the living room so that it could easily be switched on at a suitable time for recording. The tape recorder was set up so that the aphasic subject only had to press the record button at the start and the stop button when recording had finished.

Originally, the intention had been to record a conversation between the aphasic subject and their spouse as this was likely to be the most common conversational partner. However, problems in collecting naturalistic conversation between subject and spouse were experienced with the first subject, EN. The recording of a conversation was discussed with EN and her husband together. When asked when they most often chatted together, however, they both reported that they did not talk very much and that it would be impossible to record a ten minute conversation. This sort of report clearly has implications for decisions on intervention and particularly for data collection for assessment of language use. These issues are taken up again in 11.5.1. Given this response, it was decided to abandon obtaining conversation with the spouse as it was clear that naturalistic conversation was not going to be successfully obtained. From discussion with EN, the researcher found out that a cousin who lived locally called in at least twice a week to see her. The two talked together while her husband went to get some shopping. As this conversation was a regular event, it was seen as a good opportunity to collect naturalistic data and the recording was made successfully.

The second and third subjects were also asked if there were ever times in the day when they would sit and chat to their spouse for a few minutes. The second subject AD and his wife felt that recording a conversation between themselves would be difficult. Thus, for AD, a recording was also made of a conversation with a relative who called regularly to see him (in this case his daughter who lived locally). The third subject, JJ, reported that she and her husband did sit and talk together when he came home from work so a conversation with spouse was obtained for this subject. It is of interest to note that the issue of difficulty in recording conversations between spouses arose when both were retired and at home together.

It was made clear to the subjects both before and after the recordings had been obtained that they were free to wipe any of the recording if they so wished and they were offered the opportunity to listen to the tapes. The opportunity to listen to part of the tape was taken up by one subject but none of the subjects requested any deletions to be made from the recordings.

Once the conversations had been collected, the researcher selected 12 minutes of each conversation for transcription. Where possible, continuous stretches of dyadic conversation were chosen. However, on occasions a third party would come in. In these cases transcription of conversational turns was halted at the point where the third person entered the conversation and continued when they left the conversation. The purpose of collecting 12 minutes of conversation was to provide roughly equivalent quantities of data for analysis. Where the conversations lapsed into silence, timing and transcription continued after the lapse.

All conversational turns were transcribed using English orthography, except for phonemic paraphasias and neologisms for which broad phonetic transcription following the International Phonetic Association (1989) conventions was used. Unfilled pauses both within and between turns were measured using a stop watch to the nearest tenth of a second. A measure was taken three times and where there was a discrepancy in the value obtained the mean of the three values was taken. The transcription conventions for the conversation are shown in appendix F. Once a transcription of a conversation had been made, it was checked by listening to the recording again and reading through the transcription. The transcriptions were used in conjunction with listening to the tapes as the basis for the various analyses carried out (see 4.4.2 to 4.4.4 below).

4.4.2 Analysis of major and minimal turns

The first analysis carried out on the conversational data was an examination of the proportion of major turns produced by the two interlocutors in each of the conversations. The purpose of this analysis was to investigate whether the aphasic subjects use minimal turns as an avoidance strategy to taking full turns at talk. The issue of the turn status of minimal turns has been discussed in 3.1.2. Using the criteria established in 3.1.2, each turn at talk was analysed as either a major or minimal turn. In addition, turns that occurred in overlap where one interlocutor dropped out were counted as incomplete turns and excluded from the analysis. The proportion of major turns produced in the conversation by each of the interlocutors was calculated in order to provide a rough and easy measure of the sharing of the burden of conversation.

4.4.3 Analysis of self repair

The purpose of the analysis of self repair was twofold. First, it offered a method to investigate whether impairments identified using cognitive neuropsychological assessments manifest themselves as trouble sources in the conversational turns of the aphasic subjects. Second, it allowed an investigation of the impact of manifestations of cognitive neuropsychological impairment on the interaction.

The first issue was investigated in two ways:

1) By comparison of the proportion of self repairs made by the aphasic subject to the proportion of self repairs made by the normal interlocutors. For each of the identified patterns of self repair (described below) a calculation of the percentage of major turns containing each form of repair was made. This gives a measure which allows comparison across the different conversations.

2) By comparison of the aphasic subjects with the normal interlocutors of the type of trouble source which gives rise to the need for the self repair. Where trouble sources found in an aphasic subject's turns are not found in the normal interlocutors' turns, this suggests that the occurrence of repairs is a manifestation of the subject's cognitive neuropsychological impairment. In contrast, where a particular form of trouble source is found in both the aphasic and the normal interlocutors' conversational turns this indicates that the occurrence of the trouble source cannot be linked to cognitive neuropsychological impairments as they are produced by the non-language impaired interlocutors. It may be of relevance, however, to note whether the trouble sources emerge more frequently during aphasic subjects' turns than during normal subjects' turns.

The second issue (the impact of the manifestations of cognitive neuropsychological impairments on the interaction) was investigated by examining the success of self repair. For each of the identified forms of repair, the number of successful self repairs was calculated as a percentage of the total number of repairs made. It should be noted that the tokens of a form of self repair may be greater than the number of turns containing a particular form of repair as some turns will contain more than one use of a particular pattern of repair.

The success of a self repair was defined in relation to CA principles by looking for evidence in the subsequent interaction. If the repair is successful, the turn should be accepted as mutually understood by the conversational partner in the next turn. If an attempt at self repair fails, however, then the conversational partner will initiate collaborative repair work in order to achieve acceptance of the presentation and completion of the contribution. Alternatively, the self repair attempt may be superseded by a further self repair attempt. In this case, the first self repair attempt can also be seen to have failed in the sense that it is not perceived by the current speaker to have dealt with the trouble source.

In discussing success, it is important to stress that phonological and syntactic "correctness" is not the criterion that interlocutors orient to and therefore is not the criterion used in this analysis. As discussed in 3.2.1, "errors" occur in conversation which do not become the focus of repair work. Thus although self repair may not result in a phonologically or syntactically perfect utterance, provided this does not interfere with the conversational partner's acceptance of the presentation, it can still be seen as successful repair.

A framework for the analysis of self repair was developed from examination of the self repair attempts occurring in EN's conversations (recall that data collected from EN was used initially to develop the current analytic framework). Four main patterns of self repair were identified; replacement repairs, abandoned main clauses followed by subsequent clauses, delays and repetitions. Each of these will be described in turn with:

1) A description and examples of the trouble sources giving rise to the use of the repair pattern for the normal interlocutors.

2) A consideration of how particular cognitive neuropsychological impairments (defined in terms of the models discussed in Chapter Two) may give rise to patterns of self repair. In the consideration of the manifestation of impairments in the use of repair, it is important to stress that aphasic subjects may not attempt repairs of their utterances despite their errors. This may be because ability to repair is beyond their linguistic abilities, because they consider the error made will not cause a problem in the interaction (not all errors are repaired in normal conversation, see 3.2.1) or because they have not identified the need for repair. Therefore the absence of repair does not indicate that there is no impact of the impairment on the subject's conversation. It is also necessary to consider whether there is any evidence to indicate that the impairment gives rise to collaborative work initiated by the conversational partner (see 4.4.4 below).

3) A description and examples of failed repair attempts.

i) Replacement repairs

In this pattern of self repair the interlocutor provides a replacement for part of the turn already produced. The repairables included cut-off words, words, phonemic paraphasias and phrases.

Use by normal interlocutors: The proportion of major turns containing this repair pattern ranged from 2% to 14% for the normal interlocutors. Examining the repairables that were replaced in the normal interlocutors' turns, the largest proportion of replacement repairs involved replacements of noun phrases including pronouns. Examples are given in *(i)* to *(iii)* (the repairable to be replaced and the replacement are highlighted):

(i)

123 LP so were you in **Italy** in **a hospital in Italy** when you had meningitis

(ii)

195 RE I thought you cut those in the [wɪnt]in the **autumn**

(iii)

86 LP right who actually runs **the** runs **it** then

All of these examples demonstrate that on some occasions parts of the turn preceding the item to be replaced is recycled. In *(i)* a noun phrase is replaced with an expanded noun phrase. In *(ii)* a noun is cut off and replaced with a semantically related noun. In *(iii)* a noun phrase is cut off after the determiner and is replaced with a pronoun.

The normal interlocutors also produced replacement repairs in which a word was cut off before completion despite no audible error followed by a replacement with the same word as is seen in the following example:

(iv)

235 BC aye **[twɛn] twenty** pence it is

Replacement of grammatical features was also observed in the normal interlocutors' replacement repairs. There are tokens in which morphemes marking tense, prepositions and determiners are replaced as seen in the following examples:

(v)

221 BC and you know there's there **was** somebody short for the (1.1) (3 syllables) so they put Phyllis on

(vi)

161 LP so have you actually been out **with** the car then out **in** the car

(vii)

74 LP oh **the** [spi] **your** speech therapist

<u>Use as a consequence of cognitive neuropsychological impairments:</u> A number of different cognitive neuropsychological impairments could give rise to the use of

replacement repairs. Considering firstly impairments to single word processing, production of semantic paraphasias as a consequence of impairment to the phonological output lexicon (see 2.2.3) may give rise to replacement of words. Semantic paraphasias arising as a consequence of impairment to the semantic system (see 2.2.2) are less likely to be repaired because the central impairment may prevent detection of the error. Phonemic paraphasias and neologisms arising as a consequence of damage at the level of either the phonological output lexicon or the phonological output buffer may also give rise to replacement repairs. Moving onto an examination of impairments to sentence production, deficits in the creation of the positional level of representation in selecting either phrasal frames or function words could give rise to replacement repairs involving grammatical features.

Success of repair: Replacement repairs are seen as unsuccessful if collaborative repair is initiated to deal with the repairable in the next turn or if further repair is carried out on the same trouble source indicating that the first attempt has failed. All the normal interlocutors' repairs were successful. Examples of failed replacement repairs produced by the aphasic interlocutors are given below:

(viii)
6 AD London ['junəti 'junəf jun]
[
7 LP uni*versity

AD attempts to replace the phonological error but LP initiates collaborative work in overlap before AD has successfully produced the replacement.

(ix)
111 AD ...if they've had to ['lɪfə] to **live a** to **do do this sort themselves** you see later on y'know it's it can be
[
112 LP what if* they have to take part in a war you mean

In T111 AD replaces a phonological error at the start of a non-finite clause. This replacement can be seen to have failed, however, because it is followed by a further replacement with a different verb. The second replacement has also failed as LP initiates collaborative repair in T112 by giving a demonstration of understanding reached.

ii) Abandoned main clauses followed by a subsequent clause

This repair type involves abandonment of a main clause before completion after which a second clause is produced.

Use by normal interlocutors: The proportion of major turns containing this repair pattern ranged from 1% to 5% for the normal interlocutors. 75% of the normal interlocutors' use of this strategy contained no delay between the abandonment of the first clause and the initiation of the second clause. The longest delay between abandoned clause and subsequent clause for the remaining 25% of this repair pattern was 1.1 seconds.

Within the normal interlocutors' use of this repair pattern, there were tokens in which abandonment of the first clause occurred early on in the clause as in *(x)* as well as tokens where the clause is abandoned at a point nearer to completion as in *(xi)*.

(x)

RE 125 well they they er: Craig took them to play football

(xi)

LP 74 can you not get do you feel anything in that leg

Use as a consequence of cognitive neuropsychological impairment: It is difficult to determine the nature of the repairable i.e. what has given rise to the need for this pattern of repair. Laver (1973) makes the distinction between monitoring for intention and meaning of what is said and monitoring for linguistic deviancy. While speaking, the interlocutor may change his or her mind as to what message he or she wishes to express or the way in which he or she wishes to express it. Changes of this nature are clearly a manifestation of recipient design in conversation (Schegloff, 1987b) and may lead to a clause being abandoned and being followed by a subsequent clause as is seen in excerpts *(x)* and *(xi)* above. Linguistic deviancy could be of three major types; a lexical error, a phonetic or phonological error, or a syntactic error. Such errors are obviously more prolific in aphasic conversation. If the deviancy is limited to a small part of the clause as is likely for the former two types of error, then it is more likely that such errors will be dealt with in isolation through a replacement repair. In contrast with syntactic errors, it is more likely that a new clause will be required. Levelt (1983) suggests that normal speakers start syntactic constructions which lead to a deadlock which is subsequently repaired. In addition, impairment to the processes of sentence production could also lead to the need for this pattern of repair. Impairment in processing of thematic roles (see 2.3.1 above) may give rise to the use of this repair pattern although these agrammatic patients may be so severely impaired that they do not produce clausal structures (e.g. Saffran, Schwartz and Marin, 1980). A lexical retrieval deficit arising from an impairment at the level of the phonological output lexicon (see 2.2.3 above) or in integrating the representations into the constituent frames (see 2.3.2 above) will also give rise to problems in sentence production which may give rise to the use of this repair pattern. At this point it is worth noting that the use of this repair pattern actually requires a high level of syntactic skill which aphasic subjects with severely impaired syntactic abilities will not have. Thus, the use of this pattern of repair indicates retention of a certain level of linguistic ability.

<u>Success of repair:</u> This pattern of repair can be seen to have failed if the conversational partner initiates collaborative repair during or after its use. The normal interlocutors had no such failures in their use of this repair pattern. An example from one of the aphasic subjects is given below in excerpt *(xii)*:

(xii)

43 EN yeah and there's this sort of (2.0) everything in its er look at this (0.8) 'hhh oh it's=

44 LP =you feel as if you can't tidy up either and* that's getting you down as well

[

45 EN yeah yeah

Failure can also arise from the subsequent clause also being abandoned and followed by a further repair. The abandonment of the second clause indicates that the first use of this repair strategy has not been successful. Recursive use of this pattern of repair occurred in 15% of the normal interlocutors' use of this strategy (three tokens). In all cases the recursive use of repair was used to alter the way a message was conveyed which has been suggested above to arise as a consequence of recipient designed turns-at-talk. An example of this is shown in *(xiii)*:

(xiii)

LP 94 so most is it mostly old well presumably it's all old people isn't it

iii) and iv) Editing terms: Repetitions and Delays

The two final types of repair pattern involve the use of repetition and the use of filled and unfilled pauses. These phenomena are often referred to as editing terms in the literature and they commonly occur between the interruption of an utterance and the repair that is carried out. However, they also occur in isolation from other repair phenomena. After the editing term the turn is continued with no change being made to it. Levelt (1983) has called these covert repairs, proposing that monitoring can take place on inner speech before the utterance is overtly expressed. Whether they occur in isolation or in conjunction with other repair phenomena, it appears that the function of repetitions and delays is to give time for the repair to be produced. Because of the covert nature of the trouble sources, it is not straightforward to identify the reason for the use of repetitions and delays, particularly when the repairs are successful. The quantity, length and success of their use by the aphasic interlocutor in comparison to the normal interlocutors does, however, provide some indication of whether their occurrence can be identified as a manifestation of the subject's cognitive neuropsychological impairments.

Repetitions

Besides dealing with problems with the speakers' turn, repetition can also have an interactional repair function. Where one speaker's turn is overlapped by another, when the turn emerges into the clear the speaker may recycle the part of the turn which has been obscured (Schegloff, 1987b, see 3.2.1). Examples of this use of repetition were found for all interlocutors. While this use of repetition by the aphasic interlocutors is informative as to retained interactional abilities, it does not provide any information as to the impact of cognitive neuropsychological impairments. Thus, in the calculation of the proportion of major turns containing this repair pattern, repetition with this function was not included in the count.

Use by normal interlocutors: The proportion of major turns containing repetitions for the normal interlocutors ranged from 0% to 12%. The majority of repetitions consisted of single repetition of a single word. 91% (20 tokens) of the repetitions occurred in isolation from other repair patterns; after the repetition the turn was completed with no further repair.

As repetitions and delays function in a similar way, the issues of their use as a consequence of cognitive neuropsychological impairments and their success will be discussed together after a consideration of delays and their use by normal interlocutors.

Delays

This repair pattern includes both filled and unfilled pauses. Included within filled pauses are non-lexical speech forms such as er and erm as well as metalinguistic comments such as "what's it called" which can also be seen to functioning to provide time for lexical retrieval.

Use by normal interlocutors: The proportion of major turns containing this repair pattern ranged from 0 to 9%. Two thirds of the control subjects' delays in conversation consisted of a delay of one second or a short unfilled pause. The remaining delays did not exceed two seconds.

Use as a consequence of cognitive neuropsychological impairment: As has already been noted above, the identification of the repairable associated with particular editing terms is not straightforward, particularly when the repair is successful. An impairment at the level of the phonological output lexicon giving rise to failed or delayed lexical retrieval may be expected to necessitate the use of editing terms.

Success of repair: For editing terms occurring in conjunction with replacement repairs, if the repair is successfully completed then it can be proposed that the use of the repetition or delay has been successful. If it is not successfully replaced then it can be seen to have failed as is seen in the following excerpt:

(xiv)

172 AD so they backed me from the ['mɛdʒi] the the the the*['wɛdʒimənt

[

173 LP the regiment

AD 'wɛdʒimənt] yeah

In T172 AD cuts off a phonological error and then repeats the four times before producing his replacement. However before this repair is carried out LP has initiated collaborative repair and provided the word that he is trying to produce in his replacement.

Repetition and delay can also be seen to fail when it occurs in isolation from other repair attempts if collaborative repair is initiated. For editing terms occurring between an abandoned clause and subsequent clause, however, it is not clear whether the editing term has been successful or failed. If the editing term is effecting a repair within a clause such as giving time for lexical retrieval, the abandonment of the clause can be seen as evidence of the failure of the repair attempt to resolve the trouble source. If, however, the editing term is functioning to give time for a subsequent clause to be produced, when the subsequent clause is successful then the use of the editing term can also be seen as successful. As it is not possible to decide between these possibilities for both repetitions and delays, editing terms occurring in this environment will not be analysed in terms of success or failure but will be counted as a separate category.

4.4.4 Analysis of collaborative repair

In 3.3, it was proposed that Clark and Schaefer's (1987, 1989) model of contributing to conversation offers a useful framework for the exploration of collaborative repair in aphasic conversation. In the examination of the conversational data collected in this study, the various forms of initiators of the acceptance phases noted by Clark and Schaefer (1987, 1989) were apparent in the often complex repair sequences observed.

This aspect of the analysis carried out on the conversation adheres most closely to CA principles in that the major focus is sequential analysis. For this it is very difficult to separate out the description of the analysis from the analysis itself which is presented in detail in Chapters Six, Eight and Ten. In order to avoid replication, this section will be limited to the provision of an example of each of the initiators of the acceptance phase in the hierarchy presented in table 3.1 (p.123) above. For full explication of the analysis the reader is referred to sections 6.3, 8.3 and 10.3 where collaborative repair sequences of data are discussed in depth.

Clark and Schaefer (1987, 1989) proposed that the strongest initiators of the acceptance phase demonstrate that B has reached state three of understanding (B understood what A meant by the presentation). These included moving onto the next relevant contribution, producing an acknowledgement token and showing continued attention non-verbally. These initiators achieve acceptance in the next turn without repair work. Examples of such immediate acceptance are given in excerpts *(xv)* and *(vxi)* below:

(xv)

135 EN it was three o'clock

136 LP so what did they say

(xvi)

154 EN and they could've put that in the back of the car

155 LP right then

If B is in state two (i.e. has heard the presentation) but is not sure if he is in state three (has understood what A meant by the presentation), the next strongest form of initiator of the acceptance phase is appropriate. This involves a demonstration of understanding reached. This can involve restatement of the entire presentation as illustrated in *(xvii)* or may be focused on a part of the presentation which is problematic for B as illustrated in *(xviii)*. Finally, collaborative completions of presentations can also be seen as a form of demonstration of understanding reached. They demonstrate understanding of an incomplete presentation. An example of this is given in *(xix)*.

(xvii)

43 EN yeah and there's this sort of (2.0) everything in its er look at this (0.8) .hhh oh it's

44 LP you feel as if you can't tidy up either and* that's getting you down* as well

[[

45/46EN yeah yeah mhm mhm

47 EN =mhm

(xviii)

88 EN and here's was where it ached

89 LP that ached as well the bottom half

[

90 EN yeah* oh it's it's (1.0) terrible

(xix)

63 EN yeah and it's just [f:::]

64 LP fractured

65 EN erm [f:] (1.7) mhm and what do you put in it

If B has reached state two (i.e. heard the presentation) but is not in state three (i.e. understood what A meant by the presentation) the acceptance phase may be initiated by a question to obtain further or more specific information as illustrated in *(xx)*.

(xx)

200 EN and we'd been looking o::h (4.0) we's been looking at ['bɛdə] yes for five months shifting out

201 LP is this after your stroke you were thinking of moving or before

202 EN er no after a stroke

Another way in which B can demonstrate being in state two of understanding is through repetition of all or part of the presentation. Repetition is also used to show that B is in state one (i.e. has noticed that A uttered a presentation) but is not sure if he is in state 2 (i.e. has heard it correctly). In this function, repetition can be seen to function as a hearing check as illustrated in *(xxi):*

(xxi)

35 AD and where abouts on the [ɛm] A1 would you be going onto the A1

(2.1)

36 AD coming home

37 RE coming home

38 AD yeah

39 RE just from the M62

RE's repetition in T37 of AD's previous T36 appears to function as a hearing check. Acceptance of the repetition with <u>yeah</u> results in RE continuing with next relevant presentation in T39.

The use of repetitions for two different levels of understanding can lead to misunderstandings of the intended function of the repetition as seen in *(xxii).*

(xxii)

34 EN well that's just God er erm got here is oh God is (1 syllable) that's ['bɛtnt] me down

35 LP that's getting you down

[

36 EN yes* yeah

37 LP what er what

EN's T36 shows that she has interpreted LP's partial repetition in T35 as having a hearing check function. This appears, however, to be a misinterpretation since LP in T37 does not accept T36 with a next relevant contribution but initiates further collaborative work with a question seeking clarification of EN's T34 presentation. As noted above, B can show that he has reached state two but is not in state three by either requesting clarification through a question of by demonstrating state two by repetition of all or part of the presentation. In this excerpt, LP starts with the latter demonstration of understanding reached but when this is misinterpreted uses the former form appropriate for the level of understanding reached.

Finally, if B is in state one (i.e. noticed that A uttered a presentation) but is not in state two (correctly heard the presentation) the weakest initiator of the acceptance phase may be used. This involves requesting a repetition of the presentation as illustrated in *(xxiii).*

(xxiii)

237	AD	so that it'll only be (0.8) it'll be er
		[
238	RE	three feets* a lot mind
239`	AD	eh
240	RE	three feets a lot Dad

AD requests a repetition of RE's T238 with <u>eh</u>. RE duly re-presents her presentation in T240.

As noted in 3.3, all acceptance phase initiators are in themselves presentations which require acceptance. As a consequence of this if an acceptance phase initiator is not accepted immediately (with type A acceptance phases, see table 3.1), it is possible to have further collaborative repair sequence embedded within the first one. As will emerge from the analyses in sections 6.3, 8.3 and 10.3 such embedded collaborative repair sequences are a characteristic of aphasic discourse.

In this chapter the methodological procedures of the study have been described. These are applied in the subsequent six chapters where the results of the investigation are presented. The findings for each of the subjects are presented as separate case studies. For each subject, one chapter is devoted to the findings of the cognitive neuropsychological investigations and this is immediately followed by a chapter dealing with the findings of the conversation analysis.

Chapter Five

COGNITIVE NEUROPSYCHOLOGICAL INVESTIGATION OF SUBJECT EN

5.0 Introduction

This chapter sets out to report the findings of the cognitive neuropsychological investigations of subject EN and to offer an interpretation of her performance in terms of the models of language processing described in Chapter Two. The assessments and analyses used in this investigation and the performance of the control subjects have been described in Chapter Four. The findings reported here, regarding EN's intact and impaired processing abilities, are drawn upon in a subsequent analysis of the conversational data (Chapter Six) in an attempt to identify the impact of cognitive neuropsychological impairments on her conversational ability.

The chapter starts with a description and interpretation of EN's performance on assessments of single word processing in 5.1. In 5.2, her sentence production abilities are examined and in the final section of the chapter (5.3) sentence comprehension is considered.

5.1 Single word Processing

5.1.0 Preliminary orientation

The findings from the assessments of single word processing are presented in relation to the levels of processing discussed in 2.2. Phonological and auditory lexical input processing is reported on in 5.1.1. The findings from the assessments of semantic processing are reported in 5.1.2. Sections 5.1.3 to 5.1.5 describe EN's performance on assessments of phonological and lexical output processing (in repetition, oral reading and oral naming respectively). Within each section, EN's performance on all of the assessments is described and performance is interpreted in relation to the model of language processing presented in 2.2.

5.1.1 Assessments of phonological and auditory lexical input processing

Specific assessments were not administered to examine the functioning of auditory phonological analysis and the phonological input lexicon. It is, however, possible to infer from EN's high level of performance on other assessments that required adequate auditory phonological analysis and lexical processing (e.g. spoken word picture matching, auditory synonym judgement (see 5.1.2 below), word repetition (see 5.1.3 below)), that there is no deficit at these levels of processing.

5.1.2 Assessments of central semantic processing

PALPA assessments 47 and 48, word-picture matching (spoken and written versions): EN made no errors on this assessment in either modality. Thus, her performance fell within the range of the PALPA control subjects.

PALPA assessments 49 and 50, synonym judgement (spoken and written versions): EN's performance on this assessment for both modalities of presentation is shown in table 5.1.

Table 5.1 EN's performance on PALPA assessments 49 and 50, synonym judgement (spoken and written versions controlled for imageability).

Word Pairs	Spoken version (49)	Written version (50)
High imageability	30 (100%)	29 (97%)
Low imageability	26 (87%)	25 (83%)
Overall	56 (93%)	54 (90%)

EN performed at a high level, with equivalent performance in both modalities. Her performance on low imageability items fell below the range of the matched control subjects although she was still able to provide a correct judgement for over 80% of the word pairs (chance performance is 50%). The majority of errors involved identifying non-synonymous pairs of words as synonyms which suggests that EN may have adopted a strategy of accepting pairs of words as correct when she was unsure.

Interpretation of performance on assessments of semantic processing: EN's error-free performance on spoken and written word-picture matching provides evidence of intact access to the semantic system from the visual modality (i.e. picture processing). It also suggests that for high imageability words EN has no impairment in accessing the semantic system from either spoken or written input or in semantic processing itself. Her performance on the synonym judgement tasks also supports these conclusions. Lack of difference in performance across modalities indicates no impairment in access to the semantic system. EN's poorer performance on the low imageability items of the assessment indicates a mild abstract semantic impairment (see 2.2.2 above).

5.1.3 Assessments of phonological and lexical output processing: Repetition

PALPA assessment 9, repetition of words (controlled for frequency and imageability): EN successfully repeated all the words on this assessment without error. Her performance thus fell within the range of the control subjects.

PALPA assessment 8, repetition of non-words: EN successfully repeated 77/80 (96%) of the non-words which fell within the range of the PALPA control subjects. She was able to attempt repetition of each of the non-words immediately with one attempt for each item. All errors were closely phonologically related to the target:

['samə] -> ['sɒmə]

['pɪstjə] -> ['pɪtjə]

['ɪtəni] > ['ɪtəlt]

Interpretation of performance on assessments of repetition: EN's good performance in the repetition of both words and non-words of one, two and three syllables indicates that the non-lexical phonological input-to-output conversion route is intact as this is the only route by which non-words can be repeated. It therefore appears that the processes involved in auditory phonological analysis and the phonological output buffer are intact for coping with items of this level of difficulty. Further evidence for intact processing at these levels comes from the performance on other output tasks.

Further investigation using the more demanding experimental repetition assessment (see 4.3.1) was not undertaken with EN as this assessment was revised for use in this study after completion of data collection with her.

5.1.4 Assessments of phonological and lexical output processing: Oral reading

PALPA assessment 31, oral reading of words controlled for imageability and frequency: EN's performance on this assessment is shown in table 5.2 with a breakdown of performance for high and low frequency and high and low imageability words. Her performance fell below the range of the matched control subjects.

EN produced an attempt at the targets without delay. EN self corrected five of the 14 errors made. 11 of the 14 errors were phonemic paraphasias, the majority differing from the target in only one phoneme:

MOTHER -> ['mʊnə]

COFFEE -> ['kɒpi]

OPINION -> [ə'pɪliən]

CLUE -> [plu klu]

There were also three responses in which EN produced errors with multiple attempts and word cut-offs. In her attempts to read THEORY and TRACTOR articulatory groping was apparent.

TRACTOR -> [kɹət skɹət 'tɹaktə]

FEATHER -> [fə fɛl (2) fɛd 'fɛðə]]

THEORY -> [s:r 'θɹʊts (14) s: 'si:ri:]

Table 5.2 EN's performance on PALPA assessment 31, oral reading of words controlled for imageability and frequency.

Word Type	Immediate correct responses
High imageability / high frequency	18 (90%)
High imageability / low frequency	18 (90%)
Low imageability / high frequency	14 (70%)
Low imageability / low frequency	14 (70%)
High imageability overall	36 (90%)
Low imageability overall	28 (70%)
High frequency overall	32 (80%)
Low frequency overall	32 (80%)
Total	64 (80%)

EN showed a significant effect of imageability (chi-square = 5.00, d.f.= 1, $p<0.05$) with more errors made on the low imageability items than high imageability items. There was no significant effect of word frequency on her reading performance (chi-square = 0.00, df= 1, NS).

Interpretation of performance on assessments of oral reading: EN's oral reading ability was relatively well preserved although she made phonological/phonetic errors on 20% of the items with word imageability affecting performance. As she is able to produce the target for the majority of items and self repaired a large proportion of errors, it is possible to rule out any impairment at the level of input processing.

Independent evidence for intact input processing is provided by her good level of performance on semantic assessments with written input (see 5.1.2).

In determining the locus of impairment, it is necessary to seek an explanation which accounts for the influence of the semantic factor of imageability on the production of phonological/phonetic errors. The production of phonemic paraphasias can be related either to an impairment involving the phonological output lexicon, or to an impairment involving the phonological output buffer (see 2.2.3 above). Furthermore, as has been discussed (see Miller, 1989a; 2.2.3 above), the dichotomy between a phonological (language) impairment and a phonetic (speech) impairment is not a clear-cut one. Phonemic paraphasias may arise from phonetic asynchronies which have phonological consequences for the hearer. It, therefore, appears that the errors that EN produced in this reading assessment could have three possible loci in terms of the model of processing presented in Chapter Two.

EN's repetition performance was at a high level (5.1.3). As repetition necessarily involves all output processes below the phonological output lexicon (the phonological output buffer and allophonic realisation) but can bypass the lexicon via the non-lexical route of repetition, this suggests that EN's errors in oral reading arise from an impairment in access to or at the level of the phonological output lexicon. This proposal is supported by the findings of the assessment of oral naming which indicate a lexical impairment (see 5.1.4 below).

If the locus of impairment giving rise to the phonological/phonetic errors is the phonological output lexicon, this would indicate that EN's reading must be mediated by either of the lexical routes and not by the non-lexical route. The latter route bypasses the lexicon. Thus, if it was operating fully, phonological errors arising from an impairment in access to or at the lexicon would not be expected. Unfortunately, assessment of oral reading of non-words was not undertaken with EN. This would have provided further information regarding the functioning of the non-lexical route.

The influence of imageability indicates that reading aloud is mediated by the semantic route (see footnote 1, p.48) because if reading could be supported by either of the two non-semantic routes a semantic factor would not be expected to influence performance. EN's performance on the synonym judgement assessments (5.1.2 above) indicates a mild semantic impairment for low imageability items. This appears to be influencing EN's performance in oral reading with more phonological/phonetic errors on low imageability items. The interaction of imageability and phonological/phonetic errors offers further support to the selection of interactive activation models of language processing to serial models (see 2.1.1). It is not possible to discern whether the direct lexical route is not functioning at all or whether activation is at a reduced level which would necessitate activation from the semantic lexical route to achieve output from the phonological output lexicon.

When words are of a high imageability, given EN's performance on semantic assessments, it appears likely that EN will be successful in accessing the semantic representation and is thus able to use the semantic lexical route of reading. The activation reaching the phonological output lexicon is enough to access the representation and thus the target is read correctly. In the case of low imageability words, however, given the finding of a mild impairment in semantic processing for these items, it is possible that this is enough to disrupt the functioning of the semantic lexical route or at least to reduce the activation feeding down to the phonological output lexicon. The reduction of activation to the lexicon may give rise to the production of phonemic paraphasias as a consequence of partial activation of the phonological lexical representations. This is in line with Kay and Ellis's (1987) explanation of EST's phonological approximations initially produced in his reading responses (see 2.2.3).

While an explanation of EN's phonological/phonetic errors, in terms of reduced activation from the semantic system to the phonological output lexicon, successfully accounts for the imageability effect, it should be noted that for two of her reading responses articulatory groping, reported to be a feature of apraxia, can be noted. While an impairment at levels below the lexicon were originally ruled out on the basis of good repetition performance, Buckingham (1991) has noted that the focus of contemporary research into apraxia of speech has not examined the nature of elicitation of speech. The identification of several routes of processing in reading and repetition, in combination with strong evidence for interactive activation, makes clear the possibility of differential output impairment consequent on the mode of input. The production of only two apparently apraxic responses indicates that there is only a mild impairment at this level of processing. Furthermore, the proposal of a mild impairment in allophonic realisation does not necessitate rejection of the proposal that errors arise from reduction in activation from the semantic system to the phonological output lexicon. The two impairments could co-occur.

5.1.5 Assessments of phonological and lexical output processing: Oral naming.

Revised Kay naming test (frequency controlled): EN's performance on the different frequency bands of the revised Kay naming test are shown in table 5.3. She performed at a level well below the range of the matched control subjects. The proportion of correct responses made within five seconds significantly decreased with a reduction in word frequency (chi-square = 10.163, df= 2, $p< 0.01$). Overall, EN was successful in retrieving the name within five seconds for 71% of the items, with further retrieval of 15% of items if given unlimited time. For a further 12% of items she failed to produce a final response. There were only two semantic errors (3%) and no phonological errors or neologisms.

Table 5.3 EN's performance on the revised Kay naming test (controlled for frequency)

Response type	High freq.	Medium freq.	Low freq.	Overall
correct >5 seconds	22 (88%)	19 (76%)	12 (48%)	53 (71%)
Delayed correct	2 (8%)	3 (12%)	6 (24%)	11 (15%)
Semantic errors	1 (4%)	1 (4%)	0 (0%)	2 (3%)
Phonological errors	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Neologisms	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Failures	0 (0%)	2 (8%)	7 (28%)	9 (12%)

An analysis of the behaviours observed in EN's naming responses is shown in table 5.4.

Table 5.4 Summary of behaviours in EN's naming responses on the revised Kay naming test

Naming behaviours	Correct>5secs.	Delayed correct	Errors/Failures	Overall
Pauses	4 (8%)*	11 (100%)	10 (91%)	25 (33%)
Semantic associates	0 (0%)	3 (27%)	2 (18%)	5 (7%)
Circumlocutions	0 (0%)	1 (9%)	5 (45%)	6 (8%)
Phonological errors	4 (8%)	2 (18%)	0 (0%)	6 (8%)
Neologisms	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Writing strategies	0 (0%)	4 (36%)	1 (9%)	5 (7%)

(*: the percentages shown in brackets refer to the percentage of responses of that type containing each behaviour i.e. 8% of the responses correct within five seconds contained pauses)

Overall, 33% of responses contained pauses. The majority of these occurred in the delayed correct responses or in the errors and failures. An example of pauses in a failed response is shown below:

DONKEY -> now this is a er: {tsk} (2) this is {tsk} can't think of it

This is typical of the searching behaviour observed in both the failed and delayed correct responses. Short pauses were also observed in 8% of the responses correct within five seconds.

Semantic associates were produced in 7% of the responses overall. Two of these were the final responses and, therefore, represented errors:

FINGER-> that's a hand

LEAF-> EN and that's a (2) er tree off a tree

LP do you know what it's called

EN er (1) branch

In the latter example EN only produced a semantic error after a delay and a circumlocution which indicates problems in lexical retrieval.

Three of the delayed correct responses also contained semantic associates. From the continuation of the attempt to respond after their production, it is clear that she was aware that they were not the target response. Indeed, it is possible that she was using the production of associates as a cueing method. For example:

DESK-> er drawers but (3) er desk

The provision of semantic information for the names that she was unable to access immediately also occurred in the form of circumlocution with 8% of responses overall containing this behaviour. This was most common in her failed responses with five out of 11 errors/failures containing circumlocution. For example:

FUNNEL-> that is oh (1) putting (1) putting (1) the putting in the oil the (7) {hehehe} dear dear

Partial phonological attempts and phonemic paraphasias were observed in 8% of the responses overall. All were corrected as is shown by the absence of any phonological errors in EN's final responses:

ZIP -> [zə zə] zip zip

THIMBLE-> er [ts] er (4) oh dear dear [θə θə] thimble

WEB -> spider in the [ɹɛb] web

EN produced no neologisms.

EN used a writing strategy in 7% of responses overall. This involved writing in the air with her finger on four occasions and spelling out orally the first letters of the word in another. It was used successfully in four out of the 11 delayed responses:

HARP-> the (5) er (2) not (3) {tsk} (4: writing target in the air) it's er the harp

There was only one use of this strategy which failed:

ZEBRA-> that's a (18: writing in the air) er (4) dear me (4) don't know

EN was also given a written version of the revised Kay naming test to allow a comparison of naming ability for different modalities of output. She was able to write the word for 70 of the 75 pictures without delay. For a further three pictures (all low frequency) there was a delay before the production of the target. She had only one failure to produce a response on the low frequency item, PLIERS and an error for the target CHICKEN which she wrote as 'poulez'. This is an unusual error; it is possible that she had accessed the French lexical item (she reported that she had a French pen friend who she had written to since her school days). The most striking feature of her written naming is that it is superior to oral naming. She was able to produce 93% of the written targets immediately in contrast to only 71% of targets in oral naming being retrieved within five seconds.

Interpretation of EN's performance on this assessment will be given after examining her performance on the verb and noun naming test.

Verb and noun naming test (frequency controlled): EN's performance on this naming assessment is given in table 5.5. This assessment demonstrates that EN's ability to name was not influenced by grammatical class as there was no significant difference in her naming of verbs and nouns (chi-square = 0.122, df=1, NS). As in the revised Kay naming test, there was a significant effect of frequency (chi-square = 15.429, df= 1, p< 0.001) with more responses correct within five seconds and fewer delayed responses, errors and failures for the high frequency words.

Table 5.5 EN's performance on the verb and noun naming test

Response type	Naming of verbs			Naming of nouns		
	High freq.	Low freq	Overall	High freq	Low freq.	Overall
correct >5 seconds	13 (93%)	4 (29%)	17 (61%)	12 (75%)	6 (38%)	18 (56%)
Delayed correct	0 (0%)	1 (7%)	1 (4%)	1 (6%)	4 (25%)	5 (16%)
Semantic errors	0 (0%)	1 (7%)	1 (4%)	0 (0%)	0 (0%)	0 (0%)
Phonological error	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Neologisms	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Failures	1 (7%)	8 (57%)	9 (32%)	3 (19%)	6 (38%)	9 (28%)
Acceptable alternatives	2	2	4	0	0	0

Interpretation of performance on oral naming assessments: It is clear that EN has an impairment of oral naming, with a large number of delayed correct responses and failures to name in both of the assessments. Consideration of the pattern of errors and the naming behaviours in the context of her performance on other cognitive assessments will be given in order to identify the locus or loci of impairments.

There are several pieces of evidence which allow the rejection of an impairment in semantic processing underlying EN's naming deficit. First, on assessments of semantic processing (5.1.1 above), EN's performance for high imageability items was almost error free. As picture naming, by definition, involves stimuli of high imageability it is unlikely that a semantic impairment underlies impaired oral naming[4] . EN's almost error-free written naming provides further evidence of intact semantic processing to achieve naming. The differential performance for different output modalities offers strong evidence to reject a central semantic impairment, instead indicating a locus of impairment at a lower level of processing.

The large number of delayed correct and failed responses in the context of apparently preserved semantic processing (for high imageability items) indicates that EN has an impairment in access to or at the phonological output lexicon. The significant effect of word frequency on performance has also been interpreted as evidence of impairment at this level, with poorer performance for representations with low resting levels of activation (e.g. Kay and Ellis, 1987). EN did not, however, show any effect of grammatical class; there was no difference in her naming performance for nouns or verbs. While a difference between grammatical classes has been associated with impairment in access to or at the phonological output lexicon (e.g. Zingeser and Berndt, 1988), not all cases reported in the literature show this dissociation.

Given EN's ability to access 15% of the targets for the Kay naming test after a delay of over five seconds, it appears that the representations in the lexicon themselves are not impaired. She was sometimes able to retrieve the name when given unlimited time to do so. This suggests that the entries in the phonological output lexicon are not degraded or abolished but rather that there is an impairment in access to the lexicon. Further support

4 It should be noted that while a semantic impairment cannot account for the anomic problems that arise in the picture naming assessments, access to low imageability items in spontaneous speech may indeed be influenced by EN's (mild) semantic impairment for low imageability items.

to this proposal is offered by EN's performance on the oral reading assessment which shows that EN has relatively intact reading ability for both regular and exception words (5.1.4). In order to read exception words aloud without error, EN must be reading via a lexical route.

If there is an impairment in access from the semantic system to the phonological output lexicon, the failures to name (with more failures for low frequency items) can be accounted for by a reduction in the level of activation from the semantic system.

It is also necessary to consider why 15% of EN's naming responses in the Kay naming test and 12% of responses in the verb and noun naming test were eventually produced after a delay of more than five seconds. While the phenomenon of delayed naming is commonly reported in the literature (e.g. Kay and Ellis, 1987), there have been no discussions about the mechanisms underlying the need for a delay before lexical retrieval can be achieved.

In experimental psychology the measurement of delay before a response is produced to a stimulus has been used as an index of the cognitive operations underlying the response. Butterworth (1985) states that the logic of this technique is straightforward; the longer the delay between stimulus and response, the more cognitive operations are inferred as being required to produce that response. Furthermore, each stage of processing will be influenced by specific factors. Thus, by varying a particular factor experimentally it is possible to draw inferences as to the effects of the factors on specific stages of processing. Ellis (1985) accounts for the increase in response latency for naming objects with low word frequencies (Oldfield and Wingfield, 1965) as indicative of a difference in the ease of retrieval of the lexical entries in the phonological output lexicon. Attribution of the increase in latency to processing at this level is supported by the fact that there is only a small frequency effect in recognition of objects.

The increased latency in EN's naming responses is indicative of more time required in cognitive processing in comparison to the normal control subjects. It is not, however, possible to specify simply from the occurrence of a delay whether the extra time needed by EN in comparison to the normal control subjects occurs because of a generalised slowing down of all the cognitive processes involved in naming pictures or whether the delay arises at a specific level. The effects of frequency on latency of response, however, does allow us to form a more specific hypothesis. EN showed a differential effect of speed of naming depending on word frequency, with more delayed responses on low frequency items. As frequency has been proposed to influence retrieval of items from the phonological output lexicon, this supports the idea that the delay in naming arises at this level.

If there is an impairment in the flow of activation to the phonological output lexicon so that access of the target item is not achieved, why does a delay eventually result in the production of the target? Several hypotheses can be proposed to account for this:

1) It is possible that the impairment to the flow of activation is not uniformly low but that it fluctuates. If, as the aphasic subject continues to search, the level of activation alters and increases, this may be enough to achieve access. This hypothesis predicts that if the level of activation fluctuates one would find runs of successful naming followed by runs which were unsuccessful, depending on the level of activation at a particular moment in time. It is possible for this hypothesis to be compatible with the finding that word frequency can influence an anomic subject's level of performance. While there is some fluctuation, the resting levels of very high frequency words are high enough to achieve activation even when the level of activation from the semantic system is very low. In contrast for low frequency words, the levels of activation from the semantic system may never reach high enough levels to achieve successful access.

Kay and Ellis (1987) have made the proposal that levels of activation fluctuate in anomia but there have been no experimental investigations of the phenomenon. It would be possible to investigate this issue by giving naming assessments with items matched for word frequency on different occasions. The resulting data could be examined for the consistency of naming responses for individual items over different testing sessions. Furthermore, an analysis of whether within individual testing sessions there are runs of successful naming followed by runs of failed or delayed naming for items with the same word frequency could be undertaken.

2) As has been discussed in 2.1.1, a central feature of interactive activation models of language processing is that there is parallel processing with feedback from lower levels to the higher levels in the system. Once activation has commenced in the semantic system, this "feeds down" to the phonological output lexicon which in turn "feeds down" to the phonological output buffer. There is also feedback from the lower levels to the higher levels. If a lexical representation has received reduced activation, this will still feed down through the lower levels. It is possible that the feedback from the lower levels may eventually build up enough activation for production of the target to be achieved. There are problems with this hypothesis. It is necessary to consider at what speed activation decays. Summation of activation may never be enough to achieve production of the target, as the delays occurring before EN produces a target may have led to decay of the original activation. An examination of the length of priming effects in normal subjects' naming may provide some information about the length of time that activation will carry over. Given the continued attempts of the aphasic subject to access the word, however, it is possible that there will be no decay of activation.

3) A third hypothesis to explain why aphasic subjects eventually access the target is that the aphasic subject has harnessed reorganisational strategies to get around the impaired level of processing. From the analysis of EN's naming responses on the revised Kay naming test, it is possible to identify one overt strategy that she utilised. In four of the 11 delayed correct naming responses EN used a writing strategy, either writing the word in the air or spelling out the word. She then used this information to produce the name orally. Reading can be achieved via three routes; it appears that extra activation via the direct lexical and non-lexical route overcame the reduction in activation and enabled EN to produce the word. While she used this strategy overtly in these cases, it is possible that on some occasions EN is able to harness such reorganisational strategies which are not demonstrated overtly, perhaps through visualisation of the written word which she then reads back.

These hypotheses of the mechanisms underlying delayed naming are not mutually exclusive. EN's use of a writing strategy on some occasions when she has problems in lexical retrieval offers support for the third hypothesis of reorgansiational strategies. This does not, however, preclude the other hypotheses. Indeed, EN may use a reorganisational strategy when, after a delay, she has still not been successful in accessing the target, either because there has been no increase in activation from the semantic system, or feedback from the partially activated lower levels has not been enough to achieve access.

In both naming assessments EN produced a small number of semantic errors. She also produced semantic associates in some of her responses before the final response. The production of semantic errors in the context of an intact semantic system has been reported by Caramazza and Hillis (1990, see 2.2.3) and can be taken as evidence that activation in the semantic system leads to activation of all semantically related representations in the phonological output lexicon. Noise arising from differing resting levels of activation due to a higher frequency or because it has more recently been accessed may lead to a semantic associate to the target reaching a high enough level of activation to be accessed, resulting in the production of a semantic paraphasia.

While there were no phonological errors in EN's final responses, an analysis of naming behaviours for the revised Kay naming test showed that there were a small number of partial phonological attempts and phonemic paraphasias. The locus or loci of impairment of phonological/phonetic errors produced in oral reading has been discussed in 5.1.3. It was suggested that they could be seen to arise as a consequence of partial activation to the phonological output lexicon. This proposal is supported by the evidence of impairment in accessing the output lexicon from EN's naming performance. It was also suggested that EN may have a mild apraxic impairment as indicated by articulatory groping in two reading responses. There was one error of a phonetic nature in the oral naming responses. The small number of examples of phonological/phonetic errors indicates that, at least for single word production tasks, this is only a mild impairment.

5.1.6 Summary of performance on assessments of single word processing

EN showed intact processing for high imageability words although she demonstrated a mild impairment in the semantic processing of low imageability items. This appears to influence reading ability with more phonological/phonetic errors on low imageability items.

From EN's performance on output tasks, it is hypothesised that she is impaired in access from the semantic system to the phonological output lexicon although underlying representations appear to be intact. This results in failures to name and delayed naming, with poorer performance for low frequency items.

5.2 *Sentence production*

5.2.0 Preliminary orientation

The findings from the analyses which provide information regarding impairments to the processes involved in sentence production (described in 4.3.2) are presented in relation to the levels of processing discussed in 2.3. Accessing of semantic representations is examined in 5.2.1. This is followed in 5.2.2 by a report on the realisation of predicate argument structures. Finally, the analysis of phrase structures is presented in 5.2.3. Interpretation of the findings in terms of the model of sentence production discussed in 2.3 is given in 5.2.4.

5.2.1 Accessing of semantic representations

The findings of assessments that provide information about EN's semantic processing have been described in 5.1.2 above. EN performed within the normal range on PALPA picture-word matching although performance on synonym judgement tasks falls just below the normal range with more errors on low imageability items. While performance on oral naming assessments is impaired, as discussed in 5.1.5 the pattern of performance indicates that this does not arise from an impairment in semantic processing. EN's performance on PALPA assessment 57 (auditory comprehension of verb and adjectives from the sentence set, see 5.3.2 below) while falling below the range of the PALPA control subjects was also at a high level, indicating relatively preserved comprehension for verb and adjective predicates.

In the conversation there was no evidence of semantic errors being made. However, as reported in 4.3.2, semantic paraphasias may be difficult to detect in conversation if they are close to the intended target. Detection is easier in a narrative task when the researcher has some idea of the lexical items that have to be accessed. While there was plenty of evidence of EN's problems in lexical retrieval in the form of lexical search behaviour and circumlocutions, she produced no semantic paraphasias in the Cinderella narrative.

5.2.2 Realisation of predicate argument structure

The proportion of main clauses produced with and without subordination by EN and the matched control subject in the Cinderella narrative is shown in table 5.6.

Table 5.6 Analysis of clausal embedding produced by EN and the matched control subject in the Cinderella narrative

Main Clauses	Subject EN	Control subject two
No subordination	26 (90%)	25 (68%)
+ embedded clause(s)	3 (10%)	8 (21%)
+ adverbial clause(s)	0 (0%)	4 (11%)

It can be seen that EN produced a greater proportion of clauses without embedding than the matched control subject and this difference reaches statistical significance (chi-square = 4.516, df=1, $p < 0.05$). Table 5.6 shows that EN did not produce any main clauses modified by adverbial clauses. There were three attempts at adverbial clauses which were abandoned as illustrated in the following excerpt:

(i)

EN they was down in the [ff] er (3.0) er mmm the (3.5) downstairs in the (4.1) the (1.5) mm mm <u>where the (1.5) all the (2.5)</u>

EN is clearly having lexical retrieval problems in this utterance. The attempt to produce an adverbial clause appears to be a strategy to compensate for the failure in lexical retrieval. Problems in lexical retrieval again arise and the clause is abandoned before production of the verb.

The production of a smaller proportion of embedding could be taken to indicate a syntactic impairment in realising subordinate clauses. The production of some embedded clauses in the Cinderella narrative, however, militates against this. Further evidence of intact syntactic processing abilities is provided by the production of subordinate clauses in the conversational data. Below are examples of clauses functioning as complements of verbs and post-modifiers of noun phrases and adjective phrases:

(ii)

23 EN that was <u>how I did it at December</u>

204 EN this old man <u>that got fronted of me</u> shouldn't have done

206 EN I'd [də] all ready <u>to shift</u>

An alternative explanation for EN's production of significantly fewer clauses with subordination than the control subject is that it arises as a consequence of limitations in lexical retrieval as has been proposed by Saffran, Berndt and Schwartz (1989, see 2.3.3 above). This proposal is congruent with the other findings of the cognitive neuropsychological investigations of EN. The findings of single word processing indicates that she is impaired in lexical retrieval (5.1.5) and there are clear manifestations of this deficit in the narrative task as illustrated in *(i)* above and excerpts *(iii)* and *(iv)* below.

Table 5.7 shows the predicate-argument structures realised by EN and the matched control subject in the Cinderella narrative. EN showed no significant difference from the matched control subject in the proportions of different appropriately realised predicate argument structures (chi-square = 4.250, df=2, N.S.). She was able to produce one, two and three argument predicates.

Table 5.7 Predicate argument structures produced by EN and the matched control subject in the Cinderella narrative

Structure type	Subject EN	Control subject two
Predicate + 1 argument	2 (7%)	12 (24%)
Predicate + 2 arguments	25 (83%)	33 (63%)
Predicate + 3 arguments	3 (10%)	7 (13%)
Problematic	7	0

Four of the 30 clauses had an incomplete final noun phrase as is illustrated in the following example:

(iii)

EN none of the slippers fitted the (4.0)

These were analysed as appropriate realisation of predicate argument structure, as it is clear from the production of the determiner that EN is attempting to realise the argument structure for that verb. Failure in completion can be seen to arise as a manifestation of EN's lexical retrieval deficit. It therefore appears on the basis of this evidence that EN is able to encode thematic roles and map these onto grammatical relations. A scan of the conversational data provides further evidence of EN's ability to appropriately realise a range of predicate argument structures.

In addition to the appropriately realised predicate-argument structures, there were seven problematic structures. It is necessary to examine these to see whether they weaken the claim that EN's ability to encode thematic roles and map these onto grammatical relations is retained. Three of the seven structures were abandoned after a form of the verb be:

(iv)

EN she was (5.2) mm (2.0)

As the verb be can function either as an auxiliary verb or as a main verb (the copula) it is not possible to discern the predicate argument structure. It seems likely, however, given the evidence of ability to appropriately realise a range of predicate argument structures in the context of the evidence for a lexical retrieval deficit, that failures in lexical retrieval accounts for the abandonment of these clauses. Similar abandonment of clauses is found in the scan of the conversational data with 15 clauses abandoned after the production of a subject and a form of be or have or a semi-auxiliary verb. Furthermore, a number of the abandoned clauses have it or there in subject position as is seen in the following excerpt:

(v)

EN it's er (1.3) it's oh it's

This may be indicative of a strategy to use cleft or existential structures to give more time before it is necessary to retrieve the lexical phonological representations. Given the experimental evidence produced by Bock (1987, see 2.3.2 above) of the influence of accessibility of the lexical representations on the form of the sentence dictated at the functional level, this would seem a plausible explanation.

Moving back to an examination of the problematic structures in the Cinderella narrative a further two of the seven were abandoned before production of the verb:

(vi)

EN when the [ərə] the (1.7) mm er (2.0) the (1.3)

EN where the (1.5) all the (2.5)

In both of these cases EN is attempting to produce an adverbial clause but runs into problems in lexical retrieval of the subject of the clause and is, therefore, forced to abandon it.

The final two problematic predicate argument structures are abandoned after the verb. Again it appears plausible to account for the production of these incomplete predicate argument structures as arising from failures in lexical retrieval.

5.2.3 Phrase structure analysis

Noun phrases: In the conversational data, EN produced a range of predeterminers and determiners. There were three cases where a determiner had been omitted and for two of these, self repair was effected and the determiner realised. EN marked plurality appropriately. She produced a wide range of pronouns, and there were no errors in marking nominative, objective or genitive case. There was only one case of an inappropriate pronoun being used with <u>she</u> being produced when <u>he</u> was appropriate.

Table 5.8 shows the proportion of referring expressions that were realised as pronouns and as full noun phrases in both the Cinderella narrative and the conversation with LP. In the Cinderella narrative, EN produced a significantly greater proportion of noun phrases as pronouns than the matched control subject (chi-square = 4.442, df=1, $p < 0.05$). In the conversational data, EN realised over three quarters of noun phrases as pronouns and this is significantly greater than the proportion produced by LP (chi-square = 6.267, df=1, $p < 0.05$).

As discussed in 2.3.2, a reliance on proforms to refer has been linked to two underlying impairments in the literature. Language impaired subjects have been shown to rely on deictic/anaphoric referring expressions because they involve the least complex syntactic structure. The extensive use of deictic/anaphoric reference has also been accounted for as a strategy to cover up failures in lexical retrieval. It is thus worth considering which of these two explanations better accounts for EN's greater use of proforms.

Table 5.8 Analysis of the realisation of referring expressions by EN and the control subjects in the Cinderella narrative and in the conversation with LP.

Referring expressions	Cinderella narrative		EN's conversation with LP	
	Subject EN	Control 2	Subject EN	LP
Full noun phrases	20 (39%)	53 (58%)	44 (24%)	52 (37%)
Pronouns	31 (61%)	39 (42%)	136 (76%)	87 (63%)

An examination of the range of full noun phrases that EN produced shows her ability to produce noun phrases with both pre- and post-modification. There are examples of post-modification with both prepositional phrases and clauses. Thus, although she realised a large proportion of pronouns in relation to syntactically more complex noun phrases, she is capable of producing the latter. Furthermore, there is no evidence of a trade-off of clause structure when phrase structure complexity increases. It therefore appears that EN's greater use of pronouns relative to the control subjects is a strategy to avoid problems in lexical retrieval. This proposal is supported by the evidence of an impairment in lexical retrieval from the findings of the investigations of single word processing (5.1.5).

The verbal group

EN produced a range of auxiliary and semi-auxiliary verbs, including the perfect, the progressive and the modal auxiliaries as well as forms of <u>do</u> and <u>will</u>. She also produced verbal groups containing more than one auxiliary. There was only one utterance token in the conversation where an auxiliary verb had been omitted.

Production of verbal affixes was also well preserved. There was only one case where the affix to mark the progressive form of the verb was omitted, but EN abandoned the clause and effected self repair. There were only two cases where EN produced incorrect subject verb agreement and in one of these the clause containing it was subsequently abandoned. EN marked tense appropriately. In summary, it appears that EN is not impaired in producing the grammatical morphemes required in verb phrases.

EN was able to produce complex verbal groups as is reflected in her production of modal, perfect and progressive auxiliary verbs. From the predicate argument analysis, it is clear that EN is able to use a range of verb sub-categories. There was no evidence of trade-off in the structure of the verbal group to compensate for more complex clause structures. As discussed in the analysis of predicate argument structures (5.2.2), several clauses were abandoned (in both the conversation and the narrative task) following forms of the verb be or have and semi-auxiliaries. However, it was proposed that this is a manifestation of EN's lexical retrieval impairment rather than a syntactic impairment in the production of verbal groups.

Preposition Phrases

EN produced preposition phrases as realisations of verb arguments for intensive, prepositional and complex transitive verbs. She also produced them as adverbials and in post-modification of noun phrases. There was only one case in the conversation in which the wrong preposition was used when EN produced at December where the expected preposition would be in. There were also three cases where a preposition phrase was abandoned. It is important to note that the vast majority of preposition phrases were syntactically and semantically well-formed.

5.2.4 Summary and interpretation of analyses of sentence production

The findings of the various analyses reported above suggest that EN is impaired in sentence production as is shown by the abandonment of clauses in both the conversational data and Cinderella narrative. I shall attempt in this section to relate the findings to the model of sentence production presented in figure 2.3, p.73.

The findings of the investigations of semantic processing and realisation of predicate argument structures suggest that the processes between the message level and the functional level are intact. Preserved ability in encoding thematic roles and mapping these onto grammatical relations is shown by EN's ability to realise a range of predicate argument structures. This is further supported by her relatively preserved level of performance on PALPA assessments 55 and 56 (auditory and written sentence comprehension, see 5.3.1. below) which indicates that there are no impairments in mapping for comprehension.

Moving onto an examination of processing from the functional level to the positional level, the phrase structure produced by EN indicates that she is not impaired in accessing the syntactic structures complete with appropriate affixes or in accessing the function word stores and integrating this information into the phrase structures. On the small number of occasions where there was a substitution or omission of a grammatical morpheme, self repair was usually carried out.

Given the findings of the assessments of single word processing (5.1), disruption to sentence production could be predicted from an impairment in accessing of representations from the phonological output lexicon. Failures in lexical retrieval can account for the abandoned clauses with indeterminate predicate-argument structure. Indeed, given the realisation of a large number of well-formed predicate argument structures produced, this is the only plausible account of the abandoned clauses.

EN's reliance on pronouns to refer can also be seen as a manifestation of her impairment in lexical retrieval. As discussed in 2.2.3, ease of lexical retrieval influences the sentence structure produced by normal subjects (Bock, 1987) and normal subjects tend to produce a greater proportion of pronouns in subject position, with noun phrases which are more difficult to access being produced in later serial positions. It appears that EN may be utilising pronouns to refer when she is unable to retrieve a lexical form.

EN also differed from the control subjects in the smaller proportion of embedded clauses that she produced. It has been stressed in 2.3.3 that the model of sentence production being utilised as a framework in this study is still underspecified, particularly in relation to sentence elaboration. It is possible to consider EN's reduced production of embedded clauses in relation to the three possibilities proposed by Saffran, Berndt and Schwartz (1989, see 2.3.3) to account for the smaller proportion of embedding produced by non-agrammatic aphasic subjects. It seems unlikely that EN is impaired in the syntactic operations involved in the production of embedded clause *per se* as she does produce some embedded structures. For the same reasons the proposal of a conceptual deficit does not seem plausible. The final proposal that lexical or phonological limitations affect the choice of syntactic structures does, however, seem a likely possibility (in the context of evidence from other sources of a lexical retrieval deficit).

To conclude, the findings of the analysis suggest that the impairment in access to the phonological output lexicon, hypothesised from the investigations of single word processing, underlies the deficits found in EN's sentence production. This proposal can account for the abandonment of clauses, the production of a greater proportion of pronouns rather than full noun phrases in comparison to the control subjects, and the smaller number of embedded clauses in comparison with the control subject.

5.3 Sentence comprehension

5.3.0 Preliminary orientation

The findings from the sentence comprehension assessments are discussed in relation to the model of sentence comprehension outlined in 2.4.

5.3.1 PALPA assessments 55 and 56, auditory sentence comprehension and written sentence comprehension

EN showed no effect of modality of presentation on her performance on these assessments, scoring 54/60 (90%) on both auditory and written versions. Thus, performance falls below the mean score of the PALPA control subjects and the overall range of the scores of the matched control subjects.

A comparison of EN's scores on the individual sentence types to the range of the PALPA control subjects shows that she only falls below the range of the control subjects on the reversible sentences in the spoken version. Three of the errors involved selection of the lexical distractor for the verb, while two errors involved reversal errors. Examining performance on the written version of the assessment, performance on the reversible sentences was within the range of the PALPA control subjects. The only sentence type that fell below the range of the control subjects on this version was sentences with non-subject gaps. The three errors involved selection of lexical distractors for the verb.

Overall, EN's performance shows no clear pattern in terms of error types across the two versions. It appears that while she made more errors overall than control subjects on both versions of the assessment, these cannot be clearly identified with a specific syntactic impairment. EN made no errors with sentences containing adjective predicates. From the total of 12 errors made across both versions of the assessment, nine were lexical errors for the verb. No errors were made on the lexical distractors for the subject. This may suggest that EN has a specific comprehension impairment for verb predicates. This hypothesis can be evaluated by examining EN's performance on PALPA assessment 57, auditory comprehension of verbs and adjectives from the sentence set, reported below.

5.3.2 PALPA assessment 57, auditory comprehension of verbs and adjectives from the sentence set

EN scored just below the range of the PALPA control subjects, scoring 36/41 on form A (88%) and 35/41 on form B (85%). All errors were made on the definitions to verbs with no errors on the adjective judgements. This corresponds to performance on the sentence comprehension assessments with perfect performance on the sentence adjective predicates in the sentence comprehension assessments. When the verbs that the errors were made with were examined, however, it was not possible to identify a link between the errors made on the sentence comprehension assessments and the understanding check. Only two of the 11 errors made on the latter corresponded to the errors made on the former. All errors were false positives (acceptance of wrong definitions) indicating that when EN was unsure she applied a lax acceptance criteria.

5.3.3 PALPA assessments 58 and 59, auditory comprehension of locative relations and written comprehension of locative relations

EN scored 16/24 on the spoken version of this assessment and 18/24 on the written version. While these scores fell well below the mean performance of the PALPA control subjects, they were within the range of scores. Errors included both reversals and lexical errors on both versions.

5.3.4 PALPA assessment 60, pointing span for noun-verb sequences

EN scored 5/14 on this assessment. She was successful up to the SVO structures but failed on the SV SV structures. Her performance fell below the range of the matched control subject and is indicative of an impairment in short term memory. Further information regarding short term memory is provided by PALPA assessment 12, repetition of sentences reported below.

5.3.5 PALPA assessment 12, repetition of sentences

EN successfully repeated 28/30 sentences. One of the errors involved repetition of "the girl is awarding the cup" as "the girl is awarding the cat", the second one involved repetition of "the cat is eager to bite" as "the man is eager to bite". EN's performance fell below the range of the matched control subjects (who made no repetition errors). The high proportion of correct responses does, however, suggest relatively preserved short term memory. Her performance on this task appears to be at a higher level than that of the pointing span assessment, suggesting that she is able to use the syntactic structure of the sentence to support performance.

5.3.6 Summary and interpretation of performance on sentence comprehension assessments

Overall, EN's performance on assessments designed to investigate sentence comprehension demonstrate a relatively good level of performance. While her level performance on the PALPA sentence comprehension assessments falls below the range of the matched control subjects performance, she was able to make correct selections for 90% of items in both modalities. The majority of errors were lexical ones, involving the verb predicates. She also performed at a level slightly below the range of the PALPA control subjects on the assessment of auditory comprehension of verbs and adjectives from the sentence set, with all errors being acceptance of incorrect verb definitions. It is possible, therefore, that EN has a impairment in comprehension of verb predicates. This could only be a mild impairment, however, as while her performance is below that of the control subjects, the majority of responses are correct. EN performed within normal limits on PALPA assessments 47 and 48, spoken and written word matching respectively which could be seen as incongruent with a hypothesis of impaired verb semantics. The latter assessments, however, only examine semantic processing of nouns and verbs have more complex semantic structure.

EN's performance on the locative relation assessments while well below ceiling level, fell within the range of the PALPA control subjects some of whom made a high proportion of errors on this assessment. No pattern was discernible in the error types.

EN's high level of performance on repetition of sentences provides evidence of a good functioning of working verbal memory. While her performance on the pointing span task falls below that of the normal control subjects, she was able to cope with three word structures. These findings, in conjunction with her performance on the sentence comprehension assessments (she made no errors on the longest sentences), indicate that an impairment to short term memory does not underlie the errors that she makes.

Overall, EN's sentence comprehension appears to be impaired in relation to the normal control subjects although she is still able to make correct judgements for 90% of the items on the sentence comprehension assessments. From the pattern of errors made on the various assessments it is not possible to offer any clear account of impairment in terms of the levels of processing discussed in 2.4.

5.4 Summary of the findings of the cognitive neuropsychological investigations

The analyses in this chapter have allowed the formulation of specific hypotheses regarding impairments to the levels of processing specified in the models presented in Chapter Two.

From the assessments of single word processing, the most striking impairment identified was an impairment in access to the phonological output lexicon, giving rise to problems in lexical retrieval. Also apparent from the investigations of single word processing was a mild level of impairment in semantic processing of low imageability items. There has been no discussion in the literature of the impact on lexical retrieval of a semantic impairment of low imageability items, and no assessment of EN's word finding were undertaken for low imageability items. Thus, it is not possible without further investigation to determine whether this level of impairment will have consequences for lexical retrieval of low imageability items.

A small number of phonological and phonetic errors were observed in EN's oral reading and picture naming responses. Given her good repetition ability, in conjunction with the evidence of an impairment in accessing the phonological output lexicon from the analysis of picture naming, it was proposed that partial activation at the lexicon could be giving rise to phonemic paraphasias. The occurrence of some errors which appear to involve problems of a phonetic nature also necessitate the proposal of a mild apraxic impairment. As discussed in 2.2.3, the distinction between errors at a phonological level and errors at a phonetic level is not as clear cut as has been assumed in the aphasiology literature. In order to evaluate whether EN's errors are a consequence of problems at both of these levels of processing, it would be necessary to undertake a more precise analysis of her errors using instrumental measures of phonetic output.

The investigation of EN's sentence production allowed the identification of an impairment giving rise to the abandonment of clauses before completion. From the various analyses, it was possible to rule out any of the semantic-syntactic levels of processing as the locus of impairment. The impairment in access to the phonological output lexicon identified from the assessments of single word processing was identified as the locus of EN's problems in sentence production, with failures in lexical retrieval necessitating abandonment of clauses. It was also proposed that this impairment accounted for the lower proportion of embedded clauses produced by EN and the greater use of pronouns in comparison to the matched control subjects.

The investigation of sentence comprehension demonstrated a relatively high level of performance, although this fell slightly below the range of the matched control subjects on the sentence comprehension assessments. It was hypothesised that EN may have a mild impairment in the semantic processing of verbs.

The investigations reported in this chapter have allowed identification of EN's speech and language impairments in terms of a cognitive neuropsychological framework. These findings will be drawn upon in the investigation of EN's conversational ability reported in the next chapter.

Chapter Six

CONVERSATION ANALYSIS OF SUBJECT EN

6.0 Introduction

In this chapter an analysis of EN's two conversations (with a relative and with the researcher respectively as described in 4.4.1) is presented. The framework for analysis has already been presented in sections 4.4.2 to 4.4.4. Where possible, links are made between the findings of the conversation analysis and the findings from the cognitive neuropsychological investigations presented in Chapter Five in order to identify the impact of impairments on the conversation. Comparison between the conversation with the researcher and the conversation with the relative allows an examination of the influence of conversational partner on the interaction.

The chapter is organised into three sections. In 6.1 turn taking in the two conversations is examined. The findings from the analysis of self repair is presented in 6.2 and in the final section (6.3), the analysis of collaborative repair is given. Attention is drawn to the differences in interactional behaviour between the conversational partners only where they appear to be substantive.

6.1 Analysis of turn taking

6.1.0 Preliminary orientation.

The analysis of turn taking is presented in three parts. First, EN's general ability to handle the split-second timing of turn taking is examined in 6.1.1. This is followed in 6.1.2 by an examination of the treatment of attributable silence by interlocutors. Finally an analysis of the production of major and minimal turns at talk is presented in 6.1.3.

6.1.1 General turn taking abilities

An examination of EN's conversation with the researcher and with her cousin demonstrates retained knowledge of the rules operating in turn taking. She demonstrated the ability to take the floor with no gap or overlap. This provides evidence of sensitivity to cues indicating transition relevance places (see 3.1.1 above) This, in turn, suggests that she has the ability to process the syntactic and prosodic features thought to be involved in the projectability of turn endings. The findings of the cognitive neuropsychological assessment of sentence comprehension (5.2) show that EN has well preserved syntactic processing abilities, which may contribute to this preserved conversational ability. As discussed in 3.1.1, it appears likely that even aphasic subjects with severe impairments of sentence comprehension retain enough syntactic knowledge to project turn endings.

EN also showed sensitivity to the turn taking procedures which deal with overlap. There were no examples of violative overlap (marked by features such as increase in volume and decrease in tempo, see Levinson, 1983: 301). Where overlap occurred, one of the interlocutors dropped out, allowing the other to proceed with his or her turn. In the following excerpt from EN's conversation with LP, the two interlocutors simultaneously self select a turn at talk. The overlap is quickly resolved by EN dropping out:

(i)

```
25     LP    o::h* that's terrible and you were just getting over the effects of your
             [
26     EN    and I was
       LP    stroke and gett*ing to feel better and* then your leg goes
                   [                         [
27/28  EN          that's it                 yeah

29     EN    yeah
```

EN also showed sensitivity to the part of her turn which has been overlapped as is demonstrated in the following excerpt:

(ii)

59 LP is your leg (1.1) are you much is your leg much better now
[
60 EN yeah it has* has settled it
it's at very little....

EN repeats part of the start of her turn which has been obscured by overlap, a phenomenon which is commonly found in normal conversation (Schegloff, 1987b) and is a clear demonstration of EN's retention of this type of conversational ability.

On several occasions, EN initiated her turn before adequately planning her utterance. While this is a common phenomenon of normal conversation arising as a consequence of the competitive nature of turn taking (see 3.1.1 above), it appears that EN's linguistic impairments sometimes prevented her from being able to repair rapidly enough to hold the floor. There were instances of EN losing turns after initiation in both conversations. This is discussed further in relation to the utilisation and success of the self repair patterns of delay and repetition (6.2.3 and 6.2.4) and in relation to the proportion of major turns produced by the interlocutors in each of the conversations (6.1.3). Excerpt *(iii)* provides an example of this phenomenon from EN's conversation with LP:

(iii)

222 LP right then

223 EN and er:: (2.0)

224 LP so you've got another room down here as well as your kitchen and your lounge

225 EN yeah and er and er (2.0)

226 LP right

227 EN mm

(3.0)

228 EN and I've left things upstairs

In T223 EN starts her turn with and which is followed by a filled and unfilled pause. After the two second unfilled pause LP initiates T224 resulting in EN losing the floor. In T225 EN indicates acceptance with an acknowledgement token which is followed by and, suggesting that she is going to produce a major turn at talk. However, she again runs into problems as is marked by the occurrence of repetitions, filled and unfilled pauses. Again after a two second unfilled pause LP initiates a turn, in this case an acknowledgement token. The acknowledgement seems to mark acceptance in its turn of the acknowledgement token yeah at the start of EN's T225, rather than acceptance of the entire incomplete turn which lacks any semantic content. Furthermore, LP does not initiate collaborative repair on the problematic turn. EN produces a further acknowledgement token in T227 marking acceptance of LP's turn and passing the opportunity to take a major turn at talk. This pairing of acknowledgement tokens is a phenomenon observed in closing sequences found in normal conversations which achieve a co-ordinated exit from the conversation. Levinson (1983: 317) calls these pairs topic-less passing turns which can be seen to achieve a mutual agreement to talk no more. In the above excerpt, the paired acknowledgements seem also to have a closing down function. In this case it appears that the interlocutors are collaborating on closing down work on a failed turn without further repair. Paired acknowledgement tokens functioning to close down sequences of turns are also found in collaborative repair sequences (see 6.3 below). After the acknowledgement tokens, there is a three second lapse in the conversation after which EN is finally successful in contributing a major turn (T228).

This excerpt shows that the normal interlocutor in this conversation will not tolerate an excessively long pause even when EN is clearly attempting to take a turn at talk. The issue of pauses within turns is discussed further in section 6.2.4, where the use of delay as a self repair strategy is examined.

6.1.2 Treatment of attributable silences by interlocutors

In the conversation with BC there were no cases where silences between turns could be interpreted as attributable to either interlocutor. The lack of any attributable silences can be seen to be a consequence of the nature of the conversation which is dominated by BC with only a small proportion of major turns being contributed by EN (see further 6.1.3).

In the conversation with LP there were seven cases of pauses between turns, six of which were analysable as silences attributable to LP. In four of these EN showed sensitivity to the sequential implicatures triggered by the silence as exemplified in the following sequence:

(iv)

228 EN and I've left things upstairs
(2.0)
229 EN you know things out of there
[
230 LP right* then=
231 EN =is all upstairs

After EN's T228 presentation there is a silence of two seconds. As Levinson (1983) states, where a turn is conditionally relevant, when it fails to occur it is noticeably absent and inferences can be drawn "either of the sort 'no response means no channel contact' or if that is clearly not the case, then 'no response means there's a problem'" (1983: 320). Acceptance by LP of EN's presentation is conditionally relevant and EN indeed interprets the absence of acceptance and occurrence of silence as an indicator of a problem requiring repair work. In T229 and T231 she clarifies her original presentation, the clarification function being marked by y'know at the start of T229 (see Schiffrin, 1988: 309 for a discussion of y'know). This excerpt demonstrates another aspect of EN's knowledge of the rules governing conversational interaction which is preserved.

6.1.3 Analysis of major and minimal turns

Figure 6.1 (overleaf) displays the proportion of major turns produced by each of the interlocutors in EN's two conversations. There is clearly a large difference in the way that she shares the conversation with the different interlocutors; in the conversation with LP the two interlocutors produce roughly equal proportions of major turns, while in the conversation with BC, EN takes a much more passive role with only 30% of the major turns being produced by her. Furthermore, as will be discussed below, a number of EN's turns failed to contribute to the discourse in this conversation. It therefore appears that EN utilises a strategy of using minimal turns to maintain participation in some conversations. The more equal sharing of major turns in her conversation with LP, however, shows that this strategy is not universally applied to all conversational contexts.

The strategic use of minimal turns can be further examined by looking at the ratio of major turns to minimal turns for each of the interlocutors. In the conversation with BC, EN produced only 0.5 major turns to each minimal turn contrasting sharply with BC who produced 16.3 major turns to each minimal turn. In the conversation with LP, however, EN produced 3.2 major turns to each minimal turn, a ratio larger, by a magnitude of 6.4, than in her conversation with BC and a larger ratio than LP who produced 1.8 major turns to each minimal turn.

Variability in the use of minimal turns by different interlocutors has been reported by Tottie (1990; see 3.1.2). However, I have found no investigations of the different usage of minimal responses in varying conversational contexts by the same interlocutor. Yet it is clear that the conversational partner is having a large influence on EN's use of minimal turns, and indeed that her conversational partners are themselves using minimal turns differently.

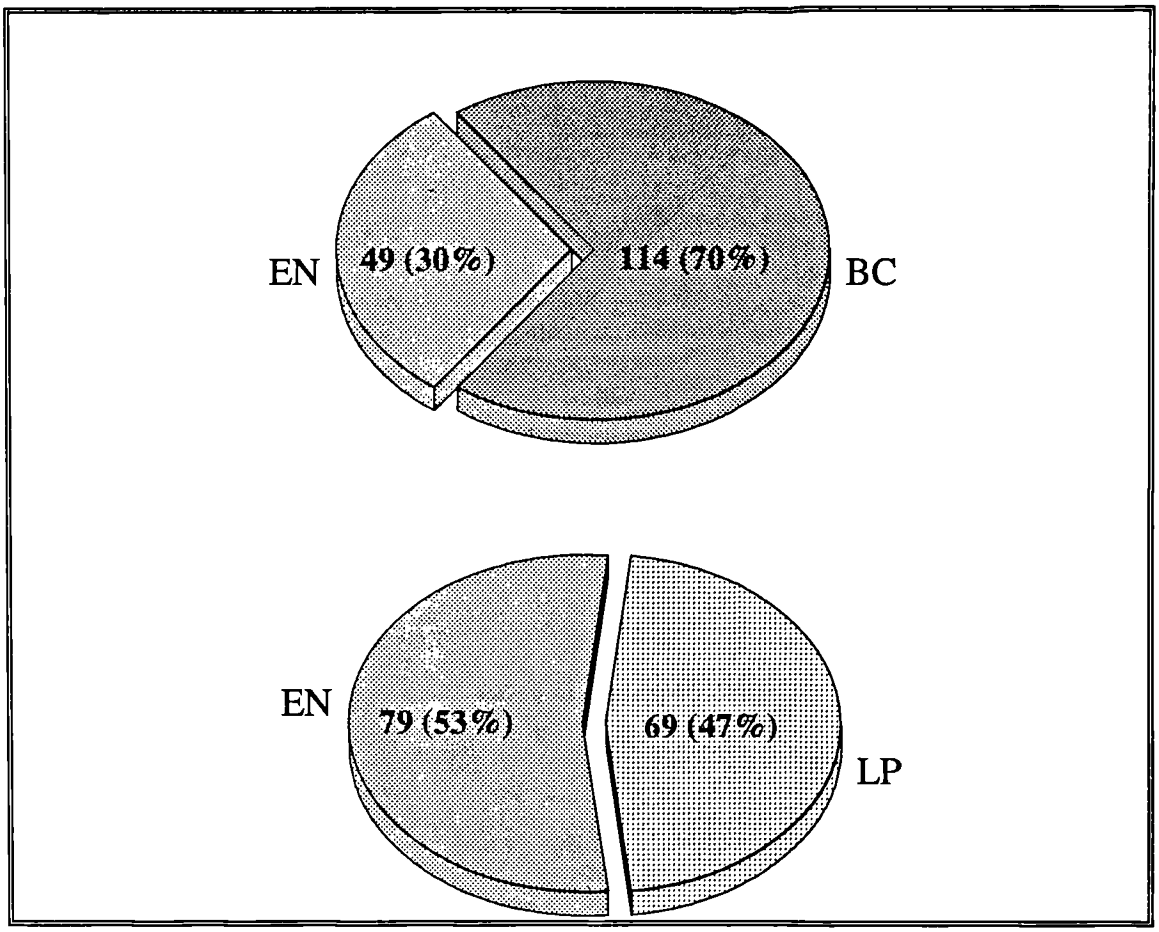

Figure 6.1 The proportion of major turns produced by EN and her conversational partners

As discussed in 4.4.1, the nature of the two conversations differed on a number of dimensions which could be expected to influence the sharing of the conversational burden. In the conversation with the researcher there was little shared knowledge. LP was eliciting information through questions thus focusing the conversation on EN herself and forcing her to take major turns. The possibility of falling back on the use of minimal turns to participate in conversation was, therefore, reduced in this conversational context. Given the lower ratio of major turns to minimal turns for LP

(1.8 : 1) the function of the minimal turns seems to be to elicit further conversation from EN, as in excerpt *(v)* below:

(v)

189 LP so do you see quite a lot of him

190 EN yeah

191 LP mm

192 EN oh yeah yeah (1 syllable)
[
193 LP what* does he do

LP elicits information from EN in T189 with a question. EN produces a minimal turn without elaborating in T190. LP's acknowledgement token in T191 can be seen to function as a 'perverse passive' (Jefferson, 1984, see 3.1.2) handing back the floor to EN who initiates her turn with further acknowledgement tokens. LP interprets T192 as another minimal turn as can be seen by T193 where she commits EN to the production of a major turn by asking a wh- question. In fact, although EN drops out and hands the floor to LP, the syllable in overlap suggests that she was going to extend T192 into a major turn.

The distribution of major turns in EN's conversation with BC can be partly explained by a closer examination of the major turns that EN produced. There were several points in the conversation at which BC appeared to "gloss over" the need for repair work on EN's presentations. Instead of allowing EN time to self repair or initiating collaborative work, BC effectively ignored the problematic turn and initiated a new turn. This included turns where EN took the floor before she had time to adequately plan her turn (as exemplified in excerpt *(iii)* above from the conversation with LP) in which, after a delay, BC initiated a turn resulting in EN losing the floor. There were eight points in the conversation in which EN lost a turn very quickly after its initiation, accounting for 16% of the major turns that EN produced in this conversation. BC also glossed over

EN's problematic turns when she ran into difficulties later on in her turn. There were a further six turns (10% of major turns) in which BC produced a turn before EN had completed her turn. Furthermore, BC's turns did not function as initiators of the acceptance phase in that they could be interpreted neither as immediate acceptance by next relevant presentation, nor as initiation of a collaborative acceptance phase. Rather EN's attempts at making a presentation were glossed over. Thus, 26% of EN's major turns can be seen to have failed because BC took the floor before she had time to complete her presentation. This contrasts with a loss of only 4% of her turns in this manner in the conversation with LP. The consequence of the failure of EN's attempts to contribute to the conversation with BC was that her turns did not shape the following interaction, thus giving rise to her passive role in the interaction. Since she was not allowed enough time to complete turns in conversation with BC, it is perhaps not surprising that EN fell back on a strategy of relying on minimal turns to contribute to the conversation. The following sequence exemplifies EN's use of minimal turns:

(vi)

```
142  BC   so I just took it in he says that's all put* your name on there I says that's it
                                               [
143  EN                                         mm
     BC   he says that's in it he says that's it
144  EN   aha
145  BC   I says (why) and then I got something for the the dole for the council
           offices* I take that up and all I says there you are fill that in I says and I'll
          [
146  EN    mm mm
     BC   I'll tell you all you want to know
147  EN   {hehe}
          (1.0)
148  BC   why you can't understand it when you're (two syllables)
                                                  [
149  EN                                            well its its* its [tə]
150  BC   I must be thick* never mind Jean=
                  [
151  EN            mhm
```

152 EN =(hehehehehehehehehe) eee:
[
153 BC aye you cannot understand half of them

154 EN aye

(2.3)

155 BC but er y'know we used to get a a rebate from Scotland

156 EN mhm

157 BC y'know off the rent

158 EN mhm

159 BC well that's been stopped 'cause we cannot get a get a rise on our pensions

160 EN mhm

161 BC so I'm I'm not allowed that anymore so* that's stopped it's finished
[
162 EN tsk

163 EN hehehe

EN simply marks acceptance of BC's major turns by acknowledgement tokens and laughter over 21 turns. There is only one attempt at a major turn in T149 which can be seen to fail as BC takes the floor again before EN completes her turn. In fact, EN finally takes a major turn at talk successfully after a further ten turns. EN's use of minimal turns can be seen as evidence of her preserved knowledge of the mechanics of turn taking in that it shows appreciation of the fact that BC is in the process of taking an extended turn at talk (see 3.1.1). However, there are points in the discourse where BC appears to have finished his narrative at which point EN could appropriately produce a full turn at talk, for example after T145 and after T153.

The different ways in which BC and LP treated EN's incomplete turns can be seen to partly relate to the quantity of shared knowledge that exists between interlocutors. As already noted in 4.4.1, EN and BC discussed topics about which they have a high level of shared knowledge. In contrast, EN and LP talked about topics involving EN of which LP had little or no background knowledge. Thus, for LP it was difficult to gloss over problematic presentations and still maintain the conversational flow as the information that EN was attempting to provide in her presentation was often necessary to the continuation of the topic. In the conversation with BC, there was enough shared knowledge of the topic for BC to continue talking on it without a severe disruption of the conversational flow, as can be seen in the following sequence:

(vii)

10 BC Letts Way but I don't know what er three weeks since I was talking to her and she said well [wə] I'll be away shortly

11 EN aha=

12 BC =but I don't know whether she was with her
[
13 EN no (2 syllables just)* she was er (1.2) daughter was waiting for some [t]

14 BC 'cause she's got a house

15 EN o:h

16 BC down there cause he's in the police thing down there now in the* in the gaol
[
17 EN aah

(1.1)

18 BC he's got his job er er he's off the buses now he's in the* on the gaols thing
[
19 EN ah

BC now you see and I thought the way she was talking I thought she might've been away about a fortnight

20 EN no she was [wə] she was supposed to er (0.6) I've forgotten but she was how she was (1.6)

21 BC I was talking to her at the butchers down down the bottom and* she was
[
22 EN mm

BC telling us she says oh I'll not be long away I'll not be long before I'm going

(1.2)

23 EN mm
[
24 BC I* says you ganning for good or what she says I'm not (1 syllable) it's it's a big house she's I'm going to live with them

25 EN aye but er but she (1.8) eee I don't know what she said

26 BC that's what she said to me anyway hinny and I thought maybe you'd heard it whether she'd moved or not you see*

27 EN [no*

Of particular interest here are the major turns produced by EN. In T13 it appears that EN is attempting to provide some information relevant to the topic of conversation (whether a neighbour has moved with her daughter). She abandons the first clause and does not complete the second before BC continues on from his previous turn. EN marks acceptance with a minimal turn in T15. BC contributes two more major turns which EN responds to with minimal turns before attempting to produce a further major turn (T20), which is again marked by several attempts at self repair including an unfilled pause before completion. At this point, BC takes the floor, talking on the same topic and again glossing over EN's incomplete and problematic turn. EN attempts to produce a further major turn at T25, abandoning the first clause. She then completes the turn with eee I don't know what she said. This is one of several tokens in both of EN's conversations where, after abandoning a clause, she reports that she does not know or has forgotten. This may be interpreted as a strategy to avoid further problematic repair work in the completion of the presentation or in achieving acceptance. What is clear in the above excerpt is that despite EN's attempts to contribute major turns to the discourse, she has not been very successful. The discourse has been dominated by BC.

6.2 Analysis of self repair

6.2.0 Preliminary orientation

This section comprises of an examination of EN's use of the four types of self repair identified and described in 4.4.3. These are: replacement repairs, abandoned clauses followed by subsequent clauses, repetitions and delays. For each of the repair types the quantity of its use, the possible links between the use of the repair and underlying cognitive neuropsychological impairments, and the outcome of its use in terms of success or failure are examined sequentially. Throughout this section comparisons are made to the use of the types of self repair by the normal interlocutors which have already been described in 4.4.3. Identification of whether EN's use of a particular pattern of self repair differs from that of the normal interlocutors allows decisions to be made as to whether its use can potentially be linked to her cognitive neuropsychological impairments.

6.2.1 Replacement repairs

Quantity of replacement repairs: EN's use of replacement repairs differed across the two conversations with a much greater proportion of major turns containing them in the conversation with LP (19%) than in the conversation with BC, where only 8% of turns contained this repair pattern. Thus, her use in the conversation with BC is within the range of the use by the normal interlocutors (2% to 14% of major turns), while in her conversation with LP she used a greater proportion of replacement repairs than the normal interlocutors.

The differential use of this repair type in the two conversations can be seen to arise from the more passive role that EN took in the conversation with BC, which reduced the need to utilise replacement repairs. In this conversation, for 26% of EN's turns BC took the floor before completion (see excerpt *(vii)* above). Thus, the opportunity for her to carry out repairs was reduced in comparison to the conversation with LP where editing terms were tolerated to a greater degree (see 6.2.4 below) and where only 4% of EN's turns were glossed over before completion.

Thus, in some conversational contexts EN's use of this repair type exceeded the quantity used by all the normal interlocutors, and it is reasonable to suggest that EN's cognitive neuropsychological impairments gave rise to its use. In the next section, an attempt is made to link the usage of replacement repair to specific cognitive neuropsychological impairments already identified (see Chapter Five) by looking at the nature of the trouble sources giving rise to EN's use of replacement repairs.

Links between the use of replacement repairs and underlying cognitive neuropsychological impairments: In the conversation with LP, 38% of replacement repairs (six tokens) dealt with trouble sources found in the conversational turns of the normal interlocutors. These included replacements of words being cut-off (and subsequently being produced in full) where there was no audible error, as well as replacements of pronouns and noun phrases. EN's use of this repair type, however, differed from the normal control subjects in that 63% of the replacements (ten tokens) arose from repair of phonological/phonetic errors as exemplified in the following examples (the replaced and replacement items are highlighted):

(viii)

17 EN the dog **[bɒt] got** them

108 EN **[tə tətətə taʊs taʊs] er South** Tyneside

The use of replacement repairs for these cases seems to be related to either the hypothesised impairment at the phonological output lexicon giving rise to phonological errors and/or the hypothesised mild impairment in allophonic realisation giving rise to apraxic errors that were identified in the assessment of single word output processing (see 5.1.3 - 5.1.5).

Surprisingly, there were no replacement repairs dealing with phonological/phonetic errors in the conversation with BC. All the replacements dealt with trouble sources also found in the conversational turns of the normal interlocutors, including replacement of cut off words despite no audible error and replacement of noun phrases.

Success of replacement repairs: EN's replacement repairs in the conversation with BC were all successful. In the conversation with LP 88% (14) were successful, with only two failures. These failures are, however, relevant to consideration of the impact of language impairments on conversational ability and so both will be examined. The first involved the replacement of an apparent phonological/phonetic error:

(ix)

142 EN they could have put this in the [dʒə] in the [drə]

143 LP in the ambulance=

144 EN =mhm

EN cuts off a word she is producing having made an apparent phonological error. The preposition phrase is recycled but EN's attempt to carry out a replacement repair is not successful and the trouble source is dealt with by LP initiating collaborative repair. She provides a demonstration of understanding reached of EN's presentation in which the replacement which she thinks EN is trying to produce is given. EN provides acceptance of the demonstration of understanding reached with an acknowledgement token. EN's cognitive neuropsychological impairments can be seen to give rise to the need for collaborative repair work. It should be noted, however, that for the other nine replacement repairs dealing with phonological/phonetic errors her repair was successful with the presentation containing the repair work achieving acceptance in the next turn. The ability to successfully self repair is a marker of the mild level of impairment giving rise to these trouble sources. This mild level of impairment was also apparent in the small number of errors of this nature in the cognitive neuropsychological assessments of output processing.

The second failure involved replacement of a noun phrase:

(x)

130 EN so we had to 'phone the (1.5) that one and er

[

131 LP you* had to'phone that number *{looks at appointment card}*

EN does not complete the noun phrase following the determiner. After an unfilled pause she produces a replacement noun phrase which is a deictic expression. The analysis of realisation of referring expressions in the phrase analysis (5.2.3) showed that EN produced a significantly greater proportion of pronouns than noun phrases in comparison to the control subjects. This, in conjunction with the evidence of an impairment in access to the phonological output lexicon from performance on output tasks (5.1.3 to 5.1.5), suggests that EN produces pronouns and proforms as a strategy to deal with failure in lexical retrieval. In the above excerpt, the delay after a determiner followed by a replacement with a deictic proform is clear evidence of the use of this strategy.

The repair can be seen to have failed in that it does not receive immediate acceptance, LP instead producing a demonstration of understanding reached as she looks for the referent of that one. This excerpt, however, illustrates that failure of self repair (because the repair work is not completed within that turn) does not mean that the attempt has not contributed to the repair work. As can be seen in this example the use of a deictic repair strategy allows LP to utilise a strong initiator of the collaborative acceptance phase. Resolution of collaborative repair is discussed further in 6.3.3.

Summary: EN's use of replacement repairs differed between the two conversations. In the conversation with LP, her usage exceeded in frequency that of the normal interlocutors suggesting that cognitive neuropsychological impairments gave rise to the greater use of this repair. This is supported by closer examination of the trouble sources, with replacement of phonological/phonetic errors. Furthermore, while the majority of the repairs were successful, it is possible to identify links with EN's lexical retrieval deficit in respect of the tokens that failed in achieving acceptance in the next turn.

6.2.2 Abandoned clauses followed by subsequent clauses

Quantity of repairs: EN produced a much greater proportion of this repair type in both conversations than the normal interlocutors with 33% of her turns in the conversation with LP and 18% of her turns in the conversation with BC containing it (range of normal interlocutors = 1% - 5%). It seems likely that EN's cognitive neuropsychological impairments were giving rise to a greater utilisation of this repair strategy.

As in the use of replacement repairs (6.3.1), there was an influence of conversational partner on the quantity of use of the repair strategy with higher frequency in the conversation with LP. As suggested in relation to replacement repairs, it seems likely that the strategy of glossing over EN's potentially problematic turns, which is used frequently by BC, results in fewer opportunities for her to carry out self repairs in the conversation with BC in comparison to the conversation with LP.

Links between the use of abandoned clause followed by subsequent clause and underlying cognitive neuropsychological impairments: As noted in 4.4.3, it is difficult to establish for an individual instance the nature of the trouble source giving rise to this form of repair. There are, however, some striking consistencies in EN's use of this repair. In nine of the 26 abandoned clauses followed by subsequent clauses in the conversation with LP, abandonment occurred after the production of a subject plus a form of the verb <u>be</u> or <u>have</u> as is seen in the following example where EN abandons three clauses consecutively:

(xi)

73 EN ...and it's (3.8: *slaps leg*) I don't know it hasn't been (1.3) it's just

The abandoned clauses produced by EN in her conversation with LP and in the narrative task have been discussed in 5.2.2 above, where it was proposed that abandonment arises as a consequence of failure in lexical retrieval. This proposal took into account the evidence of ability to produce complete and appropriate predicate argument structures in conjunction with the evidence from the cognitive neuropsychological assessments of single word processing (5.1) of an impairment in accessing the phonological output lexicon. If the verbs function as auxiliaries, then the clauses are abandoned at the point where a lexical verb is expected, and if they are functioning as the copula, the clauses are being abandoned before the production of a noun or adjective. Given the finding from the verb and noun naming assessment (5.1.5) that EN is equivalently impaired in accessing verbs and nouns it is likely that clauses are abandoned because of a failure in lexical retrieval for all word classes. There were also examples of abandonment after the production of semi-auxiliary verbs (see excerpt *(xii)*). Furthermore, there were several examples in which the subject of the clause was realised as <u>it</u> or <u>there</u> (see excerpt (xi) above). It was suggested in 5.2.3 that this strategy of using cleft or existential structures gives more time before it is necessary to retrieve representations from the phonological output lexicon.

In the smaller number of tokens produced in the conversation with BC there were also clauses abandoned at points which indicate that a lexical retrieval deficit underlies abandonment, as illustrated by the following excerpt:

(xii)

21 EN she was [wə] supposed to er (.) I've forgotten but she was how she was (2.0)

The first clause is abandoned after the semi-auxiliary verb <u>supposed to</u> and a delay.

Success of abandoned clauses followed by subsequent clauses: As outlined in 4.4.3, this repair type can fail for three reasons; collaborative repair is initiated on the subsequent clause in the next turn, the incomplete presentation is glossed over, or the subsequent clause is also abandoned leading to recursive use of the repair.

Overall, in the conversation with LP, only 38% of this repair strategy was successful (ten tokens). Failures arose in seven turns from the recursive use of the repair strategy accounting for 27% of the tokens, with the clause subsequent to the first abandoned clause also being abandoned. The remaining failures arose from the initiation of collaborative acceptance phases by LP. The majority of these were long and complex with the two interlocutors working together to establish mutual understanding. The following excerpt demonstrates this:

(xiii)

73 EN yeah it's pins over there and it's (3.8: *slaps leg*) I don't know it hasn't been (1.3) it's just
[
74 LP can you not* can you not get do you feel anything in that leg

75 EN yes it's [ff]

76 LP can you feel it

77 EN it hasn't felt [bə] (3.3) er mhm (2.2) felt (2.0) all these (3.0)

78 LP does it feel numb at all

In T73 there are two abandoned clauses. LP initiates a collaborative acceptance phase by asking a question at the point where EN starts a new clause after a 1.3 second unfilled pause. EN drops out of the overlap. EN's next clause ends with a sound elongation which could be a manifestation of EN's mild apraxic impairments and LP comes in again with a question. This collaborative sequence continues over several turns. The length and complexity can be seen to arise from the lack of information contained in EN's abandoned clauses. The impoverished presentation requires more effort to be invested in the collaborative work to establish mutual understanding of EN's presentation.

In the conversation with BC, 60% (six tokens) of EN's repair attempts were successful. One failure arose from recursive use of the repair strategy. The remaining tokens failed when BC took the floor and initiated a new turn before EN completed the subsequent clause, as is illustrated in the following sequence:

(xiv)

21	EN	no she was [wə] she was supposed to e:r (.) I've forgotten but she was how she was (2.0)
22	BC	I was talking to er the butchers down down the bottom and she was telling us....

EN abandons the first clause after the semi-auxiliary verb at the point where a lexical verb would be expected, and it is likely that this abandonment arises from a failed lexical search. In the second clause there is a repair carried out with a co-ordinate clause being replaced by a subordinate clause functioning as a clausal argument. This clause is not completed and there is a two second unfilled pause before BC takes his turn. BC does not, however, initiate collaborative repair work on the incomplete clause I've forgotten how she was... instead carrying on talking on the same general topic. By doing this BC is avoiding the need for collaborative repair. As is discussed in 6.3 below, there is a striking difference in the quantity of initiation of collaborative repair by LP and BC.

Summary: EN's frequency of use of abandoned clauses followed by subsequent clauses greatly exceeded that of the normal interlocutors. It is proposed that this greater frequency can be seen as a manifestation of EN's lexical retrieval deficit. EN's impairment at this level of processing is relatively severe so that she is often unable to effect self repair successfully. It is of interest to note that failures in the use of this repair strategy arose for different reasons. While a number of attempts failed in the conversation with LP because she initiated collaborative repair work, there were no such cases of failures in the conversation with BC. In contrast, a number of failures arose in this conversation because of BC glossing over EN's problematic and incomplete turns.

This difference indicates that while self repair may be seen to be under the control of the speaker and not his or her conversational partner, the latter indeed has an influential role to play. BC glossed over EN's problematic turns, in contrast to LP who checked her understanding on many occasions and thus extended the repair into a collaborative sequence. When EN ran into problems in her turn, LP allowed EN more time to try and effect a self repair. This resulted on some occasions in EN making more attempt at repair as is reflected in the greater recursive use of this repair pattern in the conversation with LP. As discussed in 3.1.3, it seems likely that the amount of knowledge shared by the interlocutors influences to a great extent the differences between the conversational partners. Given the high degree of shared knowledge between EN and BC it was possible for BC to gloss over possible trouble sources and still maintain the conversation. In the conversation with LP, however, there was much less support from shared knowledge and thus, the level of understanding sufficient for current purposes to be worked for in acceptance phases (see 3.3) was greater in this context.

6.2.3 Repetition repairs

Quantity of repetitions: 16% of the turns in the conversation with LP and 10% of the turns in the conversation with BC contained repetition repairs. In the latter conversation the frequency fell within the range of the normal interlocutors (0% to 12%) but use exceeded it in the conversation with LP. Therefore, the pattern of increased use of self repair in the conversation with LP already seen for both replacement repairs and abandoned clauses followed by subsequent clauses in the conversation with LP is observed again.

Links between the use of repetition repairs and underlying cognitive neuropsychological impairments: The finding that EN's use of this repair strategy in the conversation with BC did not exceed that of the control subjects could be taken to indicate that cognitive neuropsychological impairments did not give rise to the greater use of this repair pattern. When their occurrence is examined, however, it appears that EN's use of this repair strategy did differ from that of the normal interlocutors in both conversations. For the normal interlocutors, over 90% of the repetitions occurred in isolation from other repair patterns; after the repetition the turn was completed with no further repair work (see 4.4.3 above). In contrast, the majority of EN's repetition repairs were associated with further repair. Across the two conversations, 65% of repetitions co-occurred with delays in the same clause. Furthermore, across the two conversations about half of the clauses containing repetitions were subsequently abandoned.

Given the evidence from the cognitive neuropsychological assessments that EN has an impairment in accessing the phonological output lexicon, it seems plausible that both repetitions occurring in clauses that were subsequently abandoned and repetitions occurring in isolation have the effect of allowing time for lexical search. The success of the strategy is examined below.

Success of repetition repairs: As already reported above, around half of repetition repairs in each of the conversations occurred in a clause which was subsequently abandoned. While (as outlined in 4.4.3) it is not possible to determine the success of an editing term when used in an abandoned clause followed by a subsequent clause, an examination of some of the examples suggests that the repetitions and delays allowed EN time to access a lexical item. If this was not achieved the clause was abandoned and repair through a subsequent clause was attempted. If this suggestion is accepted, the repetition repairs in abandoned clauses can also be seen to have failed. Excerpt *(xv)* provides an illustration (repeated items are underlined):

(xv)

34 EN well that's that's just God er erm got here is oh God is (1 syllable) that's [bɛtnt] me down

21 EN no she was [wə] she was supposed to e:r (0.6) I've forgotten but she was how she was (1.6)

Repetition repairs sometimes failed in both conversations because collaborative repair was initiated, as in the following example:

(xvi)

38 EN well I mean it's er (1.3) {heheh} it's oh it's

(0.7)

39 LP yeah it's sort of being (0.6) you're sort of stuck here* and you can't get

[

40 EN yeah

LP out

41 EN yeah

The use of repetition with filled and unfilled pauses demonstrates that EN is having problems repairing her presentation. LP eventually initiates a collaborative acceptance by offering a demonstration of understanding reached, which EN accepts.

BC also initiated collaborative repair after a repetition by EN:

(xvii)

2 EN she was supposed to (1.0) with her daughter for er for [sə]

[

3 BC go* to go to Fleetwood she's going* she's going to Fleetward Wood as well

[

4 EN oh

BC wasn't she

[

5 EN was was she* oh I didn't know she was going to Fleetwood

EN produces a repetition of <u>for</u> preceded by a filled pause. BC comes in after this with initiation of collaborative repair, and it is noticeable that he takes his turn very quickly, not allowing time after the repetition for EN to complete her turn. This contrasts to the length of time filled by editing terms that is tolerated by LP in excerpt *(xvi)* above before collaborative repair work is initiated. Differences in the use of collaborative repair by the different interlocutors is discussed further in 6.3 below. It becomes clear from EN's T4 and T5, however, that BC's demonstration of understanding reached of T2 is not successful in that it does not convey the understanding EN was attempting to establish in her presentation. The collaborative work in this sequence is discussed further in 6.3.3 below.

Summary: In the use of repetition repairs, the pattern of greater use in the conversation with LP in comparison to BC reflects the pattern seen in the previous repair patterns discussed. While in the conversation with BC, frequency did not exceed that observed in the control subjects, usage was different in that the majority co-occurred with other forms of self repair. This contrasts with their strong tendency to occur in isolation in the conversational turns of the normal interlocutors. It appears that while the time provided by repetition permits the normal interlocutors to deal with the covert trouble source that gives rise to the repetition and to successfully complete their presentation (see 4.4.3), this was not the case for EN. A large number of the repetition repairs failed. It is likely that EN's use of this repair pattern constitutes an attempt to deal with the impairment in lexical retrieval identified in the cognitive neuropsychological investigation.

6.2.4 Delay repairs

Quantity: EN's use of this repair pattern was prolific, with 43% of her major turns in the conversation with LP and 37% of her major turns in the conversation with BC containing filled or unfilled pauses. This was a much greater quantity than the normal interlocutors (range = 0% to 9% of major turns, see 4.4.3) suggesting that EN's cognitive neuropsychological impairments were giving rise to the use of this repair pattern. The same pattern of greater use of delay repairs in the conversation with LP than that with BC follows the trend found for the other three repair patterns already discussed.

Links between the use of delay repairs and underlying cognitive neuropsychological impairment: A number of factors indicate that EN's cognitive neuropsychological impairments were giving rise to the greater use of delay repairs. Besides the greater use in both conversations than the normal interlocutors, a large proportion of the delays produced by EN were much longer than those produced by the normal interlocutors. While the majority of delays produced by the normal interlocutors involved a single filled pause or an unfilled pause of around one second, several of EN's delays exceed one second and there are tokens of delays of four and five seconds in her conversational turns (see excerpt *(xviii)* p.230 below). The impaired access to the phonological output lexicon identified from the cognitive neuropsychological investigations (see 5.1.5) would be expected to give rise to delays in conversation as EN attempted to access lexical representations. In the qualitative analysis of her naming responses (5.1.5), it was found that if she was given unlimited time for retrieval EN was often able to name pictures which she could not name immediately.

21% of the delays in the conversation with LP (ten tokens) and 33% of the delays in the conversation with BC (six tokens) occurred soon after the initiation of the turn. Repair in turn initial position is a common phenomenon of normal conversation and can be seen to arise as a consequence of the competitiveness of turn taking as interlocutors start their turn before they have had adequate time for processing. EN's more frequent use of this than the normal interlocutors is likely to emerge from her lexical retrieval impairments giving rise to the need for more time for processing.

38% of the delays in the conversation with LP (eighteen tokens) and 28% of the delays in the conversation with BC (five tokens) were produced between an abandoned clause and a subsequent clause. As discussed in relation to repetition repairs in 5.3.3 above, given the findings of the cognitive neuropsychological investigations it seems likely that editing terms in abandoned clauses are produced as a result of lexical search with abandonment of clauses and an attempt at a subsequent clause produced when access to the lexical form is not achieved.

The remaining delays occurred within turns which were either completed or on which collaborative repair work was initiated. An example is given in excerpt *(xviii)*:

(xviii)

164 EN ...got up (5.0: *drumming fingers*) [blə brak] taxi

In T164 there is a long unfilled pause before EN produces the noun phrase. The drumming of fingers appears to be a floor holding strategy (see Ahlsen, 1985) which is successful as LP does not initiate a turn in the long pause. Again it appears that EN's lexical retrieval deficit is giving rise to the use of this delay repair.

Success of delay repairs: The outcome of this repair strategy is shown in figure 6.2 (overleaf). In both conversations a large proportion occurred between abandoned clauses and subsequent clauses. It has been suggested that in the context of EN's lexical retrieval impairment, the use of editing terms effectively allows more time for lexical retrieval and therefore abandonment of the clause indicates failure of the use of the editing term (see 6.2.3 above).

For the remainder of delay repairs, the proportions of failures in the conversations indicates that EN was often unable to successfully complete her turn even when relatively long delays occurred. Excerpt *(iii)* (p.207 above) shows how long delays at the start of a turn can result in the loss of the floor. This is probably because at this point in the turn the conversational partner does not have enough information to initiate collaborative repair.

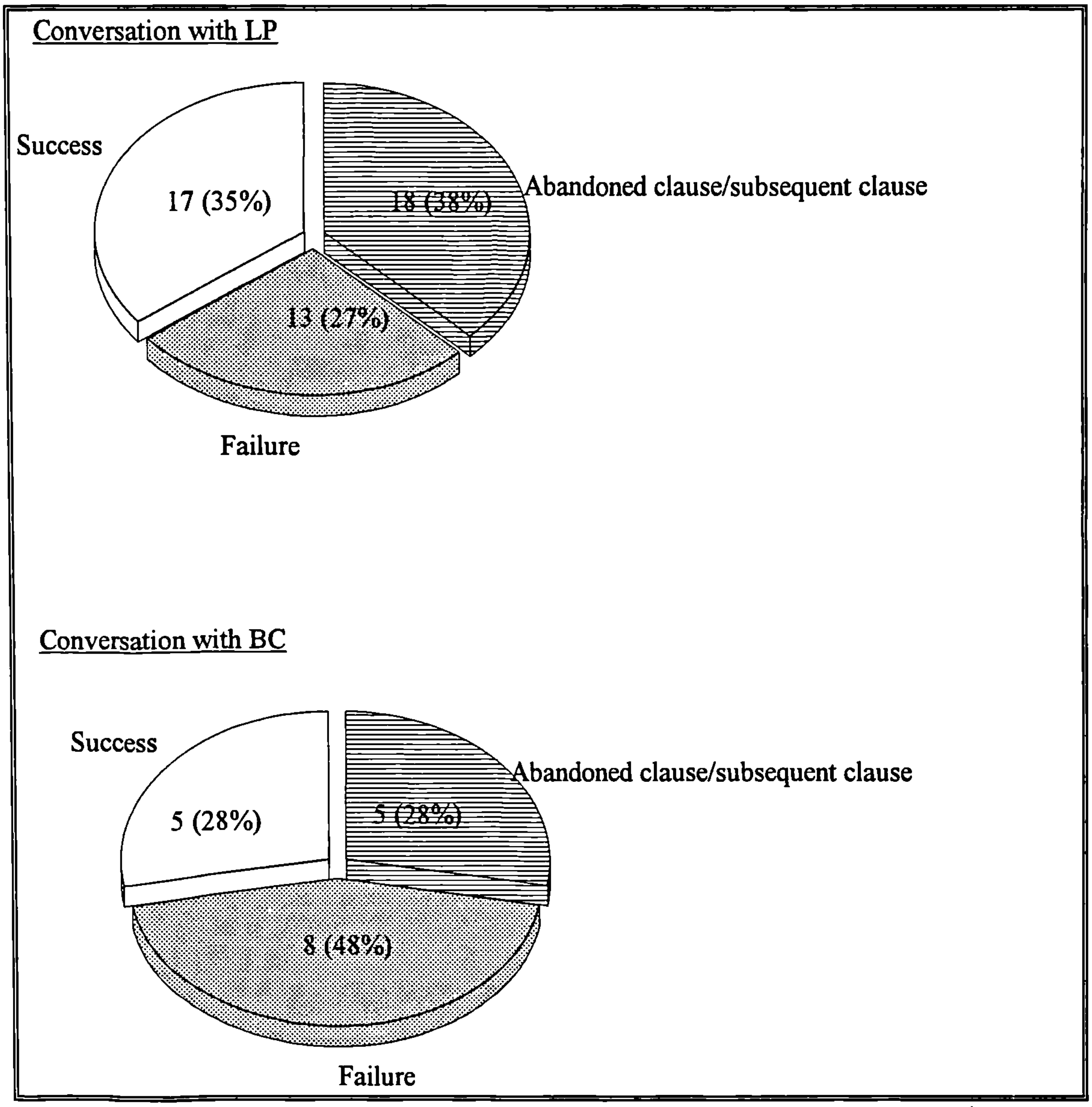

Figure 6.2 Proportion of success in the use of delay repairs

Similarly, delays within clauses were tolerated only for a short time before collaborative repair was initiated even if there was little in EN's turn to use in working towards a mutual understanding as is seen in the following excerpt:

(xix)

73 EN it's pins over there and (1.0) it's (3.8: *slaps leg)* I don't know it hasn't been (1.3) it's just
[
74 LP can you not* can you not get do you feel anything in that leg

In T73 EN produces numerous delays. After a 3.8 second delay EN abandons a clause and produces I don't know, an utterance which is observed on several occasions in EN's turns when she runs into difficulties with a presentation. In the next clause there is a 1.3 second unfilled pause after which LP initiates collaborative repair word at the same point at which EN starts yet another clause.

Overall, there were more failures of delay repairs in the conversation with BC than with LP, probably because of LP's greater tolerance of delays. Comparison of the length of the delays in the two conversations clearly illustrates BC's relative intolerance of them. On several occasions he took the floor, EN losing her turn after just a filled pause as is seen in the following excerpt:

(xx)

190 BC two pound

191 EN er er

192 BC you get twenty six on it

While in the conversation with LP the greater tolerance of delays did not always result in successful self repair, it is clear from a comparison of successful delay repairs in the two conversations that it sometimes did.

Summary: EN used delay repairs to a much greater extent than the normal interlocutors in her conversational turns, her usage differing from the normal interlocutors in length of delays, probably as a consequence of her lexical retrieval deficit. Delays did not often result in successful repair as is marked by the quantity of failures of this repair strategy. Although in the cognitive neuropsychological assessment context, delays did sometimes achieve eventual lexical access, in the competitive environment of conversation, delays of over five seconds were often not tolerated. Indeed delays of over one second are not often observed within the conversational turns of normal interlocutors.

6.3 Analysis of collaborative repair

6.3.0 Introduction

The analysis of turn taking (6.1) and the analysis of self repair (6.2) have clearly demonstrated that the impact of cognitive neuropsychological impairments on the conversational ability of the aphasic subject is substantially affected by the actions of the conversational partner. As Clark and Schaefer (1989) have stated, contributions to conversation "are not formulated autonomously by the speaker according to some prior plan, but emerge as the contributor and partner act collectively. Success depends on the co-ordinated actions by the two of them" (1989: 292). In this section, the way that EN and the two different conversational partners co-ordinated their actions is further investigated by examining collaborative repair. The framework used for this analysis is a modified version of Clark and Schaefer's (1987, 1989) model of conversational contributions. The attractions of this model for the analysis of aphasic conversation have already been outlined in 3.3.

In 6.3.1, the quantity of collaborative repair sequences is examined. In the following section (6.3.2), the collaborative repair sequences are examined to investigate possible links between the initiation of collaborative repair work by the normal interlocutors and EN's underlying cognitive neuropsychological impairments. Finally, in 6.3.3 the mode of resolution of the collaborative repair phase is studied by examining the initiators of the acceptance phase, the length and complexity of the sequences and the way that they are closed down in the conversation. Throughout the sections, the findings between the two conversations are compared and contrasted.

6.3.1 Frequency of collaborative repair in EN's conversations

There was a striking difference in the number of collaborative repair sequences initiated in the two conversations. In the conversation with LP, there were 18 collaborative sequences in contrast to only three in the conversation with BC. All collaborative work was initiated by the normal interlocutors to reach understanding of EN's presentations, indicating that EN's language impairments gave rise to the need for collaborative repair work to achieve acceptance of her presentations.

Thus, just as BC took a greater part of the interactional burden by producing the greater proportion of major turns (see 6.1.3 above) the normal interlocutors also bore more of the interactional burden through their initiation of collaborative repair work. The two interlocutors differed, however, in the way they reduced the conversational burden of EN, with LP initiating collaborative repair work to a greater extent.

The large difference in quantity of collaborative repair between the two conversations followed the trend that has been found in the conversation analysis generally. EN produced a smaller proportion of major turns in the conversation with BC (6.1.3) and a smaller proportion of all the forms of self repair (6.2) than she did in the conversation with LP. Clearly, these findings are related. First, given that EN produced a smaller number of major turns in the conversation with BC (49 major turns in comparison to 79 major turns in the conversation with LP), a smaller number of collaborative repair sequences would be expected. While the number of major turns influences the number of opportunities for collaborative repair, this alone cannot easily account for the occurrence of six times as many collaborative sequences in the conversation with LP.

A further factor which appears to influence the quantity of collaborative repair in the two conversations is the differential treatment of potentially problematic turns by the two conversational partners. We saw in 6.1.3 that BC took the floor for 26% of EN's turns before she had had time to complete her presentation, but rather than initiating collaborative repair he glossed over her attempted turn. In the conversation with LP, on the other hand, only 4% of EN's turns were taken over before completion with no collaborative work being initiated. Thus, while BC was more likely to gloss over a potentially problematic presentation LP was more likely to initiate collaborative work.

It was suggested in 6.1.3 that the strategy of glossing over EN's incomplete and potentially problematic turns is related to the amount of shared knowledge which varies between the two dyads. BC's tendency to gloss over a large proportion of EN's turns without initiating collaborative repair was a factor in EN taking a more passive role in the conversation with BC, with the production of a smaller proportion of major turns. It can thus be seen that there is a cyclical relationship between the proportion of major turns produced and the proportion of collaborative repair sequences initiated. Collaborative repair work can be seen to facilitate production of major turns by EN. The greater the number of major turns, the greater the possible need for collaborative repair work. In contrast, the adoption of a strategy of glossing over problematic turns results in EN's attempted presentations failing, leading to a reduction of her influence in shaping the interaction. As a consequence, EN's contribution of major turns to the interaction is reduced, ultimately resulting in a diminution in the quantity of collaborative repair sequences.

6.3.2 Links between initiation of collaborative work and underlying cognitive neuropsychological impairments

It has been stressed in 3.3.1 that repair is utilised as an interactional resource in normal conversation. Therefore, it is necessary to consider whether collaborative repair work initiated on EN's turns arises as a consequence of her language impairments or whether it is typical of repair work carried out in normal conversation.

It has been argued in 6.2 that the lexical retrieval deficits identified from the investigations of EN's cognitive neuropsychological investigations (Chapter Five) underlie the extensive use of several of the self repair patterns. In the conversation with LP, it appears that a large proportion of the collaborative repair sequences arose as a consequence of EN's lexical retrieval deficit. On the majority of occasions, however, the collaborative work did not take the form of simply supplying a word that EN was having problems in accessing (as will be seen in the conversations of subject JJ, see 10.3). Rather, the collaborative work could be seen to be concerned with establishment of a general understanding of EN's whole presentation as is illustrated in the following excerpt:

(xxi)

43	EN	yeah and there's this sort of (1.4) [ɛʔ] everything in its er look at this hhh oh it's		
44	LP	you feel as if you can't tidy up either and*that's getting you down* as well		
			[	[
45/46	EN		yeah yeah	mhm mhm
47	EN	mhm		
		(1.0)		
48	LP	everywhere looks very nice		

In T43 there are numerous self repair attempts with filled and unfilled pauses and abandonment of a clause followed by a subsequent clause. It has been proposed on the basis of the analysis of referring expressions produced by EN (2.2.3), in conjunction with the evidence of an impairment in access to the phonological output lexicon, that EN uses pronouns to cover up failures in lexical retrieval. A manifestation of this can be seen in T43 by EN's reliance on proforms and vague and general referring expressions (this sort of, everything, it, this). EN falls back on a deictic strategy utilising a proform in the subsequent clause look at this. LP in T44 produces a demonstration of understanding reached in overlap with EN's continuation of the turn. It appears that from the numerous self repairs in EN's turn LP 'picks up the gist' and uses this to formulate an interpretation of the problematic T43. EN marks acceptance of this through acknowledgement tokens in overlap and after completion of LP's turn. This excerpt demonstrates how EN's lexical retrieval deficits lead to the need for collaborative work to establish mutual understanding. In all, 44% (eight tokens) of the collaborative repair sequences in this conversation were of this nature. One of the three collaborative sequences initiated in the conversation with BC was similar to the above sequence with establishment of a general understanding of a multiply self-repaired turn being at issue.

There were some sequences in the conversation with LP where collaborative repair was more focused. The utilisation of a deictic referring strategy to compensate for lexical retrieval impairments, as seen in the above excerpt, gave rise on three occasions to collaborative repair work where the focus of the repair involved the confirmation of the referent. Two other tokens of collaborative repair work arose from EN's use of other compensatory strategies to deal with failures in lexical retrieval. One of these involved the use of a pointing strategy, the other involved EN writing in the air the word that she was unable to access through the spoken modality (see excerpt *(xxiv)*, p.240 below). It is therefore possible to link the occurrence of a further 28% of the collaborative repair sequences (five tokens) in the conversation with LP to the manifestation of EN's lexical retrieval impairment. The mode of resolution of these acceptance phases and the contribution to the resolution by EN's use of these various strategies is considered in 6.3.3.

The remaining 28% (five tokens) of collaborative repair sequences in the conversation with LP were initiated before EN had carried out extensive repair work with LP producing a completion of EN's turn as is seen in the following excerpt:

(xxii)

117 EN so that's better than (.)
118 LP going in the ambulance isn't it 'cause that takes
[
119 EN well* I'm not come to the ambulance won't come else (1.0) er waited here 'til quarter past two

In T118, LP offers a completion of EN's T117. As discussed in 4.4.4, the use of completion can be seen as a form of demonstration of understanding reached. Clark and Schaefer (1989) report that collaborative completions are surprisingly common in everyday conversation. Typically, an interlocutor indicates trouble in completing the initial presentation, and by offering a completion the second interlocutor minimises collaborative effort as (provided the completion is acceptable) the first interlocutor no longer has to complete the problematic turn. There is a very short pause in EN's T117 which is perhaps the trigger to LP's provision of a completion. In addition, the numerous turns in which EN runs into difficulty with self repair attempts also helps explain LP's production of completions as a strategy to minimise collaborative effort in this conversation. Thus, it is not possible to link collaborative completions directly with the manifestations of EN's cognitive neuropsychological impairments. Given the level of EN's conversational problems, however, it seems plausible that the conversational partners utilise this collaborative strategy when they are able to propose a candidate completion, in order to avoid protracted self repair by EN herself which may not be successful in achieving an immediately acceptable presentation.

The completion in the above excerpt is, however, unsuccessful in minimising collaborative work as it becomes clear from EN's T119 that the understanding demonstrated in LP's completion is unacceptable. The remaining two collaborative repair sequences in the conversation with BC also involved completions of EN's previous turn. EN does not accept BC's completions in either case, indicating a failure in the minimisation of collaborative effort in its usage. The resolution of rejected completions is examined further in 6.3.3. below.

The absence of collaborative repair sequences initiated by EN following the normal interlocutors' turns is congruent with the findings from the assessments of both single word and sentence comprehension (5.1 and 5.3) that comprehension is relatively intact. It is important to note that the absence of initiation of collaborative work by an aphasic person cannot be taken as proof of good comprehension in conversation as there may be lack of awareness of impaired comprehension. The absence of collaborative sequences initiated by the normal interlocutors to deal with miscomprehension by EN, however, suggests that EN's conversational comprehension abilities are well preserved.

6.3.3 Mode of resolution of collaborative acceptance phases

In the conversation with LP, the majority of collaborative repair sequences were initiated through a demonstration of understanding reached. We saw in 4.4.4 that this is the strongest initiator of collaborative repair in that if the understanding demonstrated is correct, completion of acceptance can be achieved quickly. Thus, by using the strongest initiator of the acceptance phase, LP can be seen to be upholding the principle of least collaborative effort. Demonstration of understanding reached was used by LP to initiate acceptance of EN's presentations both where general understanding of a turn was at issue and where it was possible to identify more specific foci of repair work. As has been seen in excerpt *(xxi)* (p.236 above) completion of the acceptance phase can be achieved very quickly under the former condition. Excerpts *(xxiii)* and *(xxiv)* below both illustrate the successful outcome of a demonstration of understanding reached when the repair work has a more specific focus.

(xxiii)

88 EN and here's was where it ached

89 LP that ached as well the bottom half

[

90 EN yeah* oh it's it's (1.0) it's terrible

LP in T89 provides a demonstration of understanding reached in which the referent of the deictic proform here in EN's T88 is specified as the bottom half. Through the use of the strongest collaborative acceptance phase initiator, the interlocutors are able to complete acceptance of EN's T88 in accordance with the principle of least collaborative effort. The same pattern is seen in the following excerpt in which EN has difficulty retrieving the word bungalow:

(xxiv)

213 EN and er there's [tststs] (2.1) [s::] {*ha*}

(4.0: *uses finger to write in the air*)

214 LP oh it's a low it's a* bungalow

[

215 EN yeah

216 EN [brɷn] bungalow

217 LP right oh that'll be a lot better for you.....

In T213, EN's mild apraxic difficulties are evident and she is clearly having problems in lexical retrieval as indicated by the delays. Eventually she uses the strategy of writing in the air. From the cognitive neuropsychological investigations of naming (5.1.5), a dissociation of impaired spoken lexical retrieval in the context of intact lexical retrieval through the written modality was observed. In T213, EN can be seen to be utilising intact access to the graphemic output lexicon as a strategy to compensate for impaired access to the phonological output lexicon. In her demonstration of understanding reached, LP verbalises the information EN has conveyed through gestural writing and EN provides acceptance of LP's demonstration in T215 and T216. EN's use of this strategy can be seen to have successfully minimised collaborative effort and while the conversational partner contributes to achieving acceptance, the collaborative work is carried out quickly. These excerpts particularly clearly demonstrate that while EN's language impairments result in LP adopting a more active role in the interaction, EN's role in collaborative repair is far from passive. By means of such strategies as deictic reference and writing, EN contributes to the quicker resolution of collaborative repair work by providing LP with more information to work with. Thus, on most occasions LP is able to initiate repair work through a demonstration of understanding reached.

Quick resolution of two collaborative acceptance phases was also observed when EN was able to accept LP's demonstration of understanding reached in the form of collaborative completions. An example is given in excerpt *(xxv)* below:

(xxv)

```
49   EN   it's [nə] n{he}ot the way that* no: no:
                          [
50   LP                   it's not the way you like
51   LP   ah dear
```

LP in overlap repeats the start of EN's turn and offers a completion. When LP has finished this completion EN's turn emerges out of overlap and through the use of acknowledgement tokens (<u>no no</u>) confirms LP's completion as correct. Collaborative acceptance is achieved quickly and efficiently.

The above examples illustrate that initiation of collaborative repair through a demonstration of understanding reached often results in quick resolution when the correct understanding is displayed. There were several excerpts in the conversation with LP where immediate acceptance was not achieved. The use of this strong initiator of the acceptance phase could, however, still be seen to minimise collaborative effort as it was effective in locating the trouble source for EN who could then attempt to focus repair work more precisely. This is illustrated in the next excerpt:

(xxvi)

8 EN and er (2.5) took the mm actually I went through there

9 LP you went through physio

[

10 EN yes ye* no er no went through there

11 LP mhm

12 EN into the toilet

13 LP right

14 EN and er...

In T9, LP provides a demonstration of understanding reached of EN's T8 presentation. The focus of the repair work is the referent of the proform there, which (as is evident from the turns preceding T8) LP has interpreted anaphorically. This excerpt is particularly useful in demonstrating how an acceptance phase initiated through demonstration of understanding reached can develop. EN starts T10 by accepting LP's demonstration with the acknowledgement token yes ye in overlap, but after realising that LP has not reached the correct understanding of the proform there, she self repairs from the acceptance to carry out repair work on her T8 presentation. EN effects the repair by explicitly rejecting LP's paraphrase before dealing with the trouble source (there). LP's demonstration of understanding reached, although not correct, minimises collaborative effort by pinpointing precisely the intended understanding which allows EN to focus further repair work.

The necessity of a collaborative model to account for repair in aphasic conversation becomes clearer with the longer and more complex acceptance phases but, as will be seen from further excerpts, this is a relatively simple example. It does, however, illustrate how presentation and acceptance phases are embedded in the acceptance phases of higher level presentations, giving rise to the kind of nested structure schematised in figure 6.3.

Pr. (8) EN: and er took the mm actually I went through there

C1

Pr. (9) LP: you went from physio

Ac.-->C2

Ac.=>

Pr. (10) EN: yes* ye no er no went through there

C3

Ac.=>

Pr. (11) LP: mhm

C4

Ac.=>

Pr. (12) EN: into the toilet

C5

Ac=>

Pr. (13) LP: right

C6

Ac=>

Pr. (14) EN: and er....

C7

Ac....

<u>Key</u>

C	Contribution
Ac.	Acceptance phase
Pr.	Presentation phase
=>	Acceptance by next relevant contribution

Figure 6.3 Contribution tree of excerpt (xxvi) showing structure of embedded contributions

The acceptance phase for the C1 presentation has five further presentation-acceptance phases embedded within it. The complexity of this embedding is kept to a minimum because the interlocutors have been able to offer the strongest form of acceptance phase initiator for each of the embedded presentations. As will be seen below, embedded structures may themselves contain further embedding.

This example illustrates the strength of Clark and Schaefer's model in accounting for the complex repair sequences common in aphasic conversation. It provides a better account of excerpt *(xxvi)* than the model proposed by Schegloff *et al*, since the latter would analyse discretely LP's T9 as an other-initiated other repair and EN's T10 and T11 rejection and correction of this as an other-initiated other repair of LP's repair. The Clark and Schaefer model, in contrast, offers a unitary analysis of the entire sequence as collaborative work aimed at achieving completion of the acceptance phase, the embedded structure of which is shown in figure 6.3.

The next excerpt is a longer and more complex repair sequence which again illustrates the collaborative nature of the repair process.

(xxvii)

136 LP so what did they say

137 EN so I have to wait 'til we (1.5) to when I know (1.4) er (1.2) you see have took me and I could have rode and I said [nən] no not (1.0) (1 syllable)

138 LP [oh* in the wheelchair to the General

(1.7)

139 LP what your husband was going to push you there

140 EN no she's going to no because she were going to (put) er (1.3) .hhh no because it was [kət kət] (2.0) mhm

(2.8)

141 EN they could have put this in the [dʒə] in the [drə]

142 LP in the ambulance=

143 EN =mhm=

144 LP yeah but there was no way that you could have got that there without an ambulance is there

145 EN yeah that's right

146 LP a:h

147 EN so

148 LP so how long is it before you go and see him

EN runs into difficulties with T137, as can be seen by the numerous self repairs with abandoned clauses followed by subsequent clauses and several long delays. LP initiates repair work with a demonstration of the understanding reached in T138. EN provides neither acceptance or rejection of LP's demonstration and after 1.7 seconds LP interprets the attributable silence as some problem with her turn as is marked by the production of a second demonstration of understanding in T139. This is more explicitly marked as an understanding check by its preface with what. In T140 EN rejects LP's demonstration of understanding but runs into problems in correcting this understanding. After phonological errors there is a two second unfilled pause, followed by mhm. This acknowledgement token is located after a self-repaired, seemingly incomplete turn, a context not observed in the turns of normal interlocutors. Given the function of acknowledgement tokens in passing up the opportunity to take a fuller turn at talk (3.1.2) it would appear that EN is using the token on this occasion as a marker of a turn for which she wishes to do no further repair work on. LP does not, however, initiate acceptance, but after 2.8 seconds of attributable silence EN attempts further self repair in T141. She also runs into problems completing words in this turn, which may result from either her apraxic difficulties or her impairment in accessing the phonological output lexicon. LP again initiates collaborative work with a demonstration of understanding reached in which she provides a candidate for the focus of the failed replacement repair (ambulance) in T142. EN accepts this as correct in T143. However, LP's T144 does not appear to close down the acceptance phase. LP requests further clarification on the issue which first arises in the demonstration of understanding reached in T138 and T139.

A pair of minimal turns follow LP's further demonstration of understanding in T144. These are a regular feature of the lengthier repair sequences in the conversation with LP although they are not found in the sequences which have a quicker resolution and are certainly not a feature of normal repair sequences. As noted in 6.1.1, pairing of acknowledgement tokens is a phenomenon observed in normal conversations, which achieve a co-ordinated exit from the conversation. In excerpt *(iii)* it was proposed that the interlocutors are using the paired tokens in a similar way to close down a failed presentation without further repair. In the above excerpt (and others in the corpus), the tokens appear to have a similar pre-closing function, providing each interlocutor with an opportunity to confirm that the long, complex and potentially confusing acceptance phase is to be closed down. If one of the interlocutors is not satisfied that mutual understanding sufficient for current purposes has been reached, then the opportunity for either interlocutor to add something more before final completion through movement to next relevant contribution is offered. Indeed, LP's T144 can be seen to be using this opportunity of continuing the repair, rather than opting for close-down by means of an acknowledgement token. The collaborative acceptance sequence can be seen to be finally closed down by the production of LP's next relevant presentation in T148.

The complexity of this repair sequence is illustrated in figure 6.4 in its representation of three levels of acceptance phase embedding. Again the collaborative model of Clark and Schaefer, with constituent analysis of contributions into presentations and acceptance phases, which may themselves be complex and recursive, seems to capture the organisational principles of repair sequences such as excerpt *(xxvii)*. It is clear that EN's linguistic impairments result in a larger part of the interactional burden being taken by LP.

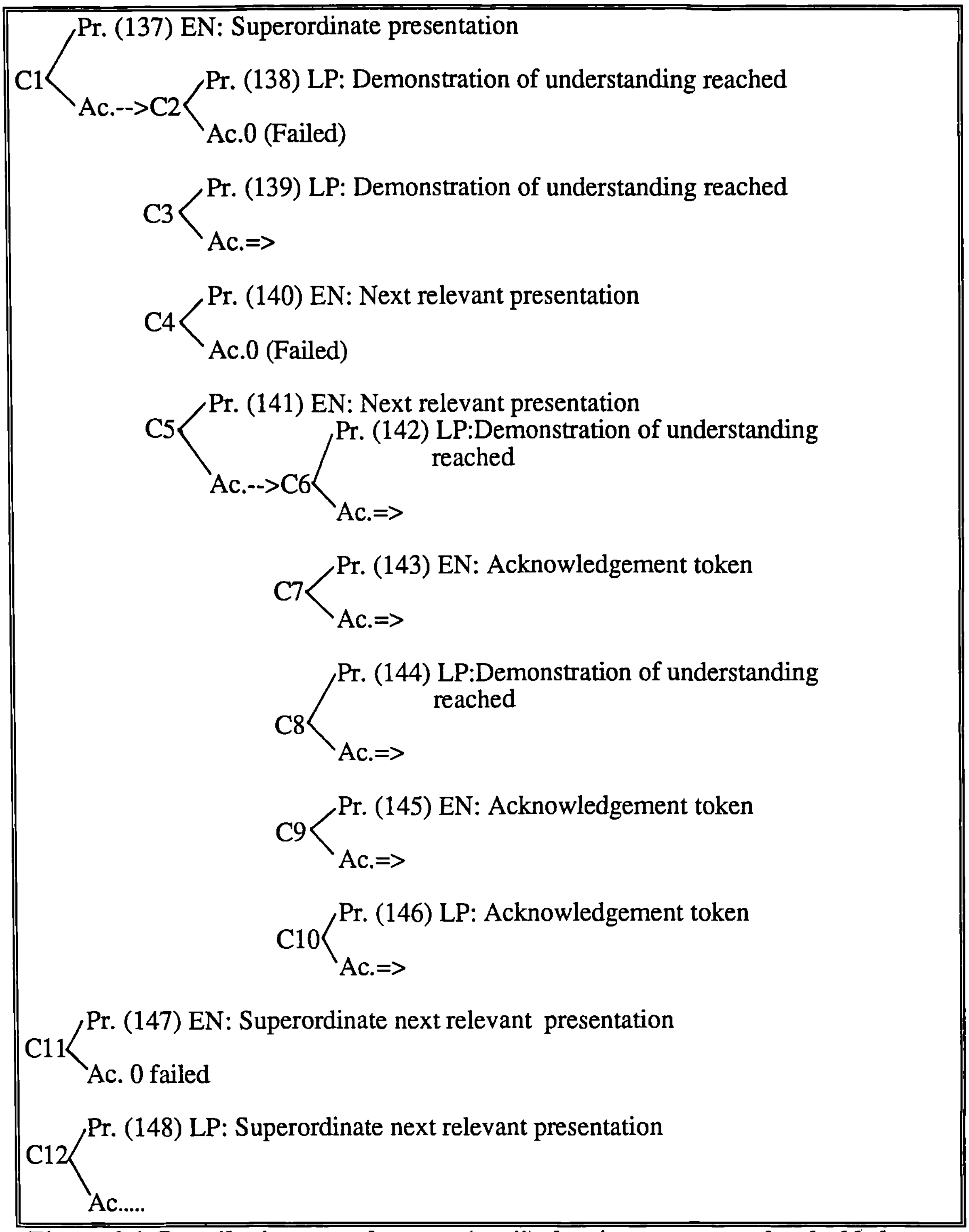

Figure 6.4 Contribution tree of excerpt (xxvii) showing structure of embedded contributions

While some of EN's turns might perhaps be labelled as failed repair if examined in isolation, such a description fails to capture the positive contribution of even incomplete turns such as T142 to the ultimately successful outcome of the repair sequence. As has been seen in more quickly resolved excerpts discussed above, however, her role in the repair is not passive. Having examined the use of demonstration of understanding reached in the conversation with LP, the discussion will now move onto the conversation with BC.

In the conversation with BC, all three collaborative acceptance phases were initiated using a demonstration of understanding reached. Two of the three involved collaborative completions which are discussed further below. The remaining initiation of collaborative repair found in this conversation had a different outcome to either the quickly resolved collaborative repair work (e.g. excerpt *(xxi)*, p.236.) or the more complex sequences (e.g. excerpt *(xxvii)*, p.244) observed in the conversation with LP:

(xxviii)

1 BC Winnie has she shifted yet

2 EN no er she was she was [sə] supposed to (1.0) with her daughter for er for [sə]

[

3 BC go* to go to Fleetwood she's go*ing she's going to Fleetward wood

[

4 EN oh

BC as well wasn't she

[

5 EN was was she* oh I didn't know she was going to Fleetwood

[

6 BC oh* aye she's gan to live it for at Fleetwood

EN runs into difficulties with her presentation (T2) as marked by the numerous delays and repetitions. BC initiates a demonstration of understanding reached in overlap with EN's turn before she has completed the clause. It is clear from EN's T4 that BC's demonstration is incorrect. However, the pattern of rejection plus further attempt at repair as seen in T10 of excerpt *(xxvi)* and T140 of excerpt *(xxvii)* is not observed. Instead, the focus of the conversation becomes the information contained in BC's (wrong) demonstration of understanding reached. In his discussion of the preference for self repair, Schegloff (1979) points out that when repair work occurs in next turn it results in the sequential implicativeness of the current turn being displaced for at least one turn. In this excerpt, it can be seen that the displacement results in the sequential implicativeness of EN's attempted presentation in T2 being lost to the sequential implicativeness of BC's T3.

As noted in 6.3.2, LP provided a demonstration of understanding reached through a collaborative completion on five occasions. The effectiveness of this in achieving minimisation of collaborative effort when the completion is accepted by EN has been illustrated in excerpt *(xxv)*, p.241 Only two of the five completions, however, were immediately accepted by EN. In the remainder of cases, more complex acceptance phases occurred as is seen in excerpt *(xxix)*:

(xxix)

63	EN	yeah and it's just [f::]=
64	LP	=fractured
65	EN	erm [f::] (1.7) mhm and what do you put in it
66	LP	a pin=
67	EN	aha
68	LP	it's got a pin in it
69	EN	yeah
70	LP	right

In T63, EN produces a sound elongation which may arise as a consequence of her mild apraxic impairment. LP offers a completion based on the sound elongation in T64. It becomes clear from the lack of immediate acceptance in EN's T65 that the completion does not demonstrate the understanding that EN was aiming for in her previous turn. EN does not explicitly reject LP's completion as is observed in other failed demonstrations of understanding reached (e.g. see excerpt *(xxvi)*, T10, p.242 above). Instead, she continues to attempt repair work on her previous turn. The lack of rejection can be seen to arise from the fact that although LP's completion demonstrates an incorrect understanding of EN's presentation, it is not incorrect in itself; her leg was fractured. After a failed attempt to self repair EN initiates a new clause after a 1.7 second unfilled pause. In this she firstly produces an acknowledgement token and then requests information from LP to achieve collaborative repair. The use of a question to obtain information again shows the active role that EN takes in the success of collaborative acceptance work. Despite the need for the conversational partner to take a more active role, successful acceptance can be seen as the joint responsibility of both the impaired and the unimpaired interlocutor.

Two of the three collaborative repair sequences in the conversation with BC took the form of completions both of which led to protracted repair sequences as the completions were not accepted as correct by EN as is seen in the following excerpt:

(xxx)

181 EN and er [maɪ] mine's only twenty (0.9)

182 BC eight

183 EN [twɛn] no it's not [t] (1.0)

184 BC well well Peg's on twenty-six

185 EN twenty [f:]

186 BC wor wor Pegs was on twenty-four mind and its went up to twenty-six now
[
187 EN yeah* twenty-four

188 BC aye

189 EN and twenty-four and then er put something on at Christmas at Easter

In this excerpt, the topic of conversation is the amount of pension the speakers receive. In T182 BC offers a completion of EN's T181. As in excerpt *(xxix)* from the conversation with LP, it becomes clear in EN's subsequent turn that this completion is not correct. This leads to further collaborative work over a further five turns focusing on the amount of pension EN receives. The very striking characteristic of this sequence is the large part played by interlocutors' shared knowledge in the nature of the collaborative repair work. BC's completions and further turns arise from his knowledge about how much a friend receives in pension. It appears that BC's presentation in T186 assists EN in the production of T187 which repairs the incomplete turn of T181. The collaborative acceptance phase is completed by BC marking acceptance with an acknowledgement token and EN follows this with next relevant presentation. In the conversation with LP, there are collaborative acceptance phases which extend over several turns before being closed down. This sequence, however, differs in that BC's contribution is to provide information about his knowledge on the topic of conversation which eventually contributes to successful acceptance of T181. In contrast, in the EN/LP conversation, LP does not share the same amount of knowledge on the topic of conversation so that the supply of this type of information is not a feature of this discourse.

Sixteen of the 18 collaborative repair sequences in the conversation with LP were initiated through a demonstration of understanding reached. Other forms of acceptance phase initiators occurred within the longer sequences as has already been seen. There were also two sequences initiated by weaker acceptance phase initiators which will be examined in turn. In the first, LP initiated collaborative repair using a request for information but in the second she used the weaker acceptance phase initiator of a repetition:

(xxxi)

200 EN and we'd been looking o::h (4.1) we{hehe}'s been looking at [bɛdə] yes for five months shifting out

201 LP is this after your stroke you were thinking of moving or before

202 EN er no after a stroke
[
203 LP a*fter right then

EN in T200 is talking about her intended move of house. In T201 LP initiates collaborative repair on this presentation with a request for information. The trouble source appears to be the location of the five months that EN mentions in relation to EN's stroke which can be seen to arise from the replacement repair on tense marking carried out by EN in T200. LP's orientation to the principle of least collaborative effort can be seen in the design of T201 which is given as a forced choice question which requires EN to select one of the alternatives before or after. Such a design can be seen to minimise collaborative effort in that EN has only to repeat the relevant part. In contrast, more effort from EN would be required from EN if a wh- question had been used (e.g. when was this?). The success of the design of LP's 201 can be seen in EN's ability to immediately supply the relevant information in T202 which is immediately accepted by LP with a partial repeat and acknowledgement token in T203. In T204, EN moves onto next relevant contribution which finally closes down the acceptance phase sequence. The next excerpt shows initiation through repetition:

(xxxii)

33 LP your husband seems a really good help though

34 EN well that's that's just God er erm got here is oh God is (1 syllable) that's [bɛtnt] me down

35 LP that's getting you down
[
36 EN yes* yeah

37 LP what er what

38 EN well I mean it's er (1.3) {hehe} it's oh it's (0.7)

39 LP yeah it's just sort of being (0.6) you're sort of stuck here* and you can't
[
40 EN yeah

LP get out

41 EN yeah

42 LP yeah

43 EN yeah and there's this sort of (1.5) everything in its er look at this

EN's T34 presentation contains numerous self repairs, and LP initiates the acceptance phase with a repetition of the final part of EN's presentation. Clark and Schaefer (1987, 1989; see 4.4.4) point out that repetition can function in two different ways as an acceptance phase initiator, each with a different interactional outcome. The weaker form is a hearing check, when B knows that A has made a presentation but is not sure that he has heard it correctly. The repetition displays his hearing which A can either accept as correct or initiate further collaborative work on. The stronger form is effectively a clarification request when B is in state 2 but has not reached state 3, i.e. has heard the presentation but has not understood it, so that the repetition functions to demonstrate his/her hearing. In this excerpt, EN apparently interprets LP's repetition as a hearing check , as shown by her acceptance of the repetition with yes. She appears, however, to have misinterpreted T35 since LP does not accept T36 with a next relevant contribution, but initiates another collaborative acceptance phase with a question seeking clarification of EN's original presentation. Thus, we find here a collaborative acceptance phase embedded in a higher level collaborative acceptance phase as is seen in excerpt *(xxvii)*, p.244. The question in T37 functions ultimately to elicit information which can help LP reach an understanding of the superordinate T34 presentation. EN's attempt at a next relevant contribution run into difficulties (T38) and, after a short unfilled pause, LP offers a demonstration of understanding reached in T39. EN immediately accepts this with an acknowledgement token in both overlap (T40) and at the end of the turn (T41). LP then produces an acknowledgement token setting up the pre-closing of the repair sequence observed in long and complex sequences already discussed in relation to excerpt *(xxvii)*, p.244 above. Closure of the repair sequence is finally achieved by EN's movement in T43 to the next relevant contribution.

Figure 6.5 shows the form of presentation and acceptance phases and captures the complexity of this sequence in its representation of the hierarchy of acceptance phase embedding. The length and complexity of this sequence mirrors that seen in excerpt *(xxvii)*, p.244 and the pre-closing sequence of acknowledgement tokens is observed in both. This excerpt differs, however from excerpt *(xxvii)* in the use of a range of acceptance phase initiators.

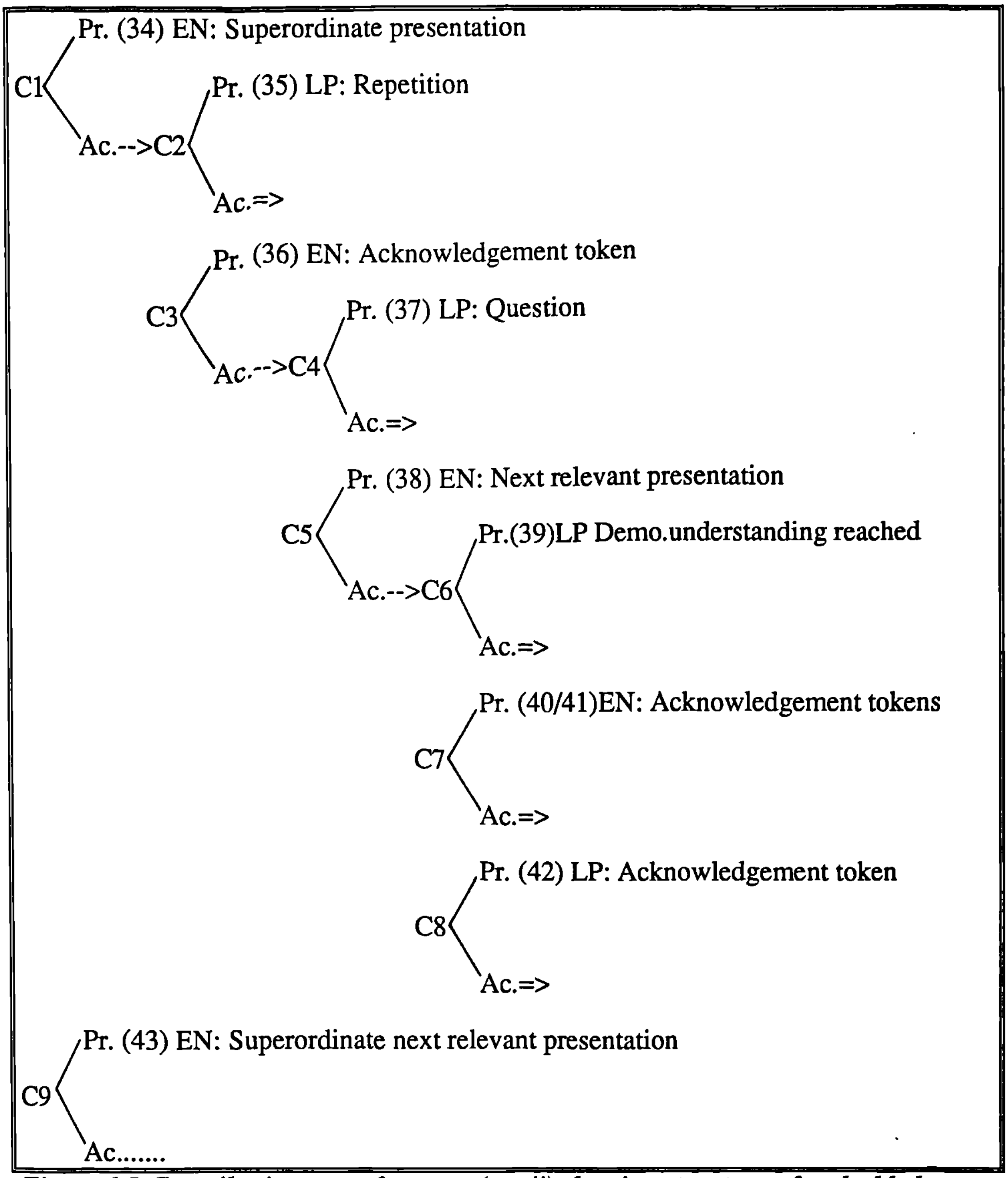

Figure 6.5 Contribution tree of excerpt (xxxii) showing structure of embedded contributions

6.4 Summary of findings of the conversation analysis

Three main issues have emerged from the various (and sometimes very complex) analyses reported in this chapter. First, the conversations provide evidence of preserved knowledge of conversational management procedures. Second, it is possible to identify the manifestations of EN's cognitive neuropsychological impairments (identified in the investigations described in Chapter Five) in the conversation and to examine their consequences. The third main issue is the importance of the factor of interlocutor on the nature of the interaction and the way that EN's language impairments are handled in the discourse. The findings relating to each of these issues will be reviewed in turn.

The findings reported in this chapter are in line with the proposals made from the review of the literature (see Chapter Three) that aphasic subjects retain knowledge regarding conversational management procedures. EN demonstrated preserved knowledge of turn-taking rules; she was able to produce split second turn transition and showed sensitivity to overlap and the significance of attributable silences. Furthermore, while the repair sequences observed in her conversation were different from those found in normal discourse, this can be seen as a consequence of reduced linguistic resources to deal with trouble sources rather than a loss of knowledge of the organisation of repair. She invariably initiated repair on her problematic presentations. In her active contribution to the completion of the acceptance phase, she also demonstrated orientation to the principle of least collaborative effort in the collaborative repair sequences .

Manifestations of EN's cognitive neuropsychological impairments on the conversations were apparent from several of the analyses. First, while her knowledge of the rules governing turn-taking appears to be intact, her ability to hold the floor after initiating a turn is affected by her linguistic impairments. On a number of occasions the production of a number of editing terms led to her losing the floor.

The analysis of self repair allowed further investigation of the impact of cognitive neuropsychological impairments on the conversation. A number of the replacement repairs dealt with phonological/phonetic problems. It was proposed that these could be seen as a manifestation of either reduced activation reaching the phonological output lexicon, or of an impairment in allophonic realisation. The mild level of these impairments was apparent from EN's ability to successfully repair the majority of the trouble sources of this nature. The use of the three remaining repair patterns was linked with EN's impairment of lexical retrieval. The severity of this impairment gave rise to a high level of failure in the attempts to self repair. An examination of the trouble sources giving rise to collaborative repair sequences in the conversation also allowed the impact of EN's cognitive neuropsychological impairments on the discourse to be identified. Almost all of the sequences arose after EN's attempts to achieve self repair.

Moving onto the influence of the conversational partner in the interaction, this factor was also apparent throughout the various analyses. BC was less tolerant of delays in EN's turns than LP, and EN lost the floor to BC in over a quarter of her major turns in contrast to only 4% of them in the conversation with LP. EN also took a much more passive role in her conversation with BC, relying on the use of minimal turns to participate in the interaction, with BC producing 70% of the major turns. In the conversation with LP the production of major turns was much more equal. It was suggested that BC's strategy of glossing over potentially problematic turns and taking a greater burden of the conversation could be related to the different patterns of mutual knowledge between the interlocutors in the conversation.

The difference between the two conversations was also found in the analysis of self repair, with smaller proportions of all of the repair types in the conversation with BC in contrast to the conversation with LP. This difference was also related to BC's strategy of glossing over EN's potentially problematic turns, giving rise to fewer opportunities to effect self repair.

The examination of collaborative repair also showed a great difference in the two conversations. LP initiated collaborative repair work to a much greater degree than BC. While BC took a greater part of the interactional burden through the production of a larger proportion of the major turns than EN and through glossing over her potentially problematic turns, LP reduced the interactional burden by the initiation of collaborative repair work to achieve acceptance of her presentations. Again it was proposed that these differences between BC and LP arose partly from the difference in shared knowledge with EN. The analysis of collaborative repair also allowed the examination of the techniques used by the interlocutors to achieve successful completion of the acceptance phase.

The issues that have been identified in this chapter clearly have implications regarding the management of aphasic patients and these are addressed in Chapter Eleven.

Chapter Seven

COGNITIVE NEUROPSYCHOLOGICAL INVESTIGATION OF SUBJECT AD

7.0 Introduction

This chapter sets out to report the findings of the cognitive neuropsychological investigations of subject AD and to offer an interpretation of his performance in terms of the models of language processing described in Chapter Two. The presentation of the findings follows the format developed in Chapter Five for the cognitive neuropsychological investigation of subject EN. The assessments and analyses used in this investigation and the performance of the control subjects have been described in Chapter Four. The findings reported here regarding AD's intact and impaired processing abilities are drawn upon in the analysis of the conversational data (Chapter Eight) in an attempt to identify the impact of cognitive neuropsychological impairments on conversation.

The chapter starts with a description and interpretation of AD's performance on assessments of single word processing in 7.1. In 7.2, his sentence production abilities are examined and in the final section of the chapter (7.3) sentence comprehension is considered.

7.1 Single word processing

7.1.0 Preliminary orientation

The findings from the assessments of single word processing are presented in relation to the levels of processing discussed in 2.2 above. Phonological and auditory lexical input processing is reported on in 7.1.1. This is followed by an examination of central semantic processing in 7.1.2. Sections 7.1.3 to 7.1.5 describe AD's performance on assessments of phonological and lexical output processing (in repetition, oral reading and oral naming respectively). Within each section, AD's performance on all of the assessments is described and interpreted in relation to the model of language processing presented in 2.2.

7.1.1 Assessments of phonological and auditory lexical input processing

PALPA assessments 1 and 2, non-word minimal pairs and word minimal pairs: AD performed at a high level on this assessment with correct judgements for 67/72 (93%) of the non word pairs and 69/72 (96%) of the word pairs. These scores fell within the range of the PALPA control subjects, suggesting that auditory phonological analysis is intact.

PALPA assessment 5, auditory lexical decision (controlled for frequency and imageability): AD made correct judgements for 155/160 (97%) of items on the lexical decision task which is within the range of the PALPA control subjects, indicating that AD has no impairment in processing at the phonological input lexicon.

Interpretation of performance on assessments of phonological and auditory lexical input processing: AD's performance on these assessments indicate that he is not impaired in auditory phonological analysis or in processing at the level of the phonological input lexicon.

7.1.2 Assessments of central semantic processing

PALPA assessments 47 and 48, picture-word matching (spoken and written versions): AD performed at ceiling level on this assessment for both modalities of input, with all 40 items matched correctly. Thus, his performance was equivalent to that of the PALPA control subjects.

PALPA assessments, 49 and 50, synonym judgement (spoken and written versions): AD's performance on the synonym judgement task for both modalities of input is shown in table 7.1.

Table 7.1 AD's performance on PALPA assessments 49 and 50, synonym judgement (spoken and written judgements controlled for imageability).

Word Pairs	Spoken version (49)	Written version (50)
High imageability	27 (90%)	30 (100%)
Low imageability	23 (77%)	28 (93%)
Overall	50 (83%)	58 (97%)

Performance on the auditory version was below the range of the matched control subjects with correct judgements on 83% of the items. Performance on the written version was significantly better than on the auditory version (chi-square = 5.93, df=1, $p < 0.05$) with correct judgements for 97% of the items. This was within the range of the matched control subjects. There was no significant effect of imageability on performance for either modality (for auditory version, chi-square = 1.92, df = 1, NS., for written version, Fisher Exact Test, p. = 0.25, NS).

Interpretation of performance on assessments of semantic processing: AD's performance on the assessments of semantic processing provide evidence of relatively intact semantic processing. He showed an impairment on auditory synonym judgement but as his performance was near to ceiling on the written version this suggests that central semantic processing is intact as he is able to make correct judgements when the semantic system is accessed via reading.

There are two possible interpretations for this differential performance across modality. The first is that AD has a mild impairment in access from the phonological input lexicon to the semantic system, although each of these levels of processing is intact. Franklin (1989) calls the symptom of this processing deficit word meaning deafness (see 2.2.2 above). An alternative explanation for differential performance across modalities is that the auditory version makes greater demands on auditory short term memory. In the auditory version, AD had the two words presented only once. In contrast, on the written version the subject had control over the duration of exposure. This may support performance as the items do not have to be held in short term memory while a judgement is reached. It will be seen that AD does have an impairment in short term memory and that he also showed significantly poorer performance on auditory definition judgements, in contrast to when the task was presented in a written form (see 7.3 below).

7.1.3 Assessments of phonological and lexical output processing: Repetition

PALPA assessment 9, repetition of words (controlled for frequency and imageability): AD's performance on this assessment is shown in table 7.2, with a breakdown of performance for words of high and low imageability and high and low frequency. He correctly repeated only 61/80 words (76%) which fell well below the range of the PALPA control subjects on this task. There was a significant effect of word frequency on performance (chi-square = 5.59, df. = 1, $p < 0.02$) but no effect of imageability (chi-square = 3.38, df = 1, NS).

All of the errors maintained the syllable structure of the target. The majority of errors (12/19) were phonemic paraphasias:

CRISIS -> ['tɹaɪsɪŋ]

ALCOHOL -> ['aŋkən 'aŋkəlɒl]

CHARACTER -> ['kaɹɪʤsən]

There were also five errors in which words were repeated as other real words. For example:

FIRE -> "follow"

VALOUR -> "value"

The remaining two errors were neologisms:

CONCEPT -> ['tɹɒmplɛd]

FEATHER -> ['fɔlə]

Table 7.2 AD's performance on PALPA assessments 9 and 31, repetition and oral reading of words controlled for imageability and frequency (immediately correct responses)

Word Type	Repetition (9)	Oral reading (31)
High imageability / high frequency	19 (95%)	19 (95%)
High imageability / low frequency	15 (75%)	19 (95%)
Low imageability / high frequency	16 (80%)	19 (95%)
Low imageability / low frequency	11 (55%)	18 (90%)
High imageability overall	34 (85%)	38 (95%)
Low imageability overall	27 (68%)	37 (93%)
High frequency overall	35 (88%)	38 (95%)
Low frequency overall	26 (65%)	37 (93%)
Total	61 (76%)	75 (94%)

PALPA assessment 8, repetition of non-words: AD successfully repeated 47/80 (59%) of the non-words which fell well below the range of the PALPA control subjects. A comparison of performance on repetition of non-words to words (assessment 9) shows that AD was significantly poorer at repeating non-words (chi-square = 5.58, df = 1, p<0.02).

The pattern of errors mirrored those found in the repetition of words. The most common errors (26/33) were phonemic paraphasias:

['dalə] -> ['dalɪŋ]

['pɪtaɹoʊ] -> ['pɪtʃaɹɪn]

There were also five repetitions of non-words as real words. Examples include:

['plaɪn] -> "blind"

['kɒti] -> "cottage"

The final two errors were neologistic:

['haləkəl] -> [aŋəkən]

['grɪvɪti] -> ['grifətʃən]

As with the repetition errors for the real words, the number of syllables of the target was always maintained in his attempts.

Experimental repetition assessment (words and non-words, controlled for number of syllables and number of clusters): AD's performance on this assessment is displayed in table 7.3 with a breakdown of responses for words and non-words of one to four syllables. As with the PALPA repetition assessments, AD showed a significant effect of word status, with significantly poorer performance for repetition of non-words (chi-square = 12.291, df = 1, p<0.01).

There was a significant effect of number of syllables for repetition of both words (chi-square = 9.93, df = 3, p< 0.02) and non-words (chi-square = 9.841, df = 3, p< 0.02) with poorer repetition with increase in number of syllables.

In this repetition task AD took a long time to respond and asked several times for multiple presentations of the target. He was requested to make his best attempt after hearing the word once. While the majority of errors maintained the number of syllables of the target, there were a few cases for both words and non-words in which the error differed in the number of syllables, for example:

CONVERSATION -> ['koʊnvəʃeɪn]

['soʊntamɪndəl] -> ['sɛntamɪnd]

Table 7.3: AD's performance on the experimental repetition assessment (immediate correct responses)

Number of syllables	Words (repetition)	Non-words (repetition)	Words (oral reading)
One syllable	17/20 (85%)	12/20 (60%)	20/20 (100%)
Two syllables	15/25 (60%)	6/25 (24%)	23/25 (92%)
Three syllables	11/25 (44%)	5/25 (20%)	22/25 (88%)
Four syllables	11/25 (44%)	7/25 (28%)	22/25 (88%)
Overall	54/95 (57%)	30/95 (32%)	87/95 (92%)

The commonest form of errors were phonemic paraphasias for both words and non-words (31/41 and 41/57 respectively). While some errors only involved the difference of one distinctive feature on one phoneme, a large number of errors involved more than one phoneme as can be seen in the following examples:

CULTURAL -> ['kəlʃəɹɪʤ]

RESOLUTION -> ['ɹɛzənuʤən]

['mɛtapɪv] -> ['mɛkafɪl]

['ʃuzɪfənt] -> ['ʃuvɪsən]

There were examples of omission, addition, substitution and transposition of phonemes.

AD produced a number of neologisms (where less than half the phonemes in the target were realised in the attempt made). For words, 7/41 and for non-words 8/57 of the errors were neologisms. Examples include:

SENSITIVE	->	['lɛsədɪv]
CONTORTIONIST	->	['sɔtɔʃənəm]
['foʊmzɪtiv]	->	['vɔɪnbətɪn]
['doʊmpəkt]	->	['dɔɪnpənt]

For words, there was one repetition of a word as another word and two abandoned attempts at repetition. For the non-words, there were seven real word errors and one abandoned attempt. Overall, the error types mirrored those found in the PALPA repetition although the more demanding nature of this assessment gave rise to a larger number of errors.

Interpretation of performance on assessments of repetition: AD's impaired performance on the repetition assessment is suggestive of an impairment at the level of the phonological output buffer. This is indicated by the phonological nature of the errors and the significant influence of the number of syllables on performance for both words and non-words. A deficit in input processing can be ruled out as an explanation of AD's impaired repetition, since evidence of intact input processing is provided by his performance on assessments described in 7.1.1 above. While it was hypothesised on the basis of differential performance for the written and spoken versions of the synonym judgement assessments that there may be an impairment in access from the auditory input lexicon to the semantic system (see 7.1.2 above), this would only affect repetition of words but would not be expected to disrupt non-word repetition.

AD was significantly better at repeating words than non-words and this suggests that activation from the lexical routes must support performance. The non-lexical route must be functioning to some degree because although his performance was impaired, he was able to repeat a proportion of non-words correctly. The differential performance between words and non-words could be interpreted as suggestive of an impairment in access to the phonological output buffer rather than an impairment within the processing of the buffer itself, as the latter would not be influenced by word status. Further information on the distinction between an impairment in access to the buffer and an impairment to the processing within the buffer itself is provided by AD's performance on other output tasks which have different modes of input, namely oral reading assessments and picture naming assessments which are discussed in 7.1.4 and 7.1.5 below.

In the PALPA word repetition assessment, AD showed a significant effect of word frequency with poorer performance for low frequency words. This may be indicative of the involvement of the phonological output lexicon in impaired performance.

7.1.4 Assessments of phonological and lexical output processing: Oral reading

PALPA assessment 31, oral reading of words controlled for imageability and frequency: AD's performance on this assessment is shown in table 7.2 above, with a breakdown of performance for high and low frequency and high and low imageability words. He performed at a high level with 75/80 (94%) of the words read correctly. The five errors were phonemic paraphasias, all of which were self corrected immediately. For example:

TREASON -> ['tɹisən 'tɹizən]

GRAVITY -> ['gɹɛvəti 'gɹɛɪvəti gɹavəti]

He was therefore able to orally read words that he was severely impaired in repeating, the difference in performance being statistically significant (chi-square = 9.61, df = 1, p< 0.01).

Oral reading of words from experimental repetition assessment (controlled for number of syllables and number of clusters): AD correctly read 87/95 (92%) of the words from this assessment. As in the PALPA reading assessment, errors were phonemic paraphasias, the majority of which were immediately self-corrected. The pattern of errors for words of different numbers of syllables is shown in table 7.3 above where a comparison can be made between repetition and reading of the same words. While the numbers of errors are too small to carry out a statistical analysis, there appears to be a trend for more errors with an increase in word length. There is a highly significant difference between oral reading and repetition performance (chi-square = 29.95, df = 1, p< 0.001).

PALPA assessment 36, oral reading of non-words: AD correctly read 22/24 (92%) of the nonwords which is within the range of the PALPA control subjects.

Interpretation of performance on assessments of oral reading: Given the severe impairment of repetition, AD's comparatively good reading performance is surprising. As all output tasks involve processing of the phonological output buffer, we would expect the impairment at this level of processing (proposed on the basis of repetition performance) to give rise to a similar deficit in oral reading. A number of researchers report equivalent impairments across different output tasks (e.g. Caplan, Vanier and Baker, 1986). While the errors AD made in oral reading are phonological ones, the quantity of errors made was very different from that seen in repetition performance, with significantly better performance for reading than repetition of the same words.

The most obvious explanation for the discrepancy in performance between oral reading and repetition is that it arises from an impairment in input processing for repetition. However, on the basis of assessments of input processing, this explanation of the deficit was ruled out (see 7.1.3 above). The only remaining explanation for the differential performance in repetition and reading is that it can be accounted for in terms of differentially impaired access to the phonological output buffer from the different processing routes involved in reading and repetition.

While for repetition, the non-lexical route is clearly impaired (as demonstrated by impaired non-word repetition) AD performed within the normal range for the PALPA assessment for oral reading of nonwords. It should be noted that all items in this assessment are monosyllabic which therefore makes it a less demanding output task than the repetition assessments of non-words reported in 7.1.3. However, AD only repeated 60% of the one syllable non-words in the experimental repetition task. Thus, the non-lexical graphemic-to-phonological conversion route is functioning at a higher level than the non-lexical phonological input-to-output conversion route at the monosyllabic level of difficulty. It is possible that in reading, the activation reaching the buffer from the functioning non-lexical route is successful in achieving correct output. AD cannot be relying exclusively on this route of reading, however, as he did not produce regularisation errors expected from failure from the other routes. Thus, the lexical routes must also be functioning in oral reading.

7.1.5 Assessments of phonological and lexical output processing: Oral naming

Revised Kay naming test (frequency controlled): AD's performance on the different frequency bands of the revised Kay naming test are shown in table 7.4. Overall, he was able to name 69/74 (93%) of the pictures within five seconds, with the remaining five items being named correctly after five seconds. While this level of performance fell below the range of the control subjects, the ability to retrieve the name of all of the items demonstrates retained lexical processing ability.

Table 7.4 AD's performance on the revised Kay naming test (controlled for frequency)

Response type	High freq.	Medium freq.	Low freq.	Overall
Correct >5 seconds	25 (100%)	22 (92%)	22 (88%)	69 (93%)
Delayed correct	0 (0%)	2 (8%)	3 (12%)	5 (7%)
Semantic error	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Phonological error	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Neologism	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Failure	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Acceptable alternatives	0	0	1	1

Table 7.5 shows the naming behaviours that AD produced in his naming responses.

Table 7.5 Summary of behaviours in AD's naming responses on the revised Kay naming test

Naming behaviours	Correct>5secs.	Delayed correct	Overall
Pauses	2 (3%)*	5 (100%)	7 (9%)
Semantic associates	0 (0%)	0 (0%)	0 (0%)
Circumlocutions	0 (0%)	0 (0%)	0 (0%)
Phonological errors	7 (10%)	3 (60%)	10 (13%)
Neologisms	0 (0%)	0 (0%)	0 (0%)
Writing strategy	0 (0%)	0 (0%)	0 (0%)

(*: the percentage shown in brackets refer to the percentage of responses of that type containing each behaviour. i.e. 3% of the responses correct within five seconds contained pauses).

Two (3%) of the responses that were correct within five seconds contained filled or unfilled pauses, while partial phonological attempts and phonemic paraphasias occurred in seven (10%) of these responses. As these responses were correct within five seconds, AD was able to successfully effect self repair. For example:

TREE -> [tɹɛŋ] what er tree

GLASS -> [glɒs] glass

For the delayed correct responses, by definition all contained pauses. In addition three (60%) contained phonological errors. For example:

PEG -> (6) [bɛg bɛd] ah dear (4) [tʃɔz] clothes peg

SNAKE -> erm (4) [skɛɪ s:] snake

Verb and noun naming test (controlled for frequency): AD's performance on this naming assessment is presented in table 7.6.

Table 7.6 AD's performance on the verb and noun naming test

Response type	Naming of verbs			Naming of nouns		
	High freq.	Low freq	Overall	High freq	Low freq.	Overall
correct >5 seconds	15 (100%)	13 (87%)	28 (93%)	16 (100%)	16 (100%)	32 (100%)
Delayed correct	0 (0%)	2 (13%)	2 (7%)	0 (0%)	0 (0%)	0 (0%)
Semantic errors	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Phonological error	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Neologism	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Failure	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Acceptable alternatives	1	1	2	0	0	0

He performed at a high level, with the correct name being produced within five seconds for all of the nouns and 28/30 (93%) of the verbs. The two delayed correct responses involved the correction of phonological errors as is seen in the following example:

DIALLING -> (2) [rɑɪ rɪŋ laɪ] ringing dialling

In this example there appears to be interference between two semantically related verbs, ringing and dialling.

Phonemic paraphasias were also produced for three of noun responses and four of the verb responses that were correct within five seconds. In these cases AD was able to quickly self repair his errors.

Lesser syllabic naming test (controlled for frequency and number of syllables): AD's performance on this assessment for monosyllabic and polysyllabic, high, medium and low frequency nouns is shown in table 7.7.

Table 7.7 AD's performance on the Lesser syllabic naming test

Response type	Naming of monosyllabic items				Naming of polysyllabic items			
	High freq.	Med. freq.	Low freq.	Overall	High freq.	Med. freq.	Low freq.	Overall
correct >5 seconds	9 (90%)	6 (60%)	8 (80%)	23 (77%)	7 (70%)	3 (30%)	3 (30%)	13 (43%)
Delayed correct	0 (0%)	2 (20%)	2 (20%)	4 (13%)	1 (10%)	3 (30%)	4 (40%)	8 (27%)
Semantic error	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Phonological error	0 (0%)	2 (20%)	0 (0%)	2 (7%)	0 (0%)	1 (10%)	3 (30%)	4 (13%)
Neologism	1 (10%)	0 (0%)	0 (0%)	1 (3%)	1 (10%)	0 (0%)	0 (0%)	1 (3%)
Failure	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (10%)	3 (30%)	0 (0%)	4 (13%)

The more demanding nature of this assessment (arising from the lower word frequencies and polysyllabic nature of half of the targets) gave rise to a noticeably impaired pattern of performance not seen in the other naming assessments carried out. An examination of the effect of word frequency on the proportion of responses correct within five seconds suggests that AD's performance was better for the high frequency words than the medium or low frequency ones. There was a significant difference between the high frequency words and the medium and low frequency words in the number of responses correct within five seconds (chi-square = 5.00, df = 1, $p < 0.05$). There was also a significant effect of syllable length, with more responses correct within five seconds for monosyllabic targets than polysyllabic targets (chi-square = 6.944, df = 1, $p < 0.01$). Error types included phonemic paraphasias and neologisms, as well as failures to name.

Two delayed correct responses appeared to arise from a failure in initially retrieving the lexical item:

PLUM	->	(16) plum
ENVELOPE	->	(3) post (1) letter post (2) envelope

The majority of delayed correct responses, however, involved multiple phonological attempts at the target. For example:

ESCALATOR	->	['skɛlɪpə 'skɛlɪpə] (5) escalator
DOMINOES	->	[mɛʔ mɛʔ mɛʔ 'mɛnədops] the dice (4) [pɛɪ] what do you [pɛɪ] dice (4) oh dear dear this here (4) ['dɛmi] dominoes

The largest error type that AD produced was phonological error, accounting for 7% of the monosyllabic items and 13% of the polysyllabic items. These errors were either very close to the target or AD made a comment indicating some doubt with his final production, for example:

UNICORN ->[s:] yes [skə 'skɔnijən 'skɔnijən] (5) erm [skə] (2) ['kɔnijən 'kɔnijən 'kɔnijən] I don't know whether that's right.

In this example, it is of interest to note that all the phonemes of the target are present but the syllables are misordered.

Two of his final responses were neologisms (neologisms were also produced within other responses, see below). Both were produced after multiple attempts:

GLOBE -> this is a (3.5) ['lastɪm 'latɪn last] is it a ['lastɪn] no map no ['aspəl]

PHOTOGRAPHER -> AD ['fɔtəgɹaf fɔtə] (6) no no no (14) ['ɒpɹatɪst 'ɒpɹatɪst]

LP are you happy with that

AD no not really but I can't get it off

While there were no failures to make a final response for the monosyllabic targets, there were four failures (13%) for the polysyllabic items. Circumlocution and production of semantic information were found in these responses. For three of these no phonological attempts at the target were made:

PYRAMID ->: oh we have them today haven't we (19) oh they're flashing through me all over (1.1)

LP have a go

oh yes I'll er (12) [s s: s::] (4) ['stɛfən] (6) sphinx no (11) no

For the other failure AD eventually accessed some phonological information:

PARACHUTE-> this is a er (5) the armies get them (10) somethings umbrella something's umbrella er (6) things flying coming all the time flying through my mind (7) paratrooper I've got a paratrooper para paratrooper is the man the man who dropped it paratrooper para (2) trooper para (3) para para para para para something

For this item AD appeared to be suffering interference from a closely semantically related item which is also closely phonologically related. Such interference can also be detected in a response classified as a phonemic paraphasia:

TONGS -> (4) they are erm (1) [plə prɒŋz]

There is a phonological and a semantic relationship between tongs and prongs (both relating to kitchen utensils).

In table 7.8, the analysis of the behaviours in AD's naming responses is shown for monosyllabic and polysyllabic items. The most striking differences between the monosyllabic and polysyllabic responses are the proportion of responses containing pauses and the proportion of responses containing phonological errors.

Table 7.8 Summary of behaviours in AD's naming responses on the Lesser syllabic naming test

Naming behaviours	Monosyllabic items	Polysyllabic items
Pauses	7 (23%)*	18 (60%)
Semantic associates	1 (3%)	6 (20%)
Circumlocutions	0 (0%)	1 (3%)
Phonological errors	6 (20%)	15 (50%)
Neologisms	1 (3%)	1 (3%)
Writing strategy	0 (0%)	0 (0%)

(*: the percentages shown in brackets refer to the percentage of responses of that type containing each behaviour i.e. 7% of the responses for the monosyllabic items contained pauses)

The greater frequency of pauses can be linked with the greater proportion of delayed correct responses for polysyllabic targets. The majority of pauses were associated with the production of phonological errors and attempts at their correction as is seen in the following examples:

PELICAN -> ['kɛli 'kɛli] (2) ['kɛlipən] pelican

ESCALATOR -> ['skɛlipə 'skɛlipə] (5) escalator

Long delays also occurred before AD had attempted to produce the target as is seen in his attempts to name PYRAMID presented above and as seen here in his attempt at CATHEDRAL:

CATHEDRAL -> church or a (9) what is it (3) Durham what's Durham now (2) oh dear Durham church (20) Durham Durham

In these responses, AD appeared to have no phonological knowledge about the item he was trying to retrieve although he clearly had semantic knowledge as marked by the circumlocution and semantic associates that he produced. For other targets, after searching behaviour he was eventually able to access some phonological knowledge although he did not always successfully access the target. Thus, for ACCORDION after a very long delay AD started numerous phonological attempts, eventually being successful in producing the correct response:

ACCORDION -> (40) [kon 'kɒnə 'kɒmɔgiən 'mɔgi 'mɔgiən] it's a ['mɔgiən] something like that isn't it ['mɔgən 'mɔgiən kə'mɔdiən] (4) [kə kə kə'mɔdiən gə'mɔdiən] it's something [gə'mɔdiən 'ɒkɔd 'ɒkɔd] accordion

The finding of more phonological errors for the polysyllabic items is not surprising since word length is thought to influence processing of the phonological output buffer. Examples have already been given above of the responses containing phonemic paraphasias.

The words used in this assessment were also presented to AD in two more output tasks (oral reading and repetition) in order to allow a direct comparison of output performance on the same targets for different modalities of input. The results are displayed together in table 7.9 to allow comparison:

Table 7.9 Number of responses correct produced by AD within 5 seconds for naming, oral reading and repetition of the Lesser syllabic naming test words

Word type	Oral naming	Oral reading	Repetition
Monosyllabic	23 (77%)	30 (100%)	27 (90%)
Polysyllabic	13 (43%)	28 (93%)	21 (70%)

The findings are congruent with the findings of other assessments. AD was significantly better at reading than repetition (chi-square = 8.086, df = 1, $p < 0.01$). In addition, his oral naming was significantly poorer than repetition and reading (chi-square = 5.714, df = 1, $p < 0.02$ and chi-square = 23.764, df = 1, $p < 0.001$ respectively). There was a trend in all tasks for a higher level of performance with monosyllabic words.

Interpretation of performance on oral naming assessments: AD performed at a relatively high level on both the revised Kay naming test and the verb and noun naming test. In the small number of delayed correct responses AD produced phonemic paraphasias congruent with impairment to the processing of the phonological output buffer indicated by repetition performance. However, in these assessments, in which the majority of items were of one or two syllables, correct naming responses were made immediately for over 90% of items. This suggests preserved processing from the semantic system and to output processes (from the phonological output lexicon down to achieving articulation) for this level of difficulty (as measured by word imageability, frequency and length).

AD's performance on the Lesser syllabic naming test gave rise to more severely impaired performance with a number of errors and failures to name, in addition to delayed correct responses. The poorer performance on this assessment can be seen to arise from the inclusion of polysyllabic items and the use of lower word frequency items. In this naming assessment, the significant effect of word length on number of responses correct within five seconds indicates an impairment of the phonological output buffer. This is congruent with the conclusions drawn from repetition performance (see 7.1.3 above). The involvement of the buffer in AD's naming performance is further implicated both by the errors produced (with phonological errors making up the largest error type) and the behaviours observed in naming responses (with responses containing several phonemic paraphasias and neologisms being produced as an attempt was made to correctly produce the target name).

Certain aspects of AD's naming performance on the Lesser syllabic naming test can also be seen to implicate involvement of the phonological output lexicon in some of his impaired responses. First, he showed a significant frequency effect with more correct responses within five seconds for the high frequency words than the medium and low frequency words. Second, for a number of items for which he produced a delayed correct response or a failed response, he showed no phonological knowledge of the target despite often demonstrating semantic knowledge through rejected semantic paraphasias and circumlocution. Thus, for some items, there appeared to be a failure in achieving sufficient activation in the phonological output lexicon to make an attempt at the target. On the basis of AD's ability to orally read the same words without regularisation errors, it is possible to propose that processing within the lexicon itself is intact and that such delays and failures arise from reduced activation reaching the lexicon from the semantic system.

7.1.6 Summary of performance on assessments of single word processing

AD is impaired in auditory comprehension as shown by impaired performance on auditory synonym judgement. From the findings of intact auditory phonological analysis, intact input lexicon processing and intact semantic processing (as indicated by a high level of performance on written synonym judgement), it is hypothesised that AD has an impairment in access from the phonological input lexicon to the semantic system. Unlike Franklin and Howard's (1992) word meaning deaf patient, AD showed no effect of imageability on his performance. The role of impaired short term memory in differential performance across modalities is also considered.

From AD's performance on output tasks, it is hypothesised that he has an impairment involving the level of the phonological output buffer. He demonstrated a syllable effect in both repetition and naming. Phonological errors were produced in all output tasks. He did not, however, perform at a comparative level for all tasks. He made few errors in oral reading but was significantly poorer at repetition of words. Thus, it is hypothesised that the deficit is one of access to the phonological output buffer rather than an impairment in the processing of the buffer itself, as in the latter case, equivalent performance regardless of nature of the input would be expected.

The identified impairment in access from the phonological input lexicon to the semantic system could be expected to influence repetition performance as it will lead to a reduction in activation to spoken output via the semantic lexical route. In addition, there is clearly an impairment in the non-lexical phonological input-to-output conversion route as shown by impaired non-word repetition. The direct lexical route must also be impaired to some degree because otherwise the achievement of good word repetition could be expected via this route. It therefore appears that reduction in activation reaching the phonological output buffer gives rise to impaired repetition.

In oral reading, on the other hand, there is no impairment in access from the orthographic input lexicon to the semantic system. In addition, there is evidence from non-word reading of a functioning non-lexical orthographic-to-phonological conversion route. It appears that with written, as opposed to spoken input, enough activation is reaching the phonological output buffer to achieve correct production of even polysyllabic words.

While on the less demanding picture naming assessments AD performed at a high level, on the Lesser syllabic naming test his performance was impaired. The significant effect of syllable length on performance, in addition to phonological and neologistic errors, indicated the involvement of impaired access to the phonological output buffer. In addition, the significant effect of word frequency and number of failures to name suggest that there may be a reduction in activation reaching the phonological output lexicon from the semantic system.

7.2 Sentence production

7.2.0 Preliminary orientation

The findings from the analyses which provide information regarding impairments to the processes involved in sentence production are presented here in relation to the levels of processing discussed in 2.3. The structure of the section follows that found in the analysis of sentence production for subject EN in 5.2. Accessing of semantic representations is examined in 7.2.1, followed by a report on the realisation of predicate argument structures in 7.2.2. Finally, the analysis of phrase structures is presented in 7.2.3. Interpretation of the findings in terms of the model of sentence production is given in 7.2.4.

7.2.1 Accessing of semantic representations

The findings of the assessments that provide information about AD's semantic processing have been described in 7.1.2. From this it was concluded that AD has intact semantic processing although access to the semantic system from auditory input is compromised. This conclusion is supported by AD's performance on PALPA assessment 57, comprehension of verbs and adjectives from the sentence set (see 7.3.2 below). AD's performance on oral naming assessments provides further evidence of unimpaired semantic processing (see 7.1.4).

In his conversation with LP, there was no evidence of semantic errors being made. As reported in 4.3.2, however, semantic paraphasias may be difficult to detect in conversation if they are close to the intended target. Detection is easier in a narrative task when the researcher has some idea of the lexical items that have to be accessed. Surprisingly, given the evidence of relatively intact semantic processing from the cognitive neuropsychological investigations of single word processing, a number of semantic paraphasias could be detected in AD's narrative of Cinderella. These mainly occurred in the environment of apparent lexical retrieval problems with long delays and, on some occasions, attempts to self correct were made. Often the errors were perseverative. For example:

(i)

AD Cinderella was a young girl who lived with a family (4.6) and the family had three (1.9) <u>families</u> who were (2.2) ugly <u>families</u>

AD produced the semantic paraphasia <u>families</u> for <u>sisters</u> which is a perseveration of a noun earlier in the discourse. There are long delays before each of the errors which are suggestive of lexical retrieval problems. At other points in the narrative he referred to the sisters as <u>children</u> and <u>ugly children</u>. In the next example we see AD's attempt to repair the semantic error of <u>Princess</u> for <u>Prince</u>:

(ii)

AD .. and was [ɪmɛɪ] immediately seen of (1.8) the young Princess (1.7) or a young yeah a young boy a young Princess

Lexical selection problems were also apparent for verbs as well as nouns. As will be discussed below (see 7.2.2), a number of anomalous predicate argument structures could be explained in terms of a verb selection problem.

The occurrence of semantic paraphasias is incongruent with the findings of the assessments of single word processing which indicate intact semantic processing. As cogently argued by Caramazza and Hillis (1991), however, semantic errors may also arise from an impairment of the phonological output lexicon (see 2.1.1 above). While lexical retrieval problems for very low frequency words were apparent in the Lesser syllabic naming test (see 7.1.5), from his naming performance we would not expect failures in lexical retrieval for relatively high frequency words such as "sister" and "prince". It therefore appears that AD has a more severe lexical retrieval impairment when lexical access has to be integrated into the sentence production process.

Besides the production of semantic errors, other signs of problems with lexical retrieval were apparent in AD's narrative; for example, he used referentially vague nouns such as 'things' and pronouns with no traceable antecedent. The use of pronouns to refer is discussed further in the phrase structure analysis (7.2.3 below).

7.2.2 Realisation of predicate argument structure

The proportion of main clauses produced with and without clausal embedding by AD and the matched control subject in the Cinderella narrative is shown in table 7.10. AD produced a significantly greater proportion of main clauses with embedded clauses than the control subject (chi-square = 6.034, df = 2, $p < 0.05$). The proportion of main clauses with embedded clauses realising verbal arguments produced by AD was almost identical to the matched control subject but he differed from the control subject in producing three times the proportion of main clauses with other forms of embedding. To my knowledge, there are no other reports in the literature of aphasic subjects producing more sentential embedding than normal subjects although Butterworth and

Howard (1987) report that the five paragrammatic patients that they investigated were all able to correctly produce long and complex sentences with multiple interdependencies of constituents.

Table 7.10 Analysis of clausal embedding produced by AD and the matched control subject in the Cinderella narrative

Main Clauses	Subject EN	Control subject two
No subordination	21 (46%)	25 (68%)
+ embedded clause(s)	10 (22%)	8 (21%)
+ adverbial clause(s)	15 (33%)	4 (11%)

The embedding that AD produced is problematic as illustrated in the following excerpt from his narrative:

(iii)

AD ...and the young girl who was staying in the (8.5) lower part of the house (1.4) and looked after things (1.4) and made her (1.7) [fff] the three (1.8) children who had to assist in being (2.4) made dressed for the ball which they attended who was helped to do there by the (1.3) Prince

The use of multiple embedding seen in the above excerpt was not found in the control subject's narrative. It gives rise to numerous problems. First, it is not always possible to trace the referent of the relative pronoun as is seen in the penultimate relative clause (<u>who was helped to do there by the Prince</u>). Second, because of the occurrence of multiple embedding, AD sometimes "loses track" of the main clause. This is seen in four of the five phrases that he produced in the Cinderella narrative. Excerpt *(iii)* above shows an extreme example of this. A further example of AD apparently "losing track" of a clause containing embedded clauses is given in *(iv)*:

(iv)

AD: when all the (0.6) lovely things that she'd kept while she was having the ball together then found (1.0) that all her ['brɪljə] brilliant things left

The argument functioning as subject of the verb predicate found is all the lovely things that she'd kept while she was having the ball together. The argument functioning as complement is that all her ['brɪljə] brilliant things left. Thus, while the arguments do not violate the syntactic restrictions of the predicate, the clause is semantically anomalous as the referents of the two arguments are the same. In addition to the possible problems being caused by multiple embedding, there is clearly a problem in verb selection as an inanimate agent with found gives rise to a semantic anomaly.

It is clear from AD's narrative that he has problems in the use of embedded clauses. It is not possible to offer an explanation of his overuse in terms of the model discussed in 2.3 because current sentence processing models are linguistically fairly primitive and do not deal with embedding or ellipsis processes. What is of interest is that the overuse of embedding seen in this task is not apparent in AD's conversational data. While he used a variety of embedded clauses in the conversation with LP, there were no cases of problematic multiple embedding. It therefore appears that the problems of embedding only manifest themselves in the narrative task. It seems plausible to suggest that the type of sequential planning of sentences involved in narrative structure gives rise to AD's overuse.

Moving on to an examination of the analysis of predicate argument structures, 24% of AD's clauses were problematic for a variety of reasons. As it is often difficult to determine the predicate argument structures of problematic items, these are examined separately. Table 7.11 shows the proportions of appropriately realised predicate argument structures produced by AD and the matched control subject in the Cinderella narrative.

Table 7.11 Predicate argument structures produced by AD and the matched control subject in the Cinderella narrative

Structure type	Subject AD	Control subject two
Predicate + 1 argument	14 (16%)	12 (24%)
Predicate + 2 arguments	65 (73%)	33 (63%)
Predicate + 3 arguments	5 (6%)	7 (13%)
Phrases	5 (6%)	0 (0%)
Problematic	26	0

AD showed no significant difference from the matched control subject in the proportions of different appropriately realised predicate argument structures (chi-square = 3.606, df = 2, NS). This finding suggests that AD is able to encode thematic roles and map these onto grammatical relations. A scan of the conversational data provides further evidence of AD's ability to appropriately realise a range of predicate argument structures.

While this result does provide strong evidence of retained processing abilities in realising predicate argument structures, other findings need to be considered to see if they weaken this claim. First, in the Cinderella narrative in addition to the clause types listed in table 7.11, AD produced five phrases not integrated into predicate argument structure. The matched control subject produced no such phrases. Byng and Black (1989) report the production of significantly more isolated phrases than control subjects by three non-fluent patients who showed consistent problems in producing predicate argument structures. An explanation of the production of these phrases in terms of impairment in producing predicate argument structures does not seem plausible in light of the large proportion of appropriately realised predicate argument structures produced by AD. A more cogent explanation is that they arise as a consequence of

AD's tendency to produce multiple embedding (as in *(iv)* above). Whilst producing complex subordination, he "loses track" of the original main clause.

While the production of phrases not integrated into predicate argument structure can be accounted for without the rejection of the proposal of intact ability to encode thematic roles and map these onto grammatical relations, there is a second finding which may undermine this proposal. This is AD's production of 26 clauses with problematic predicate argument structures. These were examined to see whether there was a correlation between the number of arguments of the predicate or the realisation of arguments as clauses and problematic structures. No pattern of trade-off with the overall syntactic complexity of the clause was discernible.

Thirteen (50%) of the problematic clauses could be analysed as involving omission of arguments. Four of these arose from over-ellipsis in conjoined clauses as exemplified in the following excerpt:

(v)

AD and the young girl who was staying in the (8.5) lower part of the house (1.4) and looked after things (1.4) and made her [f:] the three (1.8) children

There are three conjoined clauses in the relative clause. In the first clause the relative pronoun (whose antecedent is <u>the young girl</u>) functions as the subject and the second and third clauses co-ordinated by <u>and</u> have ellipted subjects which suggests that these also have the same antecedent. While it appears semantically appropriate for the second clause to have <u>the young girl</u> as antecedent, this is not the case for the third clause. From knowledge of the story of Cinderella it seems unlikely that <u>the young girl</u> (i.e. Cinderella) is making somebody else do something with <u>the three children</u>. It is more plausible that <u>the young girl</u> is being made to do something and is the antecedent of the anaphoric <u>her</u> rather than being the argument functioning as subject. Thus, it appears that while the structure indicates that the argument functioning as subject has been ellipted, from the context it appears that it has been omitted. Sentence production models are not at a level of sophistication or specification which deal with the issue of ellipsis. Butterworth and Howard (1987) proposed that errors involving traces may arise from a difficulty in holding markers in memory. Assessment of short term memory (see 7.3.6 below) shows that AD does have impaired short term memory. It should be noted, however, that AD's use of ellipsis is not always impaired as there are also examples of appropriate ellipsis in the narrative.

In addition to omitted arguments functioning as subjects arising from over-ellipsis, there were a further two clauses with omitted arguments in subject position. Four clauses with omitted arguments with other functions were also found. For example:

(vi)

AD and the Prince wanted to try and find by knowing that she found the [prə] the (1.0) shoe that she had to find out who this person was

In the subordinate clause to try and find the argument for find is not realised. The same verb occurs in the two subordinate clauses that follow and for each of these the arguments are produced. Overall, the utterance is incoherent and there appears to be some perseveration on the verb. Another case of omission of an argument with the verb find occurs later in the narrative:

(vii)

AD and then er she found in the (2.1) the house with regard to the three (1.5) two ugly childrens who tried to wear the erm (2.6) ....

While one explanation of the anomalous predicate argument structure is that it arises from omission of an argument, this is not the only possibility. Alternatively, lexical mis-selection may underlie the error. Thus although in the house can be interpreted as an optional adverbial phrase, if the verb is mis-selected it is also possible that it can be interpreted as an obligatory argument. For example, the clause is made grammatical by the replacement of found with went.

A further 12 (46%) of the problematic clauses arose from inappropriate *realisation of* one of the arguments. When these were scrutinised as a group, one feature common to several of them was that in the discourse context the verb predicate appeared inappropriate rather than the argument. This can be demonstrated with some examples (problematic predicates are underlined):

(viii)

..and met to the ball her own ball

(ix)

..who was helped to do there by the Prince

(x)

Cinderella came sad at the house

(xi)

some things became to see Cinderella

In *(viii)* if the verb was replaced with went the syntactic violation in the realisation of the argument would be resolved. This is also the case for *(ix)* if go was substituted; for *(x)* if became was substituted; and for *(xi)* if came was substituted. While this interpretation of the problem in these clauses can be criticised as speculative, it is clear from the narrative context that these verbs are not appropriate; this supports the suggestion of a mis-selection problem. Further support is offered by the apparent mis-selection errors involving nouns, discussed in 7.2.1 above.

Schwartz (1987) has proposed that anomalous functional arguments may arise from impaired selection of semantic representations. As discussed in 7.2.1, an interpretation of semantic paraphasias arising from a semantic impairment is not congruent with the finding of AD's intact semantic processing from the assessments of single word processing. Rather, it is proposed that AD's mis-selection errors arose from impaired access to lexical phonological representations when they have to be integrated into constituent frames. Thus, on the basis of access to a semantic representation of the verb predicate, selection and tagging of thematic roles is undertaken. This information dictates accessing of representations from the phonological output lexicon and the accessing of constituent frames. Mis-selection of the verb at the phonological output lexicon will result in replacement of the verb. The syntactic form of the sentence and the arguments, however, will still be appropriate for the "correct" verb, giving rise to the production of anomalous predicate argument structures.

In the conversational data there were also cases of anomalous predicate argument structures which could be interpreted as mis-selection errors. For example:

(xii)

23 AD they bought away from the the the

(Mis-selection of <u>bought</u> for <u>came</u>)

(xiii)

55 AD and what's been doing for people during that time

(Mis-selection of <u>doing</u> for <u>happening</u>).

While the majority of anomalous realisations of an argument can be interpreted as a lexical selection problem of the predicate, this does not account for all of the cases. For example:

(xiv)

AD she realised and became that she was the Prince

The predicate <u>became</u> cannot take a that- clause in realisation of the complement. It is possible that there has been omission of an adjective phrase which was intended to realise the argument. If this were the case then the that- clause could be seen as a modifier of this. From the context, however, it seems more likely that the intended clause is became the Prince (with a semantic error for Princess) which supports the proposal that AD's realisation of the argument has violated the limitations imposed by the predicate. Butterworth and Howard (1987) have suggested that paragrammatic utterances may arise from sentence blending and this may explain some of AD's errors. While Butterworth and Howard (1987) offer an explanation in terms of a breakdown to control processes, Harley (1990) puts forward an explanation in terms of interactive activation which is in line with the model of processing being utilised in this study. He proposes that impaired inhibitory connections within the positional level result in a failure to produce a single output, giving rise to the blending of partial phrase markers and paragrammatic utterances. It is possible that AD's excessive usage of embedding arises as a strategy to blend the various phrasal fragments.

In the conversational data, there were also anomalous predicate argument structures which could not be explained in terms of mis-selections. For some of these, reasonable guesses can be made of the origin of the blends. For example:

(xv)

131 AD It's amazing how many people have spoken me about it

This could be interpreted as a blend of the following:

It's amazing how many people have spoken about it

It's amazing how many people have told me about it

In this example, an alternative explanation in terms of lexical mis-selection could also be offered. A further alternative is that AD has omitted the preposition to. However, the virtual absence of omissions of grammatical morphemes in the data (see 7.2.3 below) makes this interpretation seem less feasible.

In addition to anomalous syntactic structures, blending also offers an explanation for a small number of semantically anomalous utterances. For example:

(vi)

26 AD My home was born in Durham

This could arise from a blend of the following two constructions:

My home was in Durham

I was born in Durham

In contrast to EN, there were no abandoned predicate argument structures in AD's narrative. In the conversation with LP, 24 abandoned clauses followed by subsequent clauses were found. These differed, however, from those found in EN's conversational data in that there were fewer editing terms between the abandoned clause and subsequent clause and, for the majority of clauses, AD produced more than a subject with a form of the verb be as found for EN. In 8.2.2, a comparison of AD's usage of this repair strategy to that of the normal control subjects shows that while AD's usage of the repair strategy was qualitatively similar to the control subjects, his frequency of usage was greater. One explanation that Butterworth and Howard (1987) put forward for the production of paragrammatic utterances is that the aphasic subject realises from both interlocutors' reactions, as well as from self-monitoring that his or her utterances are not conveying what was intended at the message level. This could be seen to arise as a consequence of either lexical mis-selection or blending of competing constituent frames. In order to compensate for this, the aphasic subject may fall back on a strategy of making more than one attempt to communicate a message. Although Butterworth and Howard do not discuss whether this may give rise to abandoned clauses, it seems a possible explanation of conversational turns such as the following in which AD is telling LP about studying for a degree:

(xvii)

2 AD it was done it wasn't that I did it because I lived at I did it when I was a I was a police officer who was working while I was doing it

7.2.3 Phrase structure analysis

Noun phrases: AD produced a range of predeterminers and determiners in the conversational data. There were no examples of determiner omission although there were three tokens of self repair in which AD replaced one determiner for another. In the Cinderella narrative there were a number of cases of production of determiners with proper nouns which were not self corrected.

AD produced a wide range of pronouns and there were no errors in marking nominative, objective or genitive case or in marking plurality in either the conversational or narrative data. In the conversation, there was only one example of incorrect marking of gender and this was immediately self repaired. In the narrative, there was also a small number of gender selection errors which were not self repaired.

Table 7.12 shows the proportion of referring expressions that were realised as pronouns and as full noun phrases in the Cinderella narrative and in the conversation with LP.

Table 7.12 Analysis of the realisation of referring expressions by AD and the control subjects in the Cinderella narrative and in the conversation with LP.

Referring expressions	Cinderella narrative		AD's conversation with LP	
	Subject AD	Control 2	Subject AD	LP
Full noun phrases	115 (69%)	53 (58%)	101 (32%)	52 (37%)
Pronouns	51 (31%)	39 (42%)	217 (68%)	87 (63%)

In both contexts AD did not differ significantly from the control subject (chi-square = 3.548, df = 1, NS for the narrative; chi-square = 1.386, df = 1, NS for the conversation). Thus, although there was evidence of problems in lexical retrieval in both the narrative (see 7.2.1) and in conversation (see 8.2), AD did not utilise the strategy adopted by EN of relying on pronouns to a greater extent to avoid problems in lexical retrieval (see 5.2.3).

An examination of the noun phrases produced by AD shows his ability to produce complex noun phrases. There were numerous examples of pre-modification and both phrasal and clausal post-modification.

The verbal group

AD showed well preserved ability in the production of verb phrases. He produced a range of auxiliary and semi-auxiliary verbs and no cases of omission of auxiliaries were identified in either the conversation or the narrative. There were two examples of replacement repairs in the conversation with LP in which the auxiliary verb was substituted. In addition, there was one case of incorrect number marking but this was immediately self repaired.

Production of bound grammatical morphemes was also well preserved with no omissions identified in either the conversation or the narrative. There was only one substitution which occurred in the conversation, but this was repaired immediately:

(xxi)

199 AD if you wants if you want

AD's ability to produce complex verbal groups was reflected in his production of modal, perfect and progressive auxiliary verbs. He also demonstrated an ability to use a range of verb sub-categories.

Preposition Phrases: AD produced preposition phrases in a variety of functions including realisation of verb arguments for intensive, preposition and complex transitive verbs, as adverbials and as post-modifiers of noun phrases. In both the conversation and the narrative there were examples of possible mis-selection of prepositions, although these can be identified from the semantic context rather than from syntactic ill-formedness as is illustrated in the following excerpt from the narrative:

(xxii)

AD and (Cinderella) waited [waɪ] the [θru] sisters were taken away from the ball

From the context it is clear that AD is talking about the three sisters going <u>to</u> the ball rather than <u>from</u> it.

In addition, in the Cinderella narrative there is one use of a preposition which violates syntactic well-formedness:

(xxiii)

AD and was immediately seen of (1.8) the young princess

In this utterance <u>by</u> has been substituted by <u>of</u>. In the conversational data there were no such errors although there were four cases where AD self repaired and replaced one preposition with another.

7.2.4 Summary and interpretation of the analyses of sentence production

The findings of the various analyses reported above suggest that AD does have some impairment of sentence production processes. In this section an attempt will be made to relate them to the model of sentence production presented in 2.3.

AD's processing from the message level to the functional level appears to be intact. Although AD made a number of semantic paraphasias in the Cinderella narrative, on the basis of assessments of single word processing it is possible to reject an impairment in semantic processing as the locus of these. In both the conversation and the narrative, AD realised the majority of predicate argument structures appropriately. This indicates that there is no impairment to the processes involved in encoding thematic roles and mapping of semantic representations according to the relationships specified by the verb.

While processing to the functional level appears to be intact, there does appear to be impairment in processing to the positional level. On the basis of the findings concerning single word processing (7.1), it was proposed that the semantic paraphasias apparent in AD's narrative production arose in retrieval of lexical phonological representations. As AD demonstrated the ability to name all but very low frequency words on the naming assessments carried out (7.1.5), it is proposed that AD is impaired in the processes involving integration of lexical phonological representations into slots in the constituent frames.

While the majority of predicate argument structures realised were well-formed, a number of anomalous structures were found in both the conversation and the narrative. Two proposals have been put forward to explain the occurrence of these. It is suggested that some anomalous structures could be explained in terms of mis-selection of the lexical phonological representation of the verb. The second explanation offered is that anomalous structures are the consequence of sentential blends arising from impaired inhibitory connections between competing constituent frames. This resulted in failure to produce a single output (Harley, 1990). For some of the anomalous structures it is possible to invoke both explanations and indeed, a number of different difficulties may underlie AD's paragrammatic production. Since the evidence from the data does not offer greater support for one interpretation than the other, both seem to be equally valid.

An alternative explanation of paragrammatic utterances put forward by Butterworth and Howard (1987) is that the aphasic subject realises from both interlocutors' reactions, as well as from self-monitoring that his or her utterances are not conveying what was intended at the message level. This may result in a strategy of making more than one attempt to communicate a message. This may arise as a consequence of either of the impairments outlined above. It is proposed that this may account for the abandoned clauses found in AD's conversational turns.

The phrase structure produced by AD indicates that he is not impaired in accessing syntactic structures complete with bound grammatical morphemes or in accessing the free grammatical morpheme stores. While there were a small number of substitution errors in the conversation, these were usually self repaired and were greatly outnumbered by appropriate realisation of grammatical morphemes.

Two features of AD's sentence production were noted which cannot be dealt with by the model of sentence production being utilised in this investigation. First, AD produced a significantly greater proportion of embedding than the control subject in the narrative task. Furthermore, he produced multiple embedding not seen in the control subject's narrative which gave rise to incoherent utterances. Interestingly, this excessive use of embedding was not seen in the conversational data. One speculative explanation is that AD uses embedding as a strategy to blend the various constituent frames arising from failure to produce a single output because of impaired inhibitory connections between them. An alternative explanation, based on the absence of this phenomenon in the conversational data, is that it arises from the demands of the narrative task requiring sequential organisation of sentences into text. To my knowledge there has been no work in the aphasiological literature which investigates the differing demands of sentence production in story narrative and conversation.

The second feature, not explicable in terms of current sentence production models is AD's use of ellipsis. There was over-ellipsis of arguments functioning in subject position in conjoined sentences. It is suggested that Butterworth and Howard's (1987) explanation that errors involving traces may arise from a difficulty in holding markers in memory is congruent with the evidence of AD's impaired short term memory (identified in the assessment of comprehension abilities, see 7.3.6 below).

To conclude, although some of AD's sentence production problems can be linked to lexical retrieval problems, in contrast to subject EN (see 5.2.4), these only arise when the processes of lexical retrieval have to be integrated into sentence production. Furthermore, while for EN this impairment manifested itself in failures in retrieval leading to abandonment very early in the clause, for AD mis-selection errors were made giving rise to paragrammatic utterances.

7.3 Sentence Comprehension

7.3.0 Preliminary orientation

In this section, the findings from the sentence comprehension assessments with AD are presented and discussed in relation to the model of sentence comprehension outlined in 2.4.

7.3.1 PALPA assessments 55 and 56, auditory sentence comprehension and written sentence comprehension

AD was clearly impaired on this assessment. He scored 34/60 on the auditory version which fell well below both the mean of the PALPA control subjects and the range of the matched control subjects. While he performed at a higher level on the written version with 48/60 correct responses, this was also well below both the mean of the PALPA control subjects and the range of the matched control subjects. His performance on both versions is shown in table 7.13.

Examining first his performance on the auditory version, AD's performance fell below the range of the PALPA control subjects for all sentence types except for the sentences containing subject gaps. An examination of the error types for the whole assessment shows that errors consisted either of reversal errors or lexical distractor errors for the verb or adjective predicates. AD made no errors selecting lexical distractors for nouns. Given his ability to always reject this distractor, his overall score of 34/60 is close to what would be expected by chance, given forced choice from two pictures.

Table 7.13 AD's performance on PALPA assessments 55 and 56, auditory sentence comprehension and written sentence comprehension

Sentence type.	Assessment 55 (auditory version)	Assessment 56 (written version)
Reversible sentences	10/20 (50%)*	15/20 (75%)*
Non-reversible sentences	10/16 (63%)*	16/16 (100%)
Sentence with subject gap	6/8 (75%)	7/8 (88%)
Sentence with non-subject gap	4/8 (50%)*	6/8 (75%)
Converse relations	4/8 (50%)*	4/8 (50%)*
Total	34/60 (57%)	48/60 (80%)

(AD's score on sentence types marked with * fall below the range of performance of the PALPA control subjects)

AD made a greater proportion of errors on reversible sentences in comparison to non-reversible sentences (50% correct in comparison to 63% correct). Seven of the ten errors on the reversible sentences involved selection of the reversal distractor. Examining the non-reversible sentences, AD made a greater proportion of errors on the items containing an adjective predicate in comparison to those containing a verb predicate (37.5% correct in comparison to 87.5% correct).

AD made a greater proportion of errors on passive sentences in comparison to active sentences (50% correct in comparison to 75% correct). Performance was particularly poor for the reversible, passive sentences, with only one correct response out of four.

Examining the sentences containing gaps, AD's level of performance was particularly poor for sentences containing verb predicates, with only 4/8 correct in contrast to 7/8 correct for the sentences containing adjective predicates. AD made no correct responses for the four verb predicate sentences containing non-subject gaps.

AD also performed poorly on the converse relations verbs, making a correct picture selection for only half of the eight items.

An examination of AD's performance on the written version of this assessment shows that for this input modality AD only fell below the range of the normal control subjects for reversible and converse relation sentences.

As for the auditory version, reversibility is influencing AD's performance. For the written version the influence is particularly clear, with 100% accuracy for non-reversible sentences in comparison to 75% accuracy for reversible sentences. Furthermore, all errors involved selection of the reversal distractor.

A greater proportion of errors on passive constructions in contrast to active constructions in the written version of this assessment (67% in comparison to 92% correct) mirrors the trend found for the auditory version. As in the auditory version, more errors were made for reversible passive sentences than non-reversible passive sentences.

In contrast to AD's performance on the auditory version for sentences containing gaps, on the written version his performance fell within the range of the PALPA control subjects. His performance on the converse relation sentences was equivalent across modality, with only a fifty percent success rate.

AD's poorer performance on the auditory version in comparison to the written version can be accounted for by the impairment in access to the semantic system from the auditory input lexicon hypothesised on the basis of findings from the assessments of single word processing (see 7.1.3 above). As noted in 2.4.1, impairment at this level is clearly going to severely disrupt sentence comprehension. Impaired performance on the written version suggests, however, that the impairment in semantic access is not the only level of impairment disrupting sentence comprehension. In both versions of the assessment AD performs more poorly on reversible than non-reversible sentences. It appears, therefore, that AD was able to use semantic knowledge of the open class lexical items to perform well on non-reversible sentences but this strategy fell down for reversible sentences. As noted in 2.4.2, a myriad of different hypotheses have been put forward to explain such performance. Further consideration will be given to the various hypotheses in 7.3.6, after examination of the AD's performance on the remainder of assessments. Also of note is a uniformly impaired performance across both versions of the assessment for converse relation verbs. In contrast, AD performed within the range of the control subjects on all the sentence types containing gaps on the written version, despite poor performance on these types in the auditory version.

7.3.2 PALPA assessment 57, auditory comprehension of verbs and adjectives from the sentence set: AD's performance on this assessment fell well below the range of the PALPA control subjects, scoring 31/41 (76%) on form A and 30/41 (73%) on form B. The majority of errors (18/21) were false positives (i.e. acceptance of wrong definitions). In order to investigate whether this performance indicated a semantic processing impairment for adjective and verb predicates or instead simply arose as a consequence of AD's impaired access from the auditory phonological input lexicon to the semantic system (hypothesised from the findings of the assessments of single word processing assessments, see 7.1.3 above), AD was presented form A in written format. He made correct judgements for 38/41 of the items which fell within the range of the PALPA control subjects. This therefore indicates that AD has relatively well preserved semantic knowledge for verb and adjective predicates.

7.3.3 PALPA assessments 58 and 59, auditory comprehension of locative relations and written comprehension of locative relations

AD's performance on the two versions of this assessment again showed the poorer performance on spoken presentations of materials seen in the previous two assessments. He scored 5/24 on the auditory version which fell well below the range of the PALPA control subjects. His performance on the written version was 14/24 which is at the bottom of the range of the PALPA control subjects. In both versions he made both reversal and lexical errors. There was no discernible effect of the abstractness of items. It therefore appears that the hypothesised impairment in access to the semantic system from the phonological input lexicon accounts for impaired auditory performance.

7.3.4 PALPA assessment 60, pointing span for noun-verb sequences

AD scored 2/14 on this assessment, with accurate performance only for the SV structures. This level of performance fell well below the range of the matched control subjects and is indicative of a severe impairment in auditory short term memory. Further information regarding short term memory is provided by PALPA assessment 12, repetition of sentences reported below.

7.3.5 PALPA assessment 12, repetition of sentences

AD's performance on this assessment also fell well below the range of the PALPA control subjects, with only 7/30 sentences being repeated correctly. Given AD's impaired repetition on single word assessments (see 7.1.3 above), poor performance on repetition is not surprising. Phonemic paraphasias and neologisms that accounted for impaired performance on single word repetition only accounted for a small proportion of errors. A wide variety of errors occurred, including semantic paraphasias for verbs and adjectives, substitution of both function words and grammatical morphemes, perseveration of part of the previous sentence, and total failures. Examples of some of his errors are given below:

5) The girl is chasing the horse	The girl is ['tʃɛɪkɪŋ] the horse
6) The man is receiving the money	The man is saving the money
23) This man has got less horses	This man has more horses
7) The dog is followed by the man	The dog is following the man
17) The dog is frightened by the girl	The dog is frightened with the girl
18) The girl is indicating where to go	The girl is (3) licking to the [gəs]

It is of interest to note the semantic errors. This form of error is not found on single word repetition tasks. The errors involving function words and grammatical morphemes indicate that AD may have a specific impairment in processing at this level. As noted in 2.4.2, closed class vocabulary is thought to play an important role in sentence parsing as it provides important cues about syntactic structure. AD's repetition performance on function words in isolation was investigated with PALPA assessment 10, grammatical class repetition in order to investigate whether a similar impairment was discernible. AD performed at an equivalent level of performance for all categories. He made no substitution errors for function words, all errors being phonemic paraphasias.

The hypothesised impairment in accessing the semantic system from the phonological input lexicon is clearly going to interfere with sentence repetition. Performance also indicates impaired short term memory and this is supported by poor performance on PALPA assessment 12, noun-verb pointing span (see 7.3.4 above).

7.3.6 Summary and interpretation of performance on sentence comprehension assessments

In all of the assessments that were presented in both spoken and written modalities, AD performed particularly poorly on the auditory versions. There are two possible explanations for this. First, an impairment in access from the phonological input lexicon to the semantic system, hypothesised on the basis of his differential performance on the auditory and written versions of PALPA assessments 49 and 50, synonym judgement (see 7.1.1 above) provides a plausible explanation for poorer performance on auditory sentence comprehension assessments. Second, a short term memory impairment, indicated both by performance on PALPA assessment 60, pointing span for noun verb sequences and PALPA assessment 12, repetition of sentences could offer an alternative explanation. According to this possibility, AD performs at a higher level on written versions of assessments because these allow continued exposure to the stimuli and therefore involve a smaller memory load. A short term memory impairment could also provide an explanation of AD's impaired performance on the auditory synonym judgement task. While he was able to perform within the normal range on assessments of semantic processing involving a single word (e.g. PALPA assessment 48, auditory word picture matching), memory limitations compromise performance for assessments involving processing of two or more items.

Performance on written sentence comprehension (see 7.3.1), while better than performance on the auditory version was still clearly impaired. As discussed in 2.4.2 to 2.4.3 there have been numerous hypotheses proposed to account for impaired sentence comprehension (see table 2.1, p.92). The various possibilities will be briefly considered in turn.

First could AD's impaired performance be explained in terms of a partial syntactic deficit? Grodzinsky (1986) proposed that this represents an impairment in co-indexing traces at S-structure. AD's more impaired performance on passive sentences than active sentences is congruent with this explanation. His performance within the normal range on gapped sentences which involve co-indexing of traces does not fit with this explanation. An alternative interpretation of the partial syntactic deficit proposed by Caplan and Hildebrandt (1988) is that there is a reduction in parsing workspace. In addition, different aphasic subjects have specific impairments in the parsing process. In order to identify such patterns with AD, it would be necessary to explore his performance with a larger number of different syntactic constructions in order to tease out any specific deficits.

It has been proposed that an impairment in processing closed class grammatical items will result in asyntactic comprehension. While the occurrence of substitution errors of grammatical morphemes in the sentence repetition task (see 5.3.5) indicates a possible impairment in processing these items, AD's repetition of function words in isolation was not impaired. Further exploration of the processing of these items using grammaticality judgements would be useful to the consideration of this hypothesis.

The hypothesis of impaired short term memory has already been invoked in relation to AD's poorer performance on the auditory version of the sentence comprehension assessment. It is possible that the same impairment also interferes with AD's ability to parse written sentences. There is clear evidence that AD does have a short term memory impairment (see 7.3.4 and 7.3.5).

Two further hypotheses relating to loss of crucial input preventing syntactic analysis have been discussed in 2.4.2. The first is Linebarger, Schwartz and Saffran's (1983) trade-off hypothesis. The second is a loss of efficiency not specific to the parser (Grodzinsky, Swinney and Zurif, 1985). It is not possible to confirm or reject either of these hypotheses as an explanation of AD's performance on the basis of the findings available.

Finally, there have been a number of hypotheses suggesting that sentence comprehension impairments arise from a failure to map thematic roles. AD's impaired performance for both reversible sentences and the converse relations sentences could be taken as indicative of problems in a mapping impairment. It has been suggested, however, that there may be a central mapping procedure common to both production and comprehension (Byng, 1988, see 2.3.1). AD does not have a mapping impairment in sentence production, indicating that his impairment in sentence comprehension does not arise at this level.

The discussion of AD's performance in terms of the numerous hypotheses that have been put forward to explain impaired sentence comprehension makes clear that it is not possible to propose one possibility over the others. This difficulty can be seen to reflect the under-specification of the present models as well as arising from the need for more detailed investigations.

7.4 Summary of the findings of the cognitive neuropsychological investigations

The analyses described in this chapter have allowed the formulation of specific hypotheses regarding impairments to the levels of processing specified in the models presented in Chapter Two.

The assessments of AD's single word processing allowed the identification of an impairment in access to the semantic system from the phonological input lexicon. The possible role of a short term memory impairment (identified from the investigations of processes involved in sentence comprehension) was also considered. Also apparent from the investigations of single word processing was an impairment in access to the phonological output buffer. AD made phonological errors in oral reading, repetition and picture naming, although the proportion of errors made for the different tasks varied. A mild impairment in access to the phonological output lexicon was proposed to explain the small number of failures to name the low frequency items on the Lesser syllabic naming test.

On the basis of the sentence production analyses, it was proposed that AD is impaired in the processes involving integration of lexical phonological representations into slots in the constituent frames, with mis-selections giving rise to semantic paraphasias in sentences. It was also suggested that this impairment could account for some of the anomalous predicate argument structures produced by AD. An alternative hypothesis put forward was that there was impaired inhibitory connections between competing constituent frames (Harley, 1990).

The sentence production analysis also allowed identification of impairments in two aspects of sentence production not dealt with by current sentence production models. The first was excessive use of sentential embedding in the narrative task. The second was over-ellipsis. Tentative hypotheses were put forward to account for these findings.

The investigations of sentence comprehension also showed that AD has impairments to processes at this level of language. He showed a more severe deficit in auditory comprehension than written comprehension. This was linked to the comprehension impairments identified from the investigations of single word processing. In addition, his performance indicated impairment to processes specific to the sentence level. A number of hypotheses were considered although it was concluded, given the under-specification of sentence comprehension models as well as the limited amount of data collected from AD, that it is not possible to decide between these.

The investigations reported in this chapter have allowed identification of AD's language impairments in terms of a cognitive neuropsychological framework. These findings will be drawn upon in the investigation of AD's conversational ability in the next chapter.

Chapter Eight

CONVERSATION ANALYSIS OF SUBJECT AD

8.0 Introduction

In this chapter, the findings of the analysis of AD's two conversations (with a relative and with the researcher respectively, as described in 4.5) are presented. The format of the chapter will follow that developed in the analysis of subject EN's conversation in Chapter Six, with the presentation of turn-taking patterns in 8.1, the analysis of self repair in 8.2 and the collaborative repair analysis in 8.3. Following the detailed analysis carried out in Chapter Five, the reporting in this chapter has been kept much briefer. Attention is drawn to similarities in the findings of the analysis of AD to that of EN, and where differences occur these are explicated more fully. In particular, the chapter orients to the three major issues identified in the summary of Chapter Six. These are; preserved knowledge of conversational management procedures; identification of manifestations of cognitive neuropsychological impairments; and finally the impact of the conversational partner on the nature of the interaction.

8.1 Analysis of turn-taking

8.1.0 Preliminary orientation

AD's general turn taking abilities and his treatment of attributable silences on the whole mirrored those evident in EN's conversations (see 6.1.1 and 6.1.2). Thus, these two issues are dealt with briefly in 8.1.1. The pattern of usage of major and minimal turns across AD's two conversations was, however, different to that observed in EN's conversations and this is examined in 8.1.2.

8.1.1 General turn-taking abilities and treatment of attributable silences

In 6.1.1 the evidence for EN's retained turn-taking abilities was presented. Overall, the findings from the analysis of AD's conversations were very similar to those of EN. He demonstrated retained knowledge of the rules operating in turn taking, taking the floor with no gap or overlap. Excerpts illustrating this are given in appendix G. This provides evidence of sensitivity to cues indicating transition relevance places which in turn suggests that he has retained ability to process syntactic and prosodic features thought to be involved in the projectability of turn endings. While for EN, the cognitive neuropsychological findings indicated relatively well preserved auditory comprehension for both single words and sentences, AD shows impaired auditory comprehension at both these levels (see 7.1.2 and 7.3 above). Thus, the analysis of turn-taking shows that comprehension impairments of this magnitude do not adversely affect turn-taking abilities. This is congruent with reports in the literature of preserved turn-taking for aphasic subjects with relatively severely impaired comprehension (Schienberg and Holland, 1980, see 3.1.1 above).

Where overlap occurred in the conversations, it was quickly resolved through one of the speakers dropping out. AD on occasions recycled parts of his turn obscured by overlap, further demonstrating retained turn-taking ability (see appendix G for illustration).

One difference emerged in the analysis of turn taking between AD and EN, however. In both of EN's conversations there were instances where she lost the floor after initiating a turn because of long pauses at the start of the turn which were not tolerated by her conversational partners (see *(iii)*, p.207). There were no such instances in AD's conversations. The difference appears to relate to the different patterns in the use of self repair between the two subjects and is discussed further in relation to the utilisation and success of the self repair patterns of delay and repetition (see 8.2.3 and 8.2.4 below).

As was found for EN, AD showed the ability to interpret attributable silence after his turn as indicating a problem with his presentation which required repair work (see appendix G). This provides evidence of another aspect of AD's knowledge of the rules governing conversation which is preserved.

8.1.2 Analysis of major and minimal turns

Figure 8.1 displays the proportion of major turns produced by each of the interlocutors in AD's two conversations.

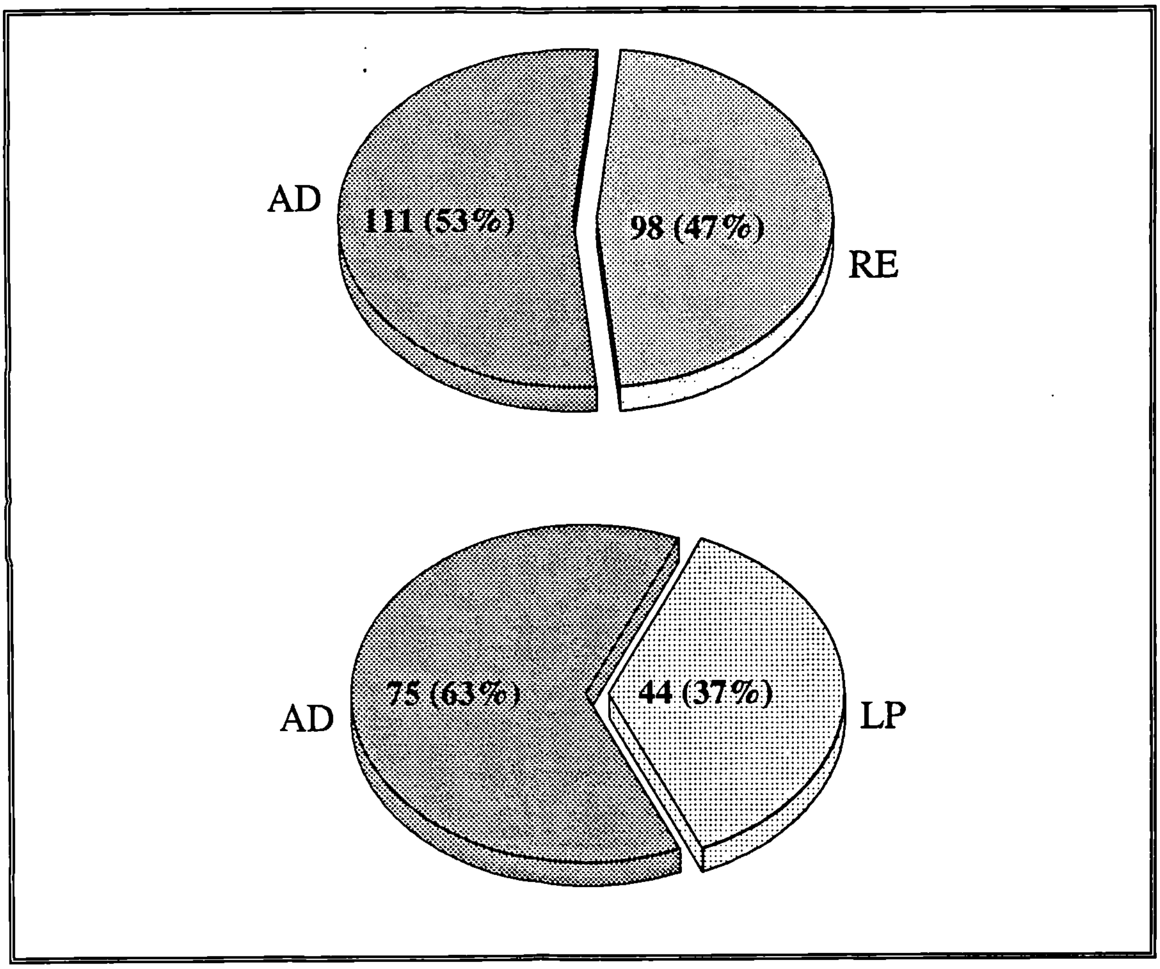

Figure 8.1 The proportion of major turns produced by AD and his conversational partners

In contrast to EN, there was not such a striking difference between the proportion of major turns produced by AD in the two conversations. The production of a greater proportion of major turns by the aphasic subject in the conversation with the researcher in comparison to that with the relative was also found for EN. It was suggested in 6.1.3 that this relates to the nature of the conversation, with the researcher eliciting information through questions which return the conversational burden to the aphasic interlocutor and force him or her to take major turns.

While AD produced a smaller proportion of major turns in the conversation with RE, he did not rely on the use of minimal turns to participate in the discourse as was observed in EN's conversation with BC. AD and RE contributed about equal proportions of major turns to the conversation. It therefore appears that AD continues to participate actively in conversation despite his language impairments.

8.2 Analysis of self repair

8.2.0 Preliminary orientation

In this section an examination of AD's use of the four types of self repair identified and described in 4.4.3 is undertaken. The structure of the section follows that developed in 6.2 with an account of the quantity of use, the possible links between usage and underlying cognitive neuropsychological impairments, and the outcome in terms of success or failure for each of the self repair patterns. As discussed in 6.2.0, a comparison of the aphasic subjects' usage of a particular pattern of self repair to that of the normal interlocutors is used to decide whether usage can potentially be linked to the subject's cognitive neuropsychological impairments.

8.2.1 Replacement repairs

Quantity of replacement repairs*:* In both conversations the proportion of AD's major turns containing replacement repairs greatly exceeded the range of usage for the normal interlocutors (2% to 14% of major turns). The proportion was particularly large in the conversation with LP, with 44% of major turns containing one or more replacement repairs. 23% of major turns in the conversation with RE contained this repair type.

The differential pattern of this repair type in the two conversations follows the trend found in EN's conversations for all types of self repair, with a greater proportion in the conversation with the researcher in comparison to the relative. While in EN's conversation with BC, her opportunities to carry out self repair were reduced because BC sometimes took the floor before EN had completed her turn, this does not seem a likely explanation for the smaller proportion of replacement repairs produced by AD in the conversation with RE. It would appear that the contrasting nature of the two conversations gives rise to this difference (see 4.4.1). It is possible that the allocation of the conversational burden to the aphasic subject in the conversation with the researcher gives rise to a greater need for self repair.

Given AD's more frequent recourse to this repair type than the normal interlocutors, it is reasonable to suggest that his cognitive neuropsychological impairments give rise to its use. The nature of the trouble sources giving rise to AD's replacement repairs are examined below in an attempt to link their usage to specific cognitive neuropsychological impairments.

Links between the use of replacement repairs and underlying cognitive neuropsychological impairments: 43% (20) of the replacement repairs in the conversation with LP and 33% (nine) of the replacement repairs in the conversation with RE dealt with a phonological error as exemplified below:

(i)

14 AD in the [ɒld] the er (0.7) [ɒl ˈɒli ˈɒbɪtɛnli] the hhh (0.5) not like university like we used to have

(target = polytechnic)

(ii)

127 AD ...because [ˈmɒnɪndʒaɪtəs mɔn] meningitis come now doesn't it

A large number of the phonemic paraphasias and partial phonological attempts which became the focus of replacement repairs were attempts at multisyllabic targets as seen in *(i)* and *(ii)* above. Furthermore, AD often produced multiple attempts at the replacement. The use of replacement repairs for these cases seems to be related to impairment in access to the phonological output buffer identified in the assessment of single word output processing (see 7.1.3 to 7.1.5).

The next largest group of trouble sources giving rise to replacement repairs involved replacement of grammatical features including replacement of both free grammatical morphemes (such as determiners, auxiliary verbs, pronouns and prepositions) and bound grammatical morphemes (such as verb agreement markers and modifiers of tense and plurality). They accounted for 43% (20) of the replacement repairs in the conversation with RE and 41% (11) of the replacement repairs in the conversation with LP. For example:

(iii)

37 AD it was <u>at</u> the it was <u>down</u> the er down the river

(iv)

146 AD the new erm class the new class<u>es</u>

(v)

177 AD and get <u>him</u> cut get <u>it</u> cut

As noted in 4.4.3, although repairs of this type are found in the conversational turns of the normal interlocutors, they are not found in this quantity. The analysis of sentence production (7.2) identified a small number of tokens in which AD made errors in selecting grammatical morphemes, although overall there were very few errors. The occurrence of these repairs demonstrates that AD has good self-monitoring ability.

Also found in both conversations were replacement of words being cut off and subsequently produced in full where there was no audible error, as well as replacement of nouns and verbs. Such replacements were also found in the conversational turns of the normal interlocutors.

Success of replacement repairs*:* 24% (11) of the replacement repairs in the conversation with LP and 8% (two) of the replacement repairs in the conversation with RE failed. The majority of failures arose with AD's attempts to self correct errors that were phonological in nature, with his conversational partner initiating collaborative repair by offering a demonstration of understanding reached as is illustrated here:

(vi)

14 AD in the [ɒld] the er (0.7) [ɒld 'ɒli 'ɒbitɛnli] the (0.5) not like university like we used to have
[
15 LP a polytechnic

16 AD mm yes

In T14 AD makes several attempts to replace a phonological error. Eventually he gives up on the replacement repair and provides circumlocutory information which enables LP to contribute the word in a demonstration of understanding reached. This example clearly shows the collaborative nature of the resolution of the trouble source.

One failure of a replacement repair in the conversation with LP arose from the replacement of a lexical verb:

(vii)

111 AD ...if they've had to er to er ['lɪfə] to live a to do this sort themselves you see later on y'know it's it (can be)
[
112 LP what if* they have to take part in a war you mean

The replacement of to live a with to do this sort themselves appears to arise from a problem in lexical selection of the verb. AD in his replacement produces the high frequency, semantically non-specific verb do. Since it was noted in the analysis of sentence production that AD appears to be impaired in the integration of lexical phonological forms into constituent frames, it seems reasonable to suggest that AD falls back on a general verb to compensate for lexical retrieval impairments. The replacement can be seen to be a failed repair attempt, however, because acceptance is not completed in the next turn. In T112 LP makes a request for clarification which gives rise to a collaborative repair sequence.

Summary: AD's usage of replacement repairs exceeds that of the normal interlocutors, suggesting that it arises as a consequence of his cognitive neuropsychological impairments. This conclusion is supported by close examination of the trouble sources, with the majority being phonemic paraphasias. While the majority of repairs were successful, it is possible to identify links with the impairment in access to the phonological output buffer in respect of the few tokens that failed to achieve acceptance in the next turn. In addition, there was one attempt at replacement which appeared to arise from problems integrating lexical phonological representations into constituent frames.

8.2.2 Abandoned clauses followed by subsequent clauses

Quantity of repairs: AD's use of this repair pattern exceeded that of the normal interlocutors with 21% of his turns in the conversation with LP and 12% of his turns in the conversation with RE containing abandoned clauses followed by subsequent clauses (range of normal interlocutors = 1% to 5%). It seems likely that AD's cognitive neuropsychological impairments are giving rise to a greater utilisation of this repair strategy.

AD utilised this repair strategy to a greater extent in the conversation with the researcher, following the trend found for replacement repairs. It was proposed in 8.2.1 that greater self repair in the conversation with the researcher in comparison to the relative may be accounted for by the contrasting nature of the two conversations.

Links between the use of abandoned clause followed by subsequent clause and underlying cognitive neuropsychological impairments: As noted in 4.4.3, it is difficult to establish for an individual case the nature of the trouble source giving rise to this form of repair. In contrast to EN (see 6.2.2) who abandoned a large number of clauses after the production of subject plus auxiliary verb, AD in the majority of cases produced a greater part of the clause before abandonment.

A number of the abandoned clauses could be explained as arising from failures in lexical retrieval as can be seen in the following example:

(viii)

153 AD it was started Africa but then it came back to the the into the (2.1) mm now it was after the American it was after the American armies came as well into er into er (1.0) eee I can't remember all this now it's terrible (1.0) it was *the* it was *on the (0.9) shall we say the west side*

The first clause is abandoned towards the end after a determiner and a 2.1 second delay at the point where a noun is required. The subsequent clause is also abandoned towards the end of a clause after repetitions and at a point where a noun is expected. AD then produces metalinguistic comments (I can't remember all this now it's terrible) before finally producing a complete clause. It is of interest to note that he still does not produce the name of the country which he has been trying to access, instead producing circumlocutory information (the west side of Africa).

There was also a number of abandoned clauses followed by subsequent clauses which had no indication (in the form of editing terms) of problems in lexical retrieval as exemplified in the following excerpt:

(ix)

2 AD ...it was done it wasn't that I did it because I lived at I I did it when I was a I was a police officer who was working while I was doing it

AD abandons two clauses, moving onto the next one without a delay. As noted in 4.4.3, abandonment of clauses is a normal conversational phenomenon and may arise because of a change at the message level. AD's usage, however, exceeds that found for the normal interlocutors and this suggests involvement of cognitive neuropsychological impairments in its usage. One possible explanation is that the limitations put upon him by problems in lexical retrieval in sentence production (identified in the sentence production analysis in 7.2.2) gives rise to the production of clauses which do not adequately express what is intended at the message level; thus the clause is abandoned and another one is initiated. This is in line with Butterworth and Howard's (1987) proposal (discussed in 7.2.2) that from interlocutors' reactions and self-monitoring, the aphasic subject becomes aware of failure to convey what is intended at the message level and this results in him or her adopting a strategy of making more than one attempt to communicate an utterance. It is also in line with Edwards and Garman's (1989) explanation of their aphasic subject's "press of speech" (see 3.1.1).

Success of abandoned clauses followed by subsequent clauses: AD's use of this repair pattern was more successful than EN's. In the conversation with LP, 63% of this repair strategy was successful (15 tokens) and in the conversation with RE, 80% of this repair strategy was successful (eight tokens). 55% of failures (six tokens) arose from recursive use of the repair pattern with the subsequent clause also being abandoned and being followed by a further subsequent clause. This is seen in excerpt *(ix)* above.

The remaining 45% of failures in the use of this repair pattern (five tokens) occurred because collaborative repair work was initiated on the subsequent clause. This arose for a variety of reasons, including the production of phonemic paraphasias, use of a non-specific referring expressions and errors in lexical selection. As will be discussed further in the collaborative repair analysis (see 8.3 below) the collaborative sequences arising from failure in AD's use of this repair were resolved much more quickly than those found in EN's conversation. This difference appears to arise from AD's provision of a lot more information in his subsequent clauses, so that less collaborative effort is required to achieve completion of the acceptance phase.

Summary: AD's use of this repair pattern exceeded that of the normal interlocutors, which suggests that greater usage may arise as a consequence of cognitive neuropsychological impairments. On some occasions the form of abandonment and of the subsequent clause is indicative of problems in lexical retrieval which can be linked to the problems in integrating lexical phonological representations into constituent frames.

AD differed from EN in his use of this repair pattern with both less overall usage and more successful usage. This suggests that AD's less severe lexical retrieval impairment (as seen from a comparison of findings of both the single word assessments and sentence production analyses) gives rise to less reliance on this repair pattern as well as greater ability to use it effectively.

8.2.3 Repetition repairs

Quantity of repetitions: AD used this repair pattern extensively with a greater proportion of repetitions in his major turns than the normal interlocutors. Following the trend found for the previous two repair patterns discussed above, a greater proportion was found in the conversation with LP (41% of major turns) in comparison to the conversation with RE (22% of major turns), (range of normal interlocutors 0% to

12%). It seems reasonable to suggest a relationship between AD's language impairments and his extensive usage of repetitions.

Links between the use of repetition repairs and underlying cognitive neuropsychological impairments: In addition to the large quantities of turns containing tokens of repetitions, there was often more than one token of repetition in a turn and repetition often involved several words rather than one single word. For example:

(x)

2 AD it was it was done the it was done the hard way I did it

(xi)

76 AD people laugh at us they they they they talk about it as though it's er you know not a laugh...

One outcome (or effect) of multiple repetitions and repetitions of more than one word which emerges clearly from these examples is a period of time to deal with the underlying trouble source giving rise to the editing term while the impression of fluency is maintained.

Examining the repetitions from the two conversations as a whole, 53% (52 tokens) occurred in isolation from other repair patterns. As discussed in 4.4.3, when repetition repair occurs in isolation it is difficult to detect the trouble source and propose whether its use can be linked to manifestations of cognitive neuropsychological impairments.

A further 12% of repetitions (12 tokens) occurred in conjunction with delays. This differs from EN, 65% of whose repetitions co-occurred with delays. Thus, AD appears to favour long repetitions which give more time, while EN used a combination of repetition and delay. AD's strategy is more successful in that it gave fewer opportunities for the conversational partner to either gloss over his turn or initiate collaborative repair work. Given the evidence of AD's impaired lexical retrieval in a sentential context, it seems plausible to suggest that his extensive use of repetitions is linked to their effect of allowing more time for lexical retrieval. The following example suggests that this is the case:

(xii)

2 AD I did it myself in my in the London (1.0) hhh London (1.4) hhh dear dear London (3.4)

3 LP was this a London University

In T2 AD repeats <u>London</u> three times in conjunction with filled and unfilled pauses. Despite the time given by these editing terms, AD does not manage to complete the turn. In T3 LP initiates collaborative repair by asking a question in which the word that AD has not been able to access is produced. The fact that AD is having problems accessing a five syllable word is suggestive of an interaction between impairments to both the phonological output lexicon and the phonological output buffer.

A further 21% (21 tokens) of the repetitions were associated with replacement repairs, a number of which were dealing with phonemic paraphasias and neologisms. It appears that AD used repetition to give time before attempting the replacement, which can be seen to arise as a consequence of impairments in access to the phonological output buffer as is seen in the following excerpt:

(xiii)

172 AD so they backed me from the ['mɛdʒi] the the the the*

[

173 LP the regiment

AD ['wɛdʒimənt 'wɛdʒəmənt] yeah

174 LP aha

AD cuts off a phonological error, the repetitions of the making clear that he is attempting a replacement repair on the phonological error. In this case the use of repetition repair can be seen to have failed because LP initiates collaborative repair work in overlap before AD has produced the replacement.

The remaining 14% of repetitions (14 tokens) occurred in clauses which were subsequently abandoned. The problems of identifying the nature of underlying trouble sources in this context has already been discussed in 4.4.3.

Success of repetition repairs: In AD's conversation with LP, 19% of repetitions (13 tokens) occurred in abandoned clauses in contrast to only 3% (one token) in the conversation with RE. The difficulty in deciding upon the success of an editing term which occurs at a point where the clause is abandoned is discussed in 4.4.3. The discrepancy in proportions between the two conversations can be linked to the greater number of abandoned clauses followed by subsequent clauses in AD's conversation with LP.

For the remainder of repetition repairs, 87% in the conversation with LP and 92% in the conversation with RE were successful. Excerpt *(xiii)* above shows the failure of repetition in the environment of a phonological error while excerpt *(xii)* demonstrates failure arising as a consequence of a failure in lexical retrieval. In both cases collaborative repair is initiated. The following excerpt shows failure where AD attempts to make a replacement repair on a lexical error:

(xiv)

190 AD and once I get those done I'll have to cut all the er trousers the the the

191 RE *the trees*

Failure arises because RE initiates collaborative repair by providing a collaborative completion before AD has successfully completed the repair.

Summary: On the basis of AD's extensive use of this repair pattern, it seems reasonable to suggest a link with underlying cognitive neuropsychological impairments. Over half of the repetitions occurred in isolation from other repair patterns which makes it difficult to hypothesise about the nature of the underlying impairment although it does demonstrate the effectiveness of this repair pattern for AD. It is possible from the failed use of repetitions to propose links with the impairments in access to the phonological output buffer and in integration of lexical phonological representations into constituent frames.

8.2.4 Delay repairs

Quantity of delay repairs: In AD's conversation with LP, 33% of major turns contained delays in contrast to 23% of major turns in the conversation with RE. This frequency of usage is greater than that found in the conversational turns of the normal interlocutors (range from 0% to 9%) suggesting that use of delays may be a manifestation of AD's cognitive neuropsychological impairments. The greater use of delays in the conversation with LP follows the trend found for all of the other patterns of repair discussed above.

Links between the use of delay repairs and underlying cognitive neuropsychological impairment: Although AD's use of delay repairs exceeds that of the normal interlocutors, 67% of the delays in his conversational turns consist of either a filled pause or an unfilled pause not exceeding one second. The majority of the remainder do not exceed two seconds. Therefore, the duration of AD's delay repairs is similar to the normal interlocutor's in contrast to EN's use of much longer delays (see 6.2.4).

In the conversation with LP, 36% of the delay repairs (13 tokens) and in the conversation with RE 18% of the delay repairs (five tokens) occurred between an abandoned clause and a subsequent clause. The difficulties in identifying the trouble source underlying editing terms in this position have been discussed in 4.4.3. There are some examples, however, which clearly arise as a consequence of lexical retrieval problems as has already been discussed and exemplified in *(xii)*, p.319 above.

In the conversation with LP, 39% of the delays (14 tokens) and in the conversation with RE, 43% of the delays (12 tokens) occurred in isolation from replacement repairs or abandoned clauses followed by subsequent clauses. The absence of any other form of repair makes it difficult to identify what has given rise to these delays although they show AD's effectiveness in using this repair type. It is possible that the delays occur to give more processing time to deal with either the lexical retrieval problems or phoneme serialisation problems identified from the cognitive neuropsychological investigations described in Chapter Seven. The following example shows the effectiveness of AD's use of a combination of filled pauses and repetitions to hold onto the floor and effect self repair:

(xv)

10 AD ...but I also did it at Newcastle 'hhh and er and and and erm in Middlesborough

For the remainder of delays, clear evidence of the link between AD's cognitive neuropsychological impairments and his use of delays was found. A number could be related to his impairment in accessing the phonological output buffer, either because of a phonological error being produced following the delay (as seen in *(xvi)* below) or because of the delay occurring within a replacement repair (see *(xvii)* below):

(xvi)

159 AD ...you get you (1.0) 'hhh err: (1.6) [kalf kɒl 'kɒlvənəns kɒlf kə]

(xvii)

14 AD in the [ɒld] the er (0.7) [ɒl 'ɒli 'ɒbitɛnli]...

Delays also occurred in environments of apparent lexical retrieval problems, for example:

(xviii)

2 AD I did it myself in my in the London (1.0) hhh London (1.4) hhh dear dear London (3.4)

3 LP was this a London University

Success of delay repairs: After exclusion of the delay repairs occurring between abandoned clauses and subsequent clauses, 65% of the delay repairs in the conversation with LP (13 tokens) and 54% of the delay repairs in the conversation with RE (11 tokens) were successful. There was a clearly identifiable link between the length of delay and the outcome of its usage, with the great majority of longer delays occurring in failed repairs. Failures arose from initiation of collaborative repair work by the interlocutor (as seen in *(xviii)* above) or from AD initiating subsequent repair work (as seen in *(xvi)* above).

Summary*:* AD used delay repairs to a greater extent than the normal interlocutors, indicating that they are a manifestation of his cognitive neuropsychological impairments. A large number of delays occurred in isolation from further repair or between an abandoned clause and subsequent clause and it is difficult to establish a link with impairments giving rise to their use. For the delay repairs that occur with further repair, however, links between AD's impairment in access to the phonological output buffer and in lexical retrieval can be identified. The majority of failures arose after AD's longer delays, with the conversational partners initiating collaborative repair.

8.3 *Analysis of collaborative repair*

8.3.0 Preliminary orientation

The presentation of the analysis of collaborative repair follows the framework developed in 6.3, with frequency of collaborative repair sequences presented in 8.3.1, links between the initiation of collaborative repair and underlying cognitive neuropsychological impairment discussed in 8.3.2, and the issue of mode of resolution of collaborative repair sequences addressed in 8.3.3. Throughout the section, similarities and differences between AD's two conversations are discussed. The findings of the analyses of EN's conversations (which have been explicated fully in 6.3) are compared to those of AD's conversations and similarities and contrasts are commented on.

8.3.1 Frequency of collaborative repair in AD's conversation

In the conversation with the researcher LP initiated 11 collaborative repair sequences on AD's major turns. This is a smaller number than observed in the researcher's conversation with EN (see 6.3.1) in which 18 collaborative sequences were initiated. This suggests that the manifestations of EN's language impairments gave rise to the need for the conversational partner to take a greater part of the interactional burden than did AD's, although the nature and resolution of the collaborative repair sequences need to be examined to explore this proposal further.

The same pattern of more frequent collaborative repair for EN in comparison to AD is not found in the conversations with relatives. AD's relative, RE, initiated 16 collaborative repair sequences on his major turns which contrasts to only three collaborative sequences initiated by BC on EN's turns. Thus, the opposite pattern is found with an apparently greater need for collaborative repair work for AD in conversation with his relative. As has been discussed in 6.3.1, however, the small number of collaborative repair sequences initiated by BC on EN's turns cannot be seen as a measure of a low level of manifestation of language impairment. Rather, it appears to arise from BC's strategy of glossing over EN's problematic turns. Thus, the striking difference in quantity of repair between the subjects' conversations with their relatives can be linked to different strategies used by BC and RE in handling trouble in the interaction. RE's strategy is similar to that used by LP with both aphasic interlocutors, in that she bears more of the interactional burden by working collaboratively with AD to achieve acceptance of his presentations.

The difference between the strategies used by the relatives raises a number of interesting issues. In 6.3.1 it was suggested that the difference between BC and LP in the use of the strategy of glossing over problematic turns can be seen to partly relate to the quantity of knowledge shared by interlocutors. The different strategy usage between BC and RE, however, shows that a high level of shared knowledge does not invariably lead to the selection of a glossing over strategy rather than a collaborative repair strategy to deal with problematic turns. What explanations can then be offered to explain the differences between BC and RE?

One possibility is that the difference in the two aphasic subjects' cognitive neuropsychological impairments and their manifestation in terms of self repair patterns may have an impact on the way that conversational partners deal with problematic turns. EN and AD differed in their usage of editing terms (see 6.2 and 8.2 respectively), and the large number of long delays in EN's conversation made her vulnerable to losing her turn. In contrast, AD's greater use of repetitions and filled pauses as editing terms resulted in greater success in holding the floor. In addition, the severe impact of EN's lexical retrieval impairment gave rise to collaborative work in which establishment of a general understanding of EN's whole presentation was at issue (6.3.2). This required greater collaborative effort than the majority of collaborative repairs which arose in

AD's conversations where the focus was on a single lexical item (see 8.3.2 below). Where collaborative repair work requires a large investment of collaborative effort, the conversational partner may avoid collaborative repair and instead gloss over the problematic presentation.

A further possible explanation of the use of different strategies by BC and RE is a difference in personal discourse styles. While there has been relatively little work on this issue, research has indicated that individual variation exists between interlocutors in the use of minimal turns (e.g. Tottie, 1990, Jefferson, 1984, see 3.1.2 above). It is possible that interlocutors differ in their use of strategies to deal with problematic turns. This has implications for indirect intervention in which strategies with the aphasic subjects' principle communicative partners are developed, as explored further in Chapter Eleven.

A further striking difference which emerges from a comparison of the frequency of collaborative repair sequences for the two subjects is in the initiation of collaborative repair sequences by the aphasic subjects on the turns of their conversational partners. In the conversation with LP, AD initiated two collaborative sequences and in the conversation with RE he initiated 12 collaborative sequences. This is in contrast to the absence of collaborative repair sequences initiated by EN following the normal interlocutors' turns.

The difference in the frequency of collaborative repair sequences initiated by AD for the two conversations demonstrates that there is not a simple causative relationship between cognitive neuropsychological impairment and initiation of collaborative repair sequences. It is clear that the nature of the conversation is also having an influence. As noted in 4.4.1, in the conversation with LP the aphasic subjects talk about topics involving themselves, with very little information concerning LP being broached. In contrast, in the conversation with RE, AD requested information from her and it appears that clarification on this information gave rise to a greater frequency of initiation of collaborative work on RE's presentations. This issue is discussed further in relation to manifestations of cognitive neuropsychological impairments in 8.3.2 below.

8.3.2 Links between initiation of collaborative work and underlying cognitive neuropsychological impairment

The majority of collaborative repair sequences initiated on AD's turns were focused on particular words in both conversations. This differs from those initiated in EN's conversations where often the establishment of a general understanding of EN's multiply repaired whole presentation was at issue (for example, see *(xxi)*, p.328 below).

In the conversation with LP 45%, (five) of the collaborative repair sequences were focused on correction of a phonemic paraphasia or neologism. In the conversation with RE, 19% (three) were of this nature. Thus, we see a manifestation of AD's impairment in access to the phonological output buffer in the collaborative repairs. For example

(xix)

172 AD so they backed me from the ['mɛdʒi] the the the the*
[
173 LP the regiment
AD ['wɛdʒimənt 'wɛdʒimənt] yeah
174 LP aha
175 AD so they took me back again...

Following a phonological error by AD, LP provides a demonstration of understanding reached for the word <u>regiment</u> in T173 (in overlap of AD's attempt to self repair). AD attempts to incorporate LP's demonstration into his presentation by repeating it but produces phonemic paraphasias. His acceptance of her demonstration is marked by <u>yeah</u> at the end of his turn. LP then provides acceptance of his presentation in T174.

There was one collaborative sequence in each of AD's conversations which seemed to arise from a failure in lexical retrieval, both of which were resolved by the conversational partner providing the word. In addition, in the conversation with RE 31% (five) of the collaborative repairs arose from errors in lexical selection. Thus, we see a manifestation of the lexical selection problem in a sentential context identified in the analysis of sentence production (see 7.2.2). Three of these were semantically related (garden repaired to grass, afternoon to weekend, time to miles), one was semantically and phonologically similar (treated repaired to trimmed) and one was semantically unrelated but shared the same initial cluster:

(xx)

190 AD I'll have to cut all the er trousers the the the

191 RE the trees

192 AD the trees that's right

[

193 RE aha

Errors such as these suggest an influence of backward activation from the phonological output buffer on retrieval from the lexicon. The absence of such trouble sources giving rise to collaborative repair in the conversation with LP is perhaps surprising. One possible account for the difference in this manifestation of language impairment is that the greater shared knowledge between AD and RE gives rise to a higher level of detection by RE. In contrast, in the conversation with LP the smaller amount of shared knowledge of the topics being discussed may result in semantic errors not being detected.

A further two collaborative repair sequences in the conversation with LP were concerned with the clarification of non-specific expressions. For example:

(xxi)

111 AD ..as they get older themselves if they have to if they've had to er to er ['lɪfə] to live a to do this sort themselves you see later on y'know it's it (can be)
[
112 LP what if* they have to take part in a war you mean

In T111 AD carries out two replacement repairs on a verb which suggests problems in lexical selection. The final replacement uses the proform verb <u>do</u>. It seems reasonable to suggest that AD falls back on the use of non-specific expressions as a strategy to compensate for the lexical retrieval problems identified in the sentence production analysis. Its usage, however, gives rise to LP *checking her understanding through a* demonstration of understanding reached.

Two further collaborative sequences in the conversation with LP came about after long and rambling turns as illustrated below:

(xxii)

199 AD it's it's remarkable to say that I mean if you wants if you wants if you want to see it you know you [sɒv] it I mean you can see it by any time right along here but 'hh but when I first saw him you see er when you you know you know I can never [s] I can never stop (1.6)

200 LP sorry
[
201 AD [rə]* they cannot stop me everything I can do except that I never they I never afraid of people speaking to them
202 LP right then

It was proposed in the analysis of self repair that AD's greater usage than the normal interlocutors of abandoned clause followed by subsequent clause may relate to limitations imposed on him by problems in lexical retrieval in sentence production (identified in the sentence production analysis, see 7.2.2) which gives rise to the production of clauses which do not adequately express what is intended at the message level; thus the clause is abandoned and another one is initiated. It is possible that AD produced this rambling turn in an attempt to express a particular meaning despite problems in lexical retrieval. This is in line with Edwards and Garman's (1989) explanation of their fluent aphasic patient's "press of speech" (see 3.1.2). T201's failure is marked by LP's initiation by a weak initiator of the collaborative acceptance phase which can be seen to indicate a low level of understanding reached.

The remainder of the collaborative sequences in AD's two conversations took a number of different forms and it was not possible to identify links with AD's cognitive neuropsychological impairments. As outlined in 3.2, repair is an interactional resource found in normal conversation and so some occurrences can be expected in aphasic discourse which are similar to those found in normal conversation.

Moving onto an examination of collaborative repair sequences initiated by AD, it was noted in 8.3.1 that the large number of these initiations is in contrast to the absence of such initiations in EN's conversation. In 6.3.1 it was proposed that this absence is congruent with the findings in the assessment of both single word and sentence comprehension that EN's comprehension is relatively intact. In contrast, on assessment, AD was found to have impairments in both single word and sentence comprehension (see 7.1 and 7.3). It therefore seems reasonable to suggest that the initiations of collaborative repair on the normal interlocutors turns is a manifestation of his impaired auditory comprehension abilities. Across both conversations AD initiated 77% (ten) of the collaborative repairs using a demonstration of understanding reached, indicating his orientation to the principle of least collaborative effort. The majority of these involved a check of general understanding of the previous turn as is illustrated in the following excerpt:

(xxiii)

143 RE aha yeah 'til September

144 AD September from here

145 RE mhm yeah

AD provides a demonstration of understanding reached in T144 which is accepted by RE in the form of an acknowledgement token. In two of the collaborative repair sequences the trouble source is the identification of the referent of a pronoun, for example:

(xxiv)

52 RE but Alec he was we're we're all worn out and I think {laughter}* he um Ken
[
53 AD yeah

RE said I bet he's asleep soon we weren't out of Cleethorpes and he was asleep and he woke up on the A1 and he says have we gone over that bridge yet (laughter)

54 AD who was that that little* the little one
[
55 RE Alec

56 RE {laughter} yeah

RE is using the pronoun he anaphorically to refer back to her son Alec. From the initiation of collaborative work in T54 to check his understanding we can see that AD is unsure of the referent. This problem may partly be associated with the mention of two males (Alec and Ken) as well as a number of self repairs in RE's turn. It is clear, however, from the clause Ken said I bet he's asleep that the referent of he is Alec. AD's contextual knowledge also supports this interpretation as he knows that since Ken was driving the car it is not plausible that he would be asleep. In 8.3.3, the issue of the impact of the manifestation of AD's auditory comprehension impairment on conversation is considered in the examination of the mode of resolution of these collaborative acceptance phases.

8.3.3 Mode of resolution of collaborative acceptance phases

In 8.3.2 it was noted that the majority of collaborative repair sequences initiated on AD's turns involved a single word, repair arising from either phonological errors or lexical retrieval problems. As a consequence of this, the majority of initiators of collaborative acceptance phases were demonstrations of understanding reached. Thus, as found in EN's conversations the principle of least collaborative effort was being observed by the interlocutors through the use of the strongest initiator of the acceptance phase.

Most instances of demonstration of understanding reached resulted in quick resolution. We can see that this success arose partly as a consequence of the specific and localised nature of the trouble sources, the commonest of which were phonological errors and lexical selection errors. The demonstration of understanding in these cases simply involved the supply of the word which AD could then either accept or reject as illustrated in the following excerpt:

(xxv)

163	AD	I [gə] went back to my ['rɛdʒənt] my [ɑm]* my regiment
		[
164	LP	your regiment
	AD	you* see and the moment I got there
		[
165	LP	right

In T163, AD attempts replacement repairs on the phonemic paraphasia that he produces. LP provides in overlap a demonstration of understanding reached of the phonemic paraphasia. In the continuation of T163 AD repeats LP's demonstration of understanding reached and LP marks acceptance with an acknowledgement token in overlap. The collaborative repair work has thus been carried out very efficiently. On most occasions, AD accepts the demonstration of understanding of his conversational partner through a repetition, sometimes combined with an acknowledgement token. However, as can be predicted from AD's performance on assessment of repetition (see 7.1.3), repetition is not always successful especially for multisyllabic words and this leads to a longer collaborative sequence as is illustrated in the following excerpt:

(xxvi)

3 AD I did it myself* in my in the London (1.0) hhh London (1.4) dear dear

4 LP right

AD London (3.4)

5 LP was this a London University

6 AD London ['junɪti 'junəf 'junə]

7 LP Uni*versity

8 AD that's right yes=

9 LP right

10 AD on on on inside one in my own home and but I did that...

AD runs into problems in lexical retrieval. LP provides a demonstration of understanding reached in T5 which AD attempts to repeat. He runs into problems in repetition of this five syllable word (as would be predicted by the impairment in access to the phonological output buffer identified from assessments of single word output processing) and this leads to LP contributing further to the collaborative repair sequence by again providing a demonstration of understanding reached. In T8 AD provides acceptance through an acknowledgement token. The collaborative sequence is closed down when, after LP has provided acceptance through an acknowledgement token, AD moves onto next relevant presentation.

While AD's attempt at repetition in the above sequence results in extension of the collaborative sequence, collaborative repair was usually more quickly resolved and the longer and more complex types of acceptance phases found in EN's conversation with LP were not found in AD's conversations. The absence of these suggests that for AD the conversational partners did not need to take such a large part of the conversational burden to compensate for language impairments as EN's conversational partners did. This contrast can be seen to relate to the different pattern of cognitive neuropsychological impairments, with EN's lexical retrieval deficits having a larger impact. While on the basis of the sentence production analysis it was proposed that AD also had impairment in lexical retrieval in sentence production, this did not have such an impact as EN's lexical retrieval deficit. EN often had to abandon turns very early on, apparently because of failures in lexical retrieval and this lead to long and complex collaborative sequences. In contrast, AD did not have this level of handicap. In the conversation with RE, there were a number of lexical selection problems which gave rise to collaborative repair work. The trouble source in these cases was, however, very specific and the discourse context provided cues which enabled RE to offer a demonstration of understanding reached which quickly lead to completion of acceptance as exemplified below:

(xxvii)

107 AD so you had a good meeting [gə] you had a good afternoon then

108 RE weekend

109 AD weekend yeah

110 RE yes mhm yesterday we spent pulling the lounge to bits

AD carries out a replacement repair in T107. It becomes clear from RE's subsequent demonstration of understanding reached (and its acceptance by AD in T109) that there has been an error in lexical selection. RE is able to use contextual information to quickly effect collaborative repair.

Similarly, while AD's impairment in access to the phonological output buffer on occasions gave rise to collaborative repair work, these were usually resolved very quickly. This is because the trouble source was specific and the discourse context and phonological information contained in the phonemic paraphasia allowed the conversational partners to quickly provide a demonstration of understanding reached. In neither of the conversations are there any cases of the conversational partners offering an incorrect demonstration of understanding reached.

In AD's conversation with LP, there were only two collaborative repair sequences which were initiated with weaker acceptance phase initiators than demonstrations of understanding reached. In one a question was used, in the other the weakest form of initiator phase, a request for re-presentation (sorry). This sequence is presented in *(xxii)*, p.330 above where it was suggested that it arose from the rambling form of AD's turn. In the conversation with RE, there was one example of initiation of collaborative repair through a repetition and one example of initiation through a request for re-presentation (what). In neither of these cases could the use of repair be linked to the manifestation of AD's cognitive neuropsychological impairments.

Moving on to an examination of the initiation of collaborative acceptance phases by AD on his conversational partners' turns, the majority were initiated by demonstrations of understanding reached and were resolved very quickly as is seen in *(xxvi)*, p.333 above. Thus, although AD's auditory comprehension did manifest itself in conversation, its impact appeared to be minimised. There are some occasions, however, in which AD did not close down the collaborative repair sequence immediately as is illustrated in the following excerpt where AD has asked RE how long a journey has taken:

(xxviii)

4 RE two and a half hours

5 AD half an hour

6 RE two and a half

7 AD two two

8 RE two hours and a half
[
9 AD two* two hours

10 RE aha=

In this sequence AD contributes three (wrong) demonstrations of understanding of RE's T4 and her subsequent repairs of them. We see in T10 that RE lets AD's third incorrect demonstration of understanding go, closing down the collaborative sequence by marking acceptance with an acknowledgement token. There are examples in both the conversations where LP and RE allow misunderstandings to pass. This is illustrated in *(xxix)*:

(xxix)

178 RE when do they go away you usually do it when you're away don't you
well* that's the back Tom
[
179 AD (1 syllable)

180 AD oh yeah

181 RE mhm

182 AD yeah

(1.0)

183 RE (1 syllable)
[
184 AD 'cause you think they're going away tomorrow you mean you think they're going away

185 RE I'm saying do you know when they're going away
[
186 AD yeah they usuall*y do but I'll get that one done before this weekend I shouldn't I'll get that one finished

187 RE aha

In T178 RE asks AD a question. The turn, however, is complex in grammatical structure with a wh- question followed by a tag question. AD starts a turn at the end of the second question (T179) which is congruent with the rules of turn taking. By asking a question RE has allocated AD the turn at next transition relevance place. RE does not stop speaking at the TRP, however, but she continues by adding a qualifier to her question. AD drops out of the overlap and takes a turn after RE's completion (oh yeah). This appears to answer the tag question in RE's T178. RE provides acceptance with an acknowledgement token in T181 and AD also produces an acknowledgement token in T182. There is then a one second lapse in the conversation after which both interlocutors initiate a turn, with RE dropping out of the overlap. Despite AD's immediate acceptance of RE's T178 by next relevant contribution, in T184 he goes back and initiates collaborative repair on this turn in T184 through a demonstration of understanding reached. RE, in T184, does not provide acceptance of this demonstration. Instead, she restates the first part of T178 in a multiply embedded clause. AD produces a next relevant presentation in T186. Although it is clear from the answer to RE's question that AD has misunderstood T185, this does not become a repair issue; the misunderstanding is allowed to pass. Although this toleration of misunderstanding is characteristic of conversation generally, it can be more precisely explicated in terms of Clark and Schaefer's (1987, 1989, see 3.3 above) proposal that interlocutors are content to achieve understanding sufficient for current purposes. The information of when AD's neighbours are going away is not essential to the current purpose of the discourse and so it is not necessary to carry out repair work.

It appears that AD is aware of his failures in comprehension as shown by his initiation of collaborative repair work. While on the majority of occasions, this resolved the trouble source, there are some excerpts in the conversations when AD had clearly misunderstood the clarification provided by his interlocutor. These were glossed over rather than becoming the focus of extended collaborative repair work.

8.4 Summary of findings of the conversation analysis

The findings of the various analyses carried out on AD's conversations can be summarised with reference to the three main issues identified in Chapter Six in the analysis of EN's conversations. These are; evidence of preserved knowledge of conversational management procedures; manifestations in conversation of AD's cognitive neuropsychological impairments identified in the investigations described in Chapter Seven; and the effect of the interlocutor on the development of the interaction.

Much as outlined in the analysis of EN's conversation (Chapter Six), the findings reported in this chapter confirm suggestions reported in the literature (1.2.1) that aphasic subjects retain knowledge of conversational management procedures. AD demonstrated preserved knowledge of turn-taking rules and the organisational resource of repair. While his usage of the latter can be seen to differ from the normal interlocutors, with greater proportions of all patterns of self repair as well as collaborative repair, this can be seen as a manifestation of cognitive neuropsychological impairments rather than a lack of awareness of how to organise repair. Indeed, his exploitation of the repair mechanisms with respect both to self repair and the initiation of collaborative repair can be seen as an active utilisation of conversational management procedures to compensate for his impairments.

The impact of AD's cognitive neuropsychological impairments did not appear to affect his ability to hold the floor (cf. the difficulties of EN in this respect, 6.1). The manifestations of impairments in the conversation were apparent, however, from the analyses of self repair and collaborative repair. His impairment in accessing the phonological output buffer was manifested in the replacement repairs carried out on phonemic paraphasias. His impairment in lexical retrieval in sentence production was also seen in replacement repairs dealing with lexical mis-selection. It was also suggested that this impairment could be linked to some extent to AD's usage of the repair patterns of abandoned clause followed by subsequent clause, repetitions and delays.

The majority of collaborative repair sequences initiated on AD's turns could be linked to the cognitive neuropsychological impairments identified in Chapter Seven. Several dealt with phonological errors which could be seen as a manifestation of AD's impairment in access to the phonological output buffer. A number arose from either lexical mis-selection errors or lexical retrieval failures which are a manifestation of AD's impairment in lexical retrieval in sentence production. AD initiated a number of collaborative repair sequences on his conversational partners' turns. These could be seen to arise as a consequence of his impaired auditory comprehension. The initiation of repair work demonstrates an awareness of his comprehension impairment.

The influence of the conversational partner on the interaction did not emerge as clearly from an analysis of AD's conversations as in the case of EN (see 6.4 above). While the tendency for the aphasic subjects to produce a greater proportion of major turns in the conversation with the researcher than with the relative was found in both cases, AD was unlike EN in that he did not take a passive role in the conversation with his relative. The more equal sharing of the proportion of major turns in both AD's conversations can be seen as a consequence of RE adopting a similar strategy to LP of dealing with AD's problematic turns. She initiated collaborative repair work in contrast with BC who, in conversation with EN, adopted a strategy of glossing over potentially problematic turns.

Two suggestions are put forward to account for the difference in the two relatives' strategies. The first is that the two aphasic subjects' different patterns of cognitive neuropsychological impairments gave rise to different self repair strategies which have an impact on the way that conversational partners dealt with problematic turns. A second possibility is that the relatives' differing strategies arose simply from differing discourse styles. A number of therapeutic implications for development of strategies in both the aphasic subject and his or her conversational partners arise from these two possibilities. These are explored in Chapter Eleven.

Chapter Nine

COGNITIVE NEUROPSYCHOLOGICAL INVESTIGATION OF SUBJECT JJ

9.0 Introduction

This chapter sets out to report the findings of the cognitive neuropsychological investigations of subject JJ and to offer an interpretation of her performance in terms of the models of language processing described in Chapter Two. Presentation follows the format developed in Chapter Five for the cognitive neuropsychological investigation of subject EN. The assessments and analyses used in this investigation and the performance of the control subjects have been described in Chapter Four. The findings reported here regarding JJ's intact and impaired processing abilities are drawn upon in a subsequent analysis of the conversational data (Chapter Ten) in an attempt to identify the manifestations of cognitive neuropsychological impairments in conversation.

The chapter starts with a description and interpretation of JJ's performance on assessments of single word processing in 9.1. In 9.2, her sentence production abilities are examined and in the final section of the chapter (9.3) sentence comprehension is considered.

9.1 Single word processing

9.1.0 Preliminary orientation

The findings from the assessments of single word processing are presented in relation to the levels of processing discussed in 2.2 above. The structure of this section follows that found in the analysis of single word processing for subject EN in 5.1 above. Phonological and auditory lexical input processing is reported on in 9.1.1. This is followed by assessment of central semantic processing in 9.1.2. Sections 9.1.3 to 9.1.5

describe JJ's performance on assessments of phonological and lexical output processing (in repetition, oral reading and oral naming respectively). Within each section, JJ's performance on all of the assessments is described and interpreted in relation to the model of language processing presented in 2.2.

9.1.1 Assessments of phonological and auditory lexical input processing

Specific assessments were not administered to examine the functioning of auditory phonological analysis and the phonological input lexicon as it is possible to infer from JJ's high level of performance on other assessments that required adequate auditory phonological analysis and lexical processing (e.g. spoken word picture matching, auditory synonym judgement (see 9.1.2 below), assessment of auditory sentence comprehension (see 9.3.1 below) that there is no deficit at these levels of processing.

9.1.2 Assessments of central semantic processing

PALPA assessments 47 and 48, picture-word matching (spoken and written versions): JJ made no errors on this assessment in either modality. Thus, her performance was within the range of the PALPA control subjects.

PALPA assessments 49 and 50, synonym judgement (spoken and written versions): JJ performed at a high level on this task in both modalities with correct judgements for 58/60 (97%) of the items on the spoken version and 59/60 (98%) of the items on the written version. This fell within the range of matched control subjects' performance.

Interpretation of performance on assessments of semantic processing: Performance on the assessments of semantic processing indicates that JJ has no impairment of semantic processing or of accessing the semantic system from either modality of input. This conclusion is further supported by her performance on naming assessments (see 9.1.5 below) where negligible semantic errors were produced.

9.1.3 Assessments of phonological and lexical output processing: Repetition

PALPA assessment 9, repetition of words (controlled for frequency and imageability): JJ's performance on this assessment is shown in table 9.1, with a breakdown of performance for words of high and low imageability and high and low frequency. JJ's performance for all groups of words fell below the mean of the PALPA control subjects and her overall score fell below the range of the matched control subjects. Therefore, JJ's performance on this assessment was impaired. There was no influence of imageability (chi-square = 0.39, df=1, NS) or frequency (chi-square = 0.39, df=1, NS) on performance.

Table 9.1 JJ's performance on PALPA assessments 9 and 31, repetition and oral reading of words controlled for imageability and frequency (immediately correct responses)

Word Type	Repetition (PALPA 9)	Oral reading (PALPA 31)
High imageability / high frequency	17 (85%)	17 (85%)
High imageability / low frequency	16 (80%)	15 (75%)
Low imageability / high frequency	16 (80%)	8 (40%)
Low imageability / low frequency	19 (95%)	9 (45%)
High imageability overall	33 (83%)	32 (80%)
Low imageability overall	35 (88%)	17 (43%)
High frequency overall	33 (83%)	25 (63%)
Low frequency overall	35 (88%)	24 (60%)
Total	68 (85%)	49 (61%)

For eight of the twelve errors, JJ produced one or more partial phonological attempts of the word in which there was no identifiable error and after which the word was produced correctly, for example:

QUALITY-> [kwə kwə kwɒ] quality

For a further two errors, a phonological error was produced in the partial phonological attempt which was then self corrected:

ELEPHANT-> [ɛf] elephant

For the final two errors, JJ made no attempt at repetition.

PALPA assessment 8, repetition of non-words: JJ successfully repeated 59/80 (74%) of the non-words. This fell well below the range of the matched control subjects indicating impaired performance. Although more errors were made on non-word repetition than word repetition, the difference did not reach statistical significance (chi-square = 3.09, df=1, NS).

All of the errors were closely phonologically related to the targets with only one of the errors differing by more than one phoneme. Seven of the errors involved repeating the word as a phonologically similar word. For example:

['fanəl] -> funnel

['hɛtəl] -> heckle

The remainder were non-word phonological errors.

Experimental repetition assessment (words and non-words, controlled for number of syllables and number of clusters): JJ's performance on this assessment is displayed in table 9.2 with a breakdown of correct responses for words and non-words of one to four syllables.

Table 9.2 JJ's performance on the experimental repetition assessment (immediate correct responses)

Number of syllables	Words (repetition)	Non-words (repetition)
One syllable	17/20 (85%)	16/20 (60%)
Two syllables	18/25 (72%)	12/25 (48%)
Three syllables	16/25 (64%)	11/25 (44%)
Four syllables	10/25 (40%)	10/25 (40%)
Overall	61/95 (64%)	49/95 (52%)

JJ's performance fell well below the range of the control subjects, indicating impaired performance. As with the PALPA repetition assessments, JJ showed no significant difference between repetition of words and non-words (chi-square = 3.11, df=1, NS) on this more demanding repetition assessment.

JJ's repetition performance for words became significantly worse with the increase in number of syllables (chi-square = 10.80, df = 3, P<0.02). There was, however, no significant effect of the number of clusters on repetition performance (chi-square = 4.45, df=2). In repetition of non-words, JJ's performance mirrored that of words with a significant effect of number of syllables on repetition performance (chi-square = 8.51, df = 3, p<0.05) but no significant effect of number of clusters (chi-square = 0.12, df = 2, NS).

On word repetition, all errors were phonological in nature. For 21 of the 35 words that JJ failed to repeat correctly on the first attempt, she was able to self-correct. On some occasions she produced phonemic paraphasias, while for others she would produce a partial phonological attempt and start again:

PROTESTANT-> [prɒ 'prɒtətənt 'prɒtətɪst] Protestant

For the remaining 14 words JJ was not able to self correct her phonological errors. These were also characterised by multiple attempts and partial attempts. On the majority of occasions, JJ was aware that she had not managed to repeat the item correctly as was shown by the comments that she made after a failed attempt to correct herself. The errors made in non-word repetition were equivalent to those made in word repetition although she did not produce the same quantity of self corrections.

Interpretation of performance on assessments of repetition: JJ's impaired performance on repetition is indicative of an impairment at the level of the phonological output buffer. This is indicated by the phonological nature of the errors and by the influence of word length as measured by number of syllables for both words and non-words which is significant for the more demanding experimental repetition assessment. The comparable performance for both word and non-word repetition is of interest. It indicates that the non-lexical phonological input-to-output conversion route is still functioning to some degree. If this were not the case then one would not expect correct repetition of 52% of the non-words in the experimental assessment and 74% of the non-words in the PALPA repetition assessment. JJ showed no influence of imageability or frequency on her repetition performance.

The equivalent performance for words and non-words could be taken as evidence of JJ's impaired repetition arising as a consequence of damage to the processing of the phonological output buffer itself rather than an access problem as it appears that, despite the different input routes to the output buffer (with activation for words potentially coming from three routes), there was no significant difference between performance on words and non-words. Further information regarding this distinction is provided by JJ's performance on other output tasks which have different modes of input, namely oral reading assessments and picture naming assessments which are examined in 9.1.4 and 9.1.5 below.

9.1.4 Assessments of phonological and lexical output processing: Oral reading

PALPA assessment 31, oral reading of words controlled for imageability and frequency: JJ's performance on this assessment is shown in table 9.1 above with a breakdown of performance for high and low frequency and high and low imageability words. The number of immediate correct responses fell below the range of the matched control subjects. All errors were phonological in nature. While word frequency did not appear to influence JJ's ability to read words without phonological errors (chi-square = 0.05, df=1, NS) there was a highly significant effect of imageability on reading with more phonological errors on low imageability items (chi-square = 11.85, df=1, p<0.001). When a comparison of performance for words with one, two or three syllables was made, word length was also shown to have a significant effect on JJ's oral reading (chi-square = 11.35, df=2, p<0.01).

All errors were phonologically related to the target and JJ was able to self correct after one or several errors for 27 out of the 31 items. For example:

QUALITY-> [kwə kɑɪl kwɪl kwɪl kwɪn] no ['kwɪlɪti] quality

As the same words were given for repetition and oral reading, it allows a direct comparison to be made in order to investigate whether modality of input influenced performance. This does indeed seem to be the case with significantly poorer production of words for reading than repetition (chi-square = 11.48, df=1, p<0.001).

Interpretation of performance on assessments of oral reading: The influence of syllable length on oral reading performance and the phonological nature of the errors supports the conclusion also drawn from her repetition performance that JJ has an impairment at the level of the phonological output buffer.

The differential performance for repetition and oral reading is relevant to the distinction between an impairment in access to the buffer (i.e. processing between two levels) and processing of the buffer itself. If there was a deficit at the level of processing then whatever the modality of input, one would expect equivalently impaired performance. JJ's equivalent performance for matched words and non-words on repetition could be taken as evidence of a central impairment at the buffer as performance is equivalent for non-words which can be repeated utilising only the non-lexical route of repetition and words which in addition have two lexical processing routes for their repetition. If, however, the routes of access to the buffer did not influence performance then equivalent performance for oral reading and repetition would be expected and this is not the case. Oral reading was more impaired.[5]

The influence of imageability on oral reading is rather a surprising finding, given the evidence from the assessments of semantic processing that JJ has intact semantic processing for high and low imageability words. The presence of an imageability effect is indicative of reliance on the lexical semantic route of reading as if the direct lexical route was operating fully then reading would not be expected to be influenced by a semantic factor.

In 5.1.4, in the interpretation of an effect of word imageability on proportions of phonological errors produced by EN, it was proposed that reduced activation from the semantic system to the phonological output lexicon may give rise to partial activation at the phonological output lexicon. As discussed in 2.1, interactive activation models can account for the influence of a higher level of processing on a lower level of processing. It is possible that although JJ has intact semantic processing for low imageability words, they give rise to smaller levels of activation to the spoken output system. This manifests

[5] It is possible that JJ's differential performance for repetition and oral reading could be explained by an impairment in the processing of the buffer which compromised all output tasks and an impairment to input processing used in reading which would result in further impairment to JJ's oral reading performance. It is possible to rule out this possibility, however, on the basis of evidence from assessments of semantic processing (see 9.1.2 above) of intact access to semantics from the orthographic input lexicon. In addition, the purely phonological nature of the errors indicates the locus of impairment is in output processes.

itself in access to the phonological output buffer where there is clearly an impairment in achieving high enough levels of activation.

9.1.5 Assessments of phonological and lexical output processing: Oral naming

Revised Kay naming test (frequency controlled): JJ's performance on the different frequency bands of the revised Kay naming test is shown in table 9.3. Her performance fell below the range of the control subjects indicating impaired naming.

Table 9.3: JJ's performance on the revised Kay naming test (controlled for frequency)

Response type	High freq.	Medium freq.	Low freq.	Overall
correct >5 seconds	19 (76%)	18 (72%)	15 (60%)	52 (69%)
Delayed correct	6 (24%)	5 (20%)	9 (36%)	20 (27%)
Semantic error	0 (0%))	0 (0%)	0 (0%)	0 (0%)
Phonological error	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Neologism	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Failure	0 (0%)	2 (8%)	1 (4%)	3 (4%)

Overall, JJ successfully named 69% of the items within five seconds. In all she was able to name 96% of the targets eventually. There was a slight trend for a decrease in naming the picture within five seconds with a decrease in frequency. This did not, however, reach statistical significance (chi-square = 1.63, df=2, NS)

It is of interest to note that four of the six delayed correct responses for high frequency words were for naming of body parts (finger, hand, foot and arm). JJ reported that she had particular problems with this semantic category.

Table 9.4 shows the naming behaviours that JJ produced in her naming responses.

Table 9.4 ***Summary of behaviours in JJ's naming responses on the revised Kay naming test***

Naming behaviours	Correct>5secs.	Delayed correct	Failures	Overall
Pauses	7 (13%)*	20 (100%)	3 (100%)	30 (40%)
Semantic associates	0 (0%)	1 (5%)	1 (33%)	2 (3%)
Circumlocutions	0 (0%)	0 (0%)	1 (33%)	1 (1%)
Phonological errors	14 (27%)	15 (75%)	2 (66%)	31 (41%)
Neologisms	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Writing strategies	0 (0%)	8 (40%)	0 (0%)	8 (11%)

(*: the percentages shown in brackets refer to the percentage of responses of that type containing each behaviour i.e. 13% of the responses correct within five seconds contained pauses)

For items that were correct within five seconds there were filled or unfilled pauses for seven (13%) of the items and partial phonological attempts or phonemic paraphasias for 14 (27%) of these tokens. As these responses were correct within five seconds JJ was able to successfully effect self repair. For six of the ten partial phonological attempts produced, there was no perceivable error, for example:

SHIP -> [ʃə] a ship

CHURCH-> [tʃə] a church

The delayed correct responses by definition all contained pauses. In addition 15 (75%) contained either partial phonological attempts or phonemic paraphasias. In contrast to the partial phonological attempts that occurred in the targets that were correct within five seconds, the majority of partial attempts in the delayed responses were phonological errors and occurred with a delay between the production of the partial attempt and the production of the target:

ANGEL-> a (2.0) [və] is it a [vi] no it's [eɪ] angel

PLIERS-> [s:] er (6) er (2) pliers

There were also more multiple phonological attempts for the delayed correct responses. For example:

FINGER-> mm (7) [fɪn fɪm fɪm fɪn 'fɪŋəl] finger

VASE -> [gə gə grɛɪ] no it's a (3) this is one of the things a [grɛɪ] no a [dʒi] (4) a [vi vɛɪz vɛɪd] a [vɛɪz] no a vase a vase

Another common behaviour that JJ produced in the delayed correct responses was a writing related strategy in which she produced the first letter of the word. She used this strategy for eight (40%) of the delayed correct responses. This strategy was not always successful as she produced the wrong letter on the first attempt for five of the eight tokens. An example of this is shown in the response for VASE above where JJ produced the letter name "g" ([dʒi]) before accessing the letter name "v" ([vi]).

There were only three items which JJ was unable to name. She produced a semantic associate for one of these which she rejected (drawers for DESK) and circumlocutory information for another. All failed attempts contained phonological attempts as illustrated in the following example:

SKATE -> er (2) [saɪ s: s::] (6) [stɛɪ s::] (1) [s::] is it [ɛs] a [si ɛs] is it [stɛɪ stɛɪ] no (9) I can't get it

Looking at the behaviours in the responses overall, we see that 40% of naming responses contained filled and/or unfilled pauses. The production of semantic associates and circumlocutions was not a common feature of JJ's naming behaviour with only two attempts containing a semantic associate and one attempt containing circumlocutory information. Thirty-one responses (41%) contained either partial phonological attempts or phonemic paraphasias. She also used a writing strategy in eight (11%) of the responses. Interpretation of these behaviours in terms of what they suggest about the underlying deficits is given at the end of this section after examining performance on the other naming assessments.

Verb and noun naming test (frequency controlled): JJ's performance on this naming assessment is given in table 9.5. This assessment demonstrates that JJ's ability to name was not influenced by grammatical class as there was no significant difference in her naming of verbs and nouns (chi-square = 1.07, df=1, NS).

Table 9.5 ***JJ's performance on the verb and noun naming test***

Response type	Naming of verbs			Naming of nouns		
	High freq.	Low freq	Overall	High freq	Low freq.	Overall
correct >5 seconds	11 (69%)	10 (63%)	21 (66%)	13 (81%)	11 (69%)	24 (75%)
Delayed correct	4 (25%)	2 (13%)	6 (19%)	3 (19%)	3 (19%)	6 (19%)
Semantic error	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Phonological error	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Neologism	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Failure	1 (6%)	4 (25%)	5 (16%)	0 (0%)	2 (13%)	2 (6%)
Acceptable alternatives	0	0	0	0	0	0

As for the revised Kay naming test, while she was able to produce the target for the majority of pictures eventually, this took longer than five seconds for 19% of both the verbs and the nouns. The failures included phonemic paraphasias and failures to name. For example:

PECKING-> oh dear me (3) she it's (4) [pə] (2) ['pɪkɪŋ 'pɒkiŋ] (2) is it [pik pɒk] no

CONJURING-> that's erm (8) juggle er (5) I can't remember

As in the revised Kay naming test, there was no significant effect of word frequency on JJ's performance for either verb naming (chi-square < 0.139, df = 1, NS) or noun naming (Fisher Exact Test, p = 0.342, NS).

Lesser syllabic naming test (controlled for frequency and number of syllables): JJ's performance on this assessment for monosyllabic and polysyllabic, high, medium and low frequency nouns is shown in table 9.6.

Table 9.6 JJ's performance on the Lesser syllabic naming test

Response type	Naming of monosyllabic items				Naming of polysyllabic items			
	High freq.	Med. freq.	Low freq.	Overall	High freq.	Med. freq.	Low freq.	Overall
correct >5 seconds	4 (40%)	5 (50%)	2 (20%)	11 (37%)	5 (50%)	2 (20%)	3 (30%)	10 (33%)
Delayed correct	2 (20%)	2 (20%)	4 (40%)	8 (27%)	2 (20%)	2 (20%)	4 (40%)	8 (27%)
Semantic errors	1 (10%)	0 (0%)	0 (0%)	1 (3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Phonological error	0 (0%)	0 (0%)	1 (10%)	1 (3%)	1 (10%)	1 (10%)	1 (10%)	3 (10%)
Neologism	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Failure	3 (30%)	3 (30%)	3 (30%)	9 (30%)	2 (20%)	5 (50%)	2 (20%)	9 (30%)

As in the other naming assessments, there was no frequency effect on naming performance (chi-square = 1.76, df = 2, NS). There was no significant effect of syllable length on naming with equivalent performance for both monosyllabic and polysyllabic words (chi-square = 0.09, df = 2, NS).

A lack of syllable effect is surprising given the nature of the phonological errors that JJ produced and the influence of number of syllables on repetition and reading performance. An examination of the behaviours within the naming responses for the monosyllabic and polysyllabic words was undertaken in order to see whether there were any detectable qualitative differences. This is shown in table 9.7

Table 9.7 Summary of behaviours in JJ's naming responses on the Lesser syllabic naming test

Naming behaviours	Monosyllabic items	Polysyllabic items
Pauses	21 (70%)*	20 (67%)
Semantic associates	3 (10%)	1 (3%)
Circumlocutions	2 (7%)	0 (0%)
Phonological errors	15 (50%)	23 (77%)
Neologisms	0 (0%)	4 (13%)
Writing strategy	5 (17%)	6 (20%)

(*: the percentages shown in brackets refer to the percentage of responses of that type containing each behaviour i.e. 70% of the responses for the monosyllabic items contained pauses)

JJ produced pauses in approximately two thirds of her responses for both monosyllabic and polysyllabic words. This mirrors the pattern observed in the other naming assessments carried out. When the proportion of phonological attempts made in responses was examined, a difference for monosyllabic and polysyllabic words begins to emerge. In total, 77% of the polysyllabic word responses contained either a partial phonological attempt or phonemic paraphasia, in contrast to only 50% of the monosyllabic word responses. Furthermore, four of the responses (13%) contained neologisms for polysyllabic words, while no neologisms were produced in an attempt at the monosyllabic words. Further difference is noted if an examination is made of the number of phonological attempts per item for the monosyllabic and polysyllabic items. While for the monosyllabic words, 33% of the turns had more than two attempts, for the polysyllabic words, 70% had more than three attempts. Examples of this include:

ESCALATOR -> an ['ɛskjələ 'ɛskju ɛs] (1) ['ɛskə] escalator

PYRAMIDS -> oh it's (6) I can't remember the name (13) I can't remember the name the the letter it's a "p" [pɪ pə] the (2) ['pɪlə 'pɪmə pɪm pɪ pɪ 'pɪvə 'pɪvərɪ] no (4) [pɪm] no (5) ['pɪvəri] no

It therefore appears that while it is not possible to detect an influence of the number of syllables on performance in terms of the number of responses correct within five seconds, when the responses are examined qualitatively this factor does appear to influence performance.

Other behaviours were produced in an equivalent proportion of responses for both monosyllabic and polysyllabic words. A writing strategy was found in 8% and 10% of the monosyllabic and polysyllabic words respectively which is equivalent to the proportion that this strategy was used in the revised Kay naming test. Similarly, JJ produced only a small proportion of semantic cues and circumlocutions for both the monosyllabic and polysyllabic targets.

The words used in this assessment were also presented to JJ in two more output tasks (oral reading and repetition) in order to allow a comparison of performance with different inputs. The findings are displayed together in table 9.8 to allow comparison.

In both the repetition and reading tasks, JJ was able to make a close phonological attempt without delay for all of the items in contrast to performance on the naming task where there was delayed responses for 27% of both the monosyllabic and polysyllabic nouns (see table 9.7). There was a significant effect of number of syllables on both JJ's reading and repetition performance with more immediately correct responses for the monosyllabic than polysyllabic targets (chi-square = 8.30, df=1, $p < 0.01$ for reading; Fisher exact probability = 0.01285 for repetition).

Table 9.8 Number of immediately correct responses produced by JJ for oral reading and repetition of the Lesser syllabic naming test words

Word type	Oral naming	Oral reading	Repetition
Monosyllabic	11 (37%)	23 (76%)	29 (97%)
Polysyllabic	10 (33%)	12 (40%)	22 (37%)

In both repetition and reading tasks, there were only a small number of failures to self repair. A comparison of reading versus repetition demonstrates the same pattern found in performance on the PALPA repetition and reading assessments with significantly fewer immediate correct responses for reading (chi-square =10.15, df=1, $p< 0.01$).

Interpretation of performance on oral naming assessments: The production of phonological errors within JJ's naming responses, in association with the pattern of phonological errors produced in the tasks of repetition and oral reading, supports the hypothesis that JJ has an impairment at the level of the phonological output buffer. A surprising feature of JJ's naming performance is that there was no significant syllable effect in the Lesser syllabic naming test although with the same material she demonstrated a syllable effect when the task was one of repetition or oral reading. When the naming responses were further examined, however, a qualitative difference was found between the monosyllabic and polysyllabic items, with more phonological errors and attempts for the latter group as well as the production of neologisms which were not found for monosyllabic items.

Differential performance on the output tasks of naming, repetition and reading of the items in the Lesser syllabic naming test is of interest. Her ability to produce an attempt at the target without delay for all of the items in repetition and reading indicates that the direct lexical routes (from phonological input lexicon for repetition and from orthographic input lexicon for reading) and the non-lexical routes that support spoken word production in reading and repetition allow a higher level of performance than from the direct semantic route, the only route to spoken word production for picture naming.

The lexical factors of word frequency and grammatical class did not influence JJ's oral naming performance, indicating that there is no impairment at the level of the phonological output lexicon. Indeed, at a quantitative level lexical retrieval does seem intact. JJ eventually produced the target response for 96% of items in the revised Kay naming test. On the Lesser syllabic naming test, however, which contains lower frequency bands (see 4.3.1) JJ only successfully named 62% of the items. Furthermore, there were qualitative features of her naming performance which suggest that retrieval at the lexicon cannot be assumed to be unimpaired. For 27% of items on the revised Kay naming test JJ took longer than five seconds to retrieve the target and 40% of her responses contained filled or unfilled pauses. A similar pattern was found in the Lesser syllabic naming test. It does not appear possible to account for this quantity of delayed responses in terms of an impairment at the level of the buffer as there were a number of tokens in which it appears that initially she had no phonological knowledge about the target. The strategy of producing the name of the first letter of the word she was trying to produce appeared to be a cueing attempt, utilising information from the graphemic output lexicon to access the phonological output lexicon. Kohn (1988) has proposed that spelling out is a strategy used by conduction aphasic patients to help order the realisation of phonemes. JJ, however, appeared to use this strategy when she had no phonological knowledge and only produces the first letter. Thus, it does not appear to be a strategy to aid the ordering of speech sounds. The lexical retrieval deficit is not severe as there were very few cases where she failed to retrieve any information. The fact that JJ was able to retrieve the majority of items after a delay indicates that processing within the phonological output lexicon is intact and that JJ has an impairment in access to the lexicon. Possible hypotheses underlying eventual access to the lexicon after a delay has already been discussed in relation to subject EN (see 5.1.5 above).

9.1.6 Summary of performance on assessments of single word processing

JJ's performance on the battery of assessments indicates that the processes involved in single word auditory comprehension are intact. Evidence of intact semantic processing comes from both semantic judgement tasks and picture naming performance.

From JJ's performance on output tasks, it is hypothesised that she has an impairment at the level of the phonological output buffer. She demonstrated a syllable effect in reading, repetition and naming tests although in the latter case this showed up in qualitatively different performance rather than a statistically significant quantitative difference.

JJ did not show an effect of frequency or grammatical class on her naming performance which perhaps could be taken to suggest that JJ has no impairment at the level of the phonological output lexicon. The analysis of naming behaviour did, however, indicate that processing at the level of the lexicon is not unimpaired and a large proportion of naming responses are delayed. It is suggested that JJ's impairment is one of access rather than being in processing at the lexicon itself as, on most occasions, she was able eventually to retrieve the word or some phonological knowledge of it.

9.2 Sentence Production

9.2.0 Preliminary orientation

The findings from the analyses which provide information regarding impairments to the processes involved in sentence production are presented in relation to the levels of processing discussed in 2.3. In 9.2.1 accessing of semantic representations is examined. This is followed in 9.2.2 by a description of the realisation of predicate argument structures. Finally, the analysis of phrase structures is presented in 9.2.3. Interpretation of the findings in terms of the model of sentence production discussed in 2.3 is presented in 9.2.4.

9.2.1 Accessing of semantic representations

The findings of assessments that provide information about JJ's semantic processing have been described in section 9.1.2. JJ performed within the normal range on PALPA picture-word matching and synonym judgement tasks. JJ also demonstrated good comprehension for verbs and adjectives on the PALPA assessment 97 (auditory comprehension of verb and adjectives from the sentence set, see 9.3.2 below). This was further demonstrated by the relatively high level of performance on PALPA sentence-picture matching assessments (see 9.3.1 below). Semantic errors were not a feature of her naming performance (section 9.1.5) and she was able to eventually retrieve the name for 96% of the items in the revised Kay naming test. As access to the semantic system is an essential part of the naming process, this provides further evidence for an unimpaired semantic system.

In the conversation, there was no evidence of semantic errors being made. As reported in 4.3.2, however, in conversation semantic paraphasias may be difficult to detect if they are close to the intended target. Detection is easier in a narrative task when the researcher has some idea of the lexical items that have to be accessed. In the Cinderella narrative three semantic paraphasias were identified. In all cases, however, JJ repaired the errors immediately as is seen in the following example:

(i)

JJ and she was given a beautiful coat no not a coat a (4) a (2) dress a dress

Given the correction of these semantic paraphasias, in conjunction with the evidence from semantic assessments it would appear that these errors do not arise from a semantic impairment. It is more likely that they arise as a consequence of an impairment in access to the phonological output lexicon as Caramazza and Hillis (1990) proposed for their subjects (see section 2.1.1 above).

9.2.2 Realisation of predicate argument structure

The proportion of main clauses produced with and without subordination by JJ and the matched control subject in the Cinderella narrative is shown in table 9.9. JJ did not differ significantly from the control subject in the proportions of clauses of different subordination patterns produced (chi-square = 3.64, df=2, NS). JJ was able to realise arguments as clauses and produced adverbial clauses.

Table 9.9 Analysis of clausal embedding produced by JJ and the matched control subject in the Cinderella narrative

Main Clauses	Subject JJ	Control subject three
No subordination	16 (73%)	20 (50%)
+ embedded clause(s)	3 (14%)	14 (35%)
+ adverbial clause(s)	3 (14%)	6 (15%)

A scan of the conversational data supports the finding of the analysis of JJ's Cinderella narrative. She produced complex clause structures with embedded clauses functioning as verbal arguments and as modifiers of noun phrases.

A comparison of the production of the different predicate argument structures produced by JJ and the matched control subject in the Cinderella narrative is presented in table 9.10. While there was no significant difference[6] in the proportions produced, it is of interest to note that JJ produced no three argument predicates. This could be interpreted as indicative of a problem in the production of more complex predicate

[6] It was not possible to use the chi-square test because of two cells with expected frequencies less than five. The three by two contingency table ruled out the possibility of using a Fisher exact test. Therefore, the three possible two by two sub- tables were tested. None of these reached statistical significance. Thus, JJ was not found to differ significantly from the control subject in the proportions of predicate arguments structures produced. (For one and two argument structures, chi-square = 0.139, df = 1, NS; for two and three argument structures, Fisher exact test p = 0.249, NS; for one and three argument structures, Fisher exact test p = 0.204, NS.).

argument structures. If there were problems with such structures, however, one would expect problematic utterances in which verb predicates requiring three arguments would be produced with omitted arguments. No such cases of incomplete predicate-argument structures were found in the narrative. Furthermore, there are examples of JJ producing clauses with three argument predicates in the conversational data. It should also be noted that the control subjects only produced a very small number of these structures in their narratives (see also Byng and Black, 1989).

Table 9.10 Predicate argument structures produced by JJ and the matched control subject in the Cinderella narrative

Structure type	Subject JJ	Control subject three
Predicate + 1 argument	9 (30%)	16 (24%)
Predicate + 2 arguments	21 (70%)	48 (71%)
Predicate + 3 arguments	0 (0%)	4 (6%)
Problematic	2	0

In the Cinderella narrative, JJ did not omit any arguments or realise any arguments inappropriately. She abandoned two clauses before completion of the predicate argument structure. In the conversational data there were only two tokens which appeared to have problematic predicate-argument structure and 14 tokens in which JJ abandoned a clause and followed it by a subsequent clause. Given that JJ's clause production does not differ significantly from that of the matched control subject in the proportions of predicate argument structures produced or the quantity of embedding, it seems unlikely that the small number of problematic predicate argument structures and abandoned clauses arise from an impairment in encoding thematic roles and mapping these onto grammatical relations. Further evidence to support the proposal that JJ is not impaired in the processes required to create the functional level of representation is supplied by her high level of performance on PALPA assessments 55 and 56 (auditory and written sentence comprehension, see 9.3.1 below).

It is possible that the tokens of abandoned clauses and problematic predicate argument structures arise as a consequence of impairment in accessing representations from the phonological output lexicon or inserting them into the constituent frames. This account is supported by the evidence from performance on assessments of picture naming (9.1.5 above) that JJ has a mild impairment in accessing the phonological output lexicon.

9.2.3 Phrase structure analysis

Noun phrases: There were no examples in the conversational data of problems in producing the closed class items required in noun phrases. JJ used a range of determiners and predeterminers and marked plurality appropriately. She produced a wide range of pronouns; there were no errors in marking subject, object or genitive case.

Table 9.11 shows the proportion of referring expressions that were realised as pronouns and as full noun phrases in both the Cinderella narrative and the conversation with LP. In the Cinderella narrative, JJ produced a significantly greater proportion of noun phrases as pronouns than the matched control subject (chi-square = 8.60, df=1, $p < 0.01$). In the conversational data, JJ realised almost three quarters of noun phrases as pronouns and this is significantly greater than the proportion produced by LP (chi-square = 14.77, df=1, $p<0.001$).

Table 9.11 Analysis of the realisation of referring expressions by JJ and the control subjects in the Cinderella narrative and in the conversation with LP

Referring expressions	Cinderella narrative		JJ's conversation with LP	
	Subject JJ	Control 3	Subject JJ	LP
Full noun phrases	15 (33%)	56 (59%)	65 (27%)	62 (47%)
Pronouns	31 (67%)	39 (41%)	174 (73%)	70 (53%)

An examination of the full noun phrases that JJ did produce reveals that JJ was able to produce complex noun phrases with both pre-modification with adjective phrases and post-modification with prepositional phrases and relative clauses. There was no evidence of trade-off of clause structure when phrase structure complexity increased. It therefore appears that JJ's greater use of pronouns than the control subjects is a strategy to avoid problems in lexical retrieval. This seems a plausible explanation given the evidence from assessment of single word processing (see 9.1.5) of a mild impairment in access to the phonological output lexicon.

The verbal group

JJ showed no problems in realising the closed class items which occur in the verbal group. She produced a range of auxiliary and semi-auxiliary verbs and no errors were detected in using verbal affixes marking tense, aspect and subject agreement or negation.

JJ was able to produce complex verbal groups as is reflected in her production of modal, perfect, progressive and passive auxiliary verbs. From the predicate argument analysis it is clear that JJ was able to use a range of verb sub-categories.

Preposition Phrases

JJ produced preposition phrases as realisations of verb arguments for intensive, prepositional and complex transitive verbs. She also produced them as adverbials and in post-modification of noun phrases and adjective phrases. There were no cases of inappropriate prepositions in the Cinderella narrative. In the conversational data there were three tokens in which a problem arose in a preposition phrase. One of these involved omission of a preposition, the other two a substitution of an inappropriate preposition. Two of the three tokens were immediately repaired. It is important to note that the vast majority of preposition phrases were syntactically and semantically appropriate.

9.2.4 *Summary and interpretation of analyses of sentence production*

The findings of the various analyses reported above indicate that JJ has a mild impairment in sentence production as is shown by the abandonment of clauses in both the narrative and the conversational context. It would appear that the impairment arises from the same locus of deficit proposed for EN (see 5.2.4), namely impaired access to the phonological output lexicon. This impairment was identified from her performance on assessments of oral naming (see 9.1.4) and can account both for the abandonment of clauses as well as the significantly greater use of pronouns to refer to referents than the matched control subjects. It should be noted that comparison of performance on the naming assessments indicates that JJ's lexical retrieval deficit is not as severe as that of EN's. This may explain why JJ, in contrast to EN, produced an equivalent amount of embedding to the matched control subject. It was proposed that EN's production of significantly fewer embedded clauses than the matched control subject could be accounted for by the impact of impaired lexical retrieval on sentence production. It would appear that JJ's level of impairment is not severe enough to influence this aspect of sentence production.

In addition, the findings of the analyses indicate that all other aspects of processing involved in sentence production are intact. The investigations of semantic processing and realisation of predicate argument structures indicate that the processes between the message level and the functional level are intact. The analysis of phrase structure provides evidence of intact accessing of syntactic structures complete with appropriate affixes together with intact accessing of the function word stores and the integration of this information into phrase structure.

9.3 *Sentence Comprehension*

9.3.0 *Preliminary orientation*

The findings of the sentence comprehension assessments are presented and discussed in relation to the model of sentence comprehension outlined in 2.4.

9.3.1 PALPA assessments 55 and 56: Auditory sentence comprehension and written sentence comprehension

JJ scored 53/60 (88%) on the spoken version of this assessment which fell below both the mean of the PALPA control subjects and the range of the matched control subjects. Further examination of the pattern of errors was therefore made, including a comparison to the ranges of the PALPA control subjects for the different sentence subtypes. This is shown in table 9.12.

Table 9.12 JJ's performance on PALPA assessments 55 and 56, auditory sentence comprehension and written sentence comprehension

Sentence types.	Assessment 55 (auditory version)	Assessment 56 (written version)
Reversible sentences	20/20 (100%)	19/20 (95%)
Non-reversible sentences	12/16 (75%)*	16/16 (100%)
Sentence with subject gap	6/8 (75%)	7/8 (88%)
Sentence with non-subject gap	8/8 (100%)	8/8 (100%)
Converse relations	7/8 (88%)	7/8 (88%)
Total	53/60 (88%)	57/60 (95%)

JJ's scores on sentence types marked with * fall below the range of performance of the PALPA control subjects

Only JJ's scores for non-reversible sentences fell below the range of the control subjects and errors were spread over a number of types of non-reversible sentences.

JJ scored at an equivalent level for both active and passive sentence items. She made a greater proportion of errors on sentences containing adjective predicates (20%, four tokens) than on sentences containing verb predicates (7.5%, three tokens). Two of the errors with adjective predicates occurred in sentences containing gaps involving co-indexation to the subject of the sentence. JJ made no errors with any of the other sentence types containing gaps. The remaining two errors arose on sentences with non-reversible comparative adjectives with a to-complement. In contrast, there were no errors on the identical sentences which did not contain the to-complement. For all four errors with adjective predicates, JJ selected the lexical adjective distractor.

On the written version of this assessment, JJ scored at a level equivalent to the mean of the PALPA control subjects and within the range of the matched control subjects. An examination of her scores for the different sentence types (table 9.12) showed that they all fell within the range of the PALPA control subjects.

The findings of this assessment indicate that JJ has a mild impairment in auditory comprehension of sentences. This is a modality specific impairment since performance on the written version was within the normal range of performance. In particular, she performed at a lower level of performance with adjective prediates. It is possible that she has a specific semantic processing deficits for this predicate type. This possibility can be explored by examining performance on PALPA assessment 57, auditory comprehension of verbs and adjectives, reported below. The poorer performance on the non-reversible comparative adjective sentences with to-complements in comparison to the sentences with the same structure but without to-complements is suggestive of an impairment in short term memory, since these sentences only differ in length. This explanation of JJ's mild short term memory deficit could also account for her better performance on the written version as this allows continued exposure to the target sentence and therefore involves a smaller memory load. Further information regarding JJ's short term memory is provided by her performance on PALPA assessment 60, pointing span for noun-verb sequences and PALPA assessment 12, repetition of sentences, reported below.

The errors made on the sentences with adjective predicates containing gaps co-indexed with the subjects indicate that JJ may have a specific impairment in processing this structure. In relation to this, it is of interest to note that the non-reversible comparative adjective sentences with to-complements (which JJ also made 2/4 errors on) also contain gaps co-indexed with the subject.

9.3.2 PALPA verb and adjective comprehension check

JJ's score on this assessment fell just below the range of the PALPA control subjects (range, 38 to 41), scoring 37/41 on form A (90%) and 36/41 on form B (88%). The errors did not relate to those made in the sentence-picture matching task. No errors were made on judgement of the adjective definitions; errors on adjectives might have been expected given that four out of seven errors on the spoken sentence-picture matching assessment were lexical errors on adjectives. Across both versions of the test, there were seven false positives (acceptance of incorrect definitions) and two misses (rejection of correct definitions).

9.3.3 PALPA assessments 58 and 59, auditory comprehension of locative relations and written comprehension of locative relations.

JJ performed extremely poorly on this assessment, scoring only 11/24 (46%) on both versions which fell below the ranges of the PALPA control subjects. On the spoken version there were 12 reversal errors and one other error. On the written version there were nine reversal errors and four other errors. JJ made errors on all the prepositions in both versions. There appeared to be an effect of animacy with 13 errors for abstract items, eight errors for inanimate items and only five errors for living things, when the two versions of the test are collapsed. JJ was very hesitant while carrying out these assessments and reported that she found them very difficult.

The low level of performance on this assessment indicates that JJ has an impairment in comprehension of locative relations. The high proportion of reversal errors is indicative of an impairment in mapping thematic roles. Since no reversal errors were made on the sentence comprehension assessments, it would appear that this is an impairment specific to preposition predicates. The effect of animacy is surprising, given the high level of performance on the low imageability items in PALPA assessments 49 and 50, synonym judgement (see 9.1.2 above).

9.3.4 PALPA assessment 60, pointing span for noun-verb sequences

JJ's performance fell well below the mean of the matched control subjects on this assessment, with a score of only 3/14. She made no errors on the two SV structures. On one of the SVO structures, although pointing to the three pictures she lost the order reversing the V and O. She failed on both of the SV SV structures after which testing was then stopped. This level of performance is indicative of an impairment to short term memory. Further information regarding short term memory is provided by performance on PALPA assessment 12, repetition of sentences, reported below.

9.3.5 PALPA assessment 12, repetition of sentences

JJ found this task extremely difficult given her phonological impairment. She was only given half of the items as she was becoming upset and frustrated by the task. She successfully repeated 6/15 of the sentences. The nine failures arose partly as a consequence of phonological problems. JJ would get to one word and make numerous attempts to produce the target; when this was not managed then she did not produce the rest of the sentence. There were also other error types in which lexical items were substituted:

The dog is followed by the man -> "The dog is following the dog"
The man is licked by the dog -> "The man is licked by the cat or is it the dog"
The man is moving the horse -> "The man is (3) is showing (5) no
The girl is selling the cat -> "The girl is"

JJ, therefore, appeared on some occasions to have a problem in maintaining a memory trace of the sentence for successful repetition.

9.3.6 Summary and interpretation of performance on sentence comprehension tasks

JJ performed at a relatively high level on the PALPA sentence comprehension assessments although her overall score fell below the mean of the PALPA control subjects and the range of the matched control subjects for the spoken version. Better performance on the written version (where her performance was equivalent to that of the control subjects) may reflect the different processing characteristics of the two presentations. While reading involves a visual stimulus which is temporally stable and is available to the subject to go back to, the spoken version does not afford continued exposure. Given the evidence for impaired short term memory from performance on the PALPA pointing span assessment and sentence repetition, it could be predicted that continued availability of the stimulus would aid JJ's comprehension.

On the auditory version of the sentence-comprehension assessment, all errors were lexical, six out of seven involving errors on the predicative words. One possibility is that errors may be influenced by specific difficulties in the comprehension of the predicative words used. Performance on the PALPA verb and adjective comprehension to definitions assessment did not support this hypothesis. Although JJ performed below the range of the PALPA control subjects, she still performed at a relatively high level and the errors made on this assessment were not on predicates that she made errors on in the sentence comprehension assessment.

JJ appeared to have a specific problem with adjective predicates. She only scored 2/4 correct on the comparative adjectives with to-complements in contrast to 4/4 correct on identical sentences without the to-complements. One possible account for this differential performance is that it is the increased sentence length which gave rise to JJ's poorer performance on the sentences with to-complements. Given JJ's impaired performance on measures of short term memory (see 9.3.4 and 9.3.5) this appears a plausible suggestion. However, it is of interest to note that on the verb predicate sentences containing gaps (which also contain a to-complement and are only one word shorter than the comparative adjective sentences with to-complements) JJ made no errors.

An alternative suggestion for these errors arises from an examination of the other errors that JJ made with sentences containing adjective predicates. She only scored 2/4 correct on sentences with adjective predicates containing gaps coindexed with the subject. In contrast, no errors were made on equivalent sentences with gaps not co-indexed with the subject or on sentences with verb predicates containing gaps. The comparative adjective sentences with to-complements, besides being longer than their equivalent sentences without to-complements, also differ in that they contain gaps coindexed with the subject. Thus, the errors on these items could be hypothesised to arise from a deficit in handling gaps with adjective predicates when the gap is coindexed to the subject of the sentence. Indeed, if we assume that JJ's lexical comprehension was good enough to reject the picture with the lexical distractor on the subject without difficulty, JJ was only scoring at chance level on this type of sentence. This problem could be accounted for as a syntactic parsing deficit in the co-indexing of empty categories (cf. discussion of Caplan and Hildebrandt, 1988 and Grodzinsky, 1990 in 2.4.2 above) or as a mapping deficit with poor performance for sentences in which there is a non-transparent relationship between D-structure and S-structure (see discussion of Schwartz et al, 1987 in 2.4.3 above). It should be noted that for the non-reversible comparative adjective sentences with infinitive clause complements, successful co-indexation of gaps is not necessary to make the correct picture selection as distractor pictures only involve lexical distractors for the comparative adjective and the object. It is possible, however, that impairment in handling gaps may interfere with performance.

JJ made no errors on reversible sentences, indicating that she is not impaired in mapping thematic roles when this is dependent on word order. While her ability to map thematic roles for verb predicates appeared to be intact, however, this did not appear to be the case for prepositions as is demonstrated by her poor performance on the assessment of comprehension of locative relations across modality of input. As the majority of errors were reversals, this indicates that JJ's comprehension of the preposition predicates is intact but that she has a problem in mapping of thematic roles (which are dependent on word order).

While a number of different possible levels of impairment have been discussed to explain JJ's performance on a number of the assessments investigating the processes involved in sentence comprehension, it should be noted that this is not a severe deficit. Furthermore, the possible explanations of impaired performance are based on small numbers of the different sentence types. Further investigation of sentence comprehension would be required to distinguish between the possible hypotheses.

9.4 Summary of the findings of the cognitive neuropsychological investigations

The analyses described in this chapter have allowed the formulation of specific hypotheses regarding impairments to the levels of processing specified in the models of language processing presented in Chapter Two.

The major impairment identified from the assessments of single word processing was in access to the phonological output buffer, giving rise to phonological errors in all spoken output tasks. In addition, from her performance on oral naming assessments JJ appears to have a mild impairment in access to the phonological output lexicon which gives rise to delayed lexical retrieval.

The investigations of sentence production indicated that the mild impairment in lexical retrieval identified from assessments of single word processing resulted in an impairment in sentence production. This manifested itself in the abandonment of clauses as well as a significantly greater use of pronouns to refer than the control subjects.

The investigation of sentence comprehension showed that JJ had some specific deficits. Written sentence comprehension was better than auditory sentence comprehension. It was suggested that a short term memory deficit may result in this differential performance. JJ appeared to have a specific processing impairment for sentences with adjective predicates containing gaps not co-indexed with the subject. A number of hypotheses that have been proposed in the literature were noted. With the limited amount of data collected in this study, it is not possible to discriminate among these. In addition, JJ demonstrated a particular difficulty in comprehension of locative relations. It was proposed that this arose from a specific difficulty in mapping of thematic roles for preposition predicates. Overall, it is important to note that while JJ performed at a level below that of the control subjects for auditory sentence comprehension, she only has a mild level of impairment as she was able to make correct judgements for 88% of the items.

The investigations reported in this chapter have allowed identification of JJ's speech and language impairments in terms of a cognitive neuropsychological framework. These findings will be drawn upon in the investigation of JJ's conversational ability presented in Chapter Ten below.

Chapter Ten

CONVERSATION ANALYSIS OF SUBJECT JJ

10.0 Introduction

In this chapter the findings of the analysis of JJ's two conversations (with a relative and with the researcher respectively, as described in 4.4) are presented. The format of the chapter will follow that developed in the analysis of subject EN's conversation in Chapter Six. Turn-taking patterns are discussed in 10.1, the analysis of self repair is presented in 10.2, and in 10.3 collaborative repair patterns are examined. The chapter concludes with a summary of the main findings in 10.4. As for the analysis of subject AD's conversation (Chapter Eight), following the detailed analysis carried out in Chapter Six, this chapter has been kept briefer. It sets out to draw attention to any similarities of the conversational behaviour of JJ to the other two subjects and where differences occur these are explicated more fully. In particular, the chapter orients to the three major issues identified in the summary of Chapter Six and already oriented to in Chapter Eight. These are; preserved knowledge of conversational management procedures; manifestations of cognitive neuropsychological impairments in conversation; and finally the impact of the conversational partner on the nature of the interaction.

10.1 Analysis of turn-taking

10.1.0 Preliminary orientation: The structure of this section follows that developed in 6.1.0. JJ's ability to handle the split-second timing of turn-taking is examined in 10.1.1. In 10.1.2 the treatment of attributable silence by JJ and her interlocutors (which differs from that found in the conversations already analysed) is examined. Finally, an analysis of the production of major and minimal turns at talk is presented in 10.1.3.

10.1.1 General turn-taking abilities

In 6.1.1 the evidence for EN's retained turn-taking abilities was presented. Overall, the findings from the analysis of JJ's conversations were very similar to those of EN (and AD, see 8.1.1). JJ demonstrated retained knowledge of the rules operating in turn-taking, taking the floor with no gap or overlap. Excerpts illustrating this are given in appendix H. As discussed for EN, this provides evidence of sensitivity to cues indicating transition relevance places which in turn is indicative of retained ability in processing syntactic and prosodic features thought to be involved in the projectability of turn endings. This links with JJ's relatively preserved auditory comprehension abilities demonstrated in assessments of both single words and sentences (see 9.1.2 and 9.3.1).

There were tokens of overlap in JJ's conversations but, as for the other two subjects, these occurred in positions predictable from the turn-taking rules (see 3.1.1) rather than being violative in nature. Where overlap did occur, JJ further demonstrated retained turn-taking ability by either dropping out to allow her interlocutor the floor or when her interlocutor dropped out she sometimes recycled the part of her turn obscured by overlap (see appendix H for illustration).

In 6.1.1 it was reported that in EN's conversations there were instances where she lost the floor after initiating a turn because of long pauses which were not tolerated by her conversational partners. In 8.1.1 it was reported that there were no such instances in AD's conversations and it was suggested that this difference was related to the different patterns in the use of self repair between the two subjects. Similarly to AD, in JJ's conversations there were no examples of her losing the floor in this way. This is discussed further in relation to the use and success of delay repairs in 10.2.4.

10.1.2 Treatment of attributable silences by interlocutors

In JJ's conversation with her husband PJ, there were eight unfilled delays in an attributable silence position. Two of these silences were attributable to PJ, coming after a question from JJ:

(i)

9	JJ	so apparently you can (1.4) you can (2.7) have you put the car outside there can you can you do that
		(1.8)
10	PJ	outside the Roma
11	JJ	mhm
12	PJ	I don't think so

In this example (and the other token of silence attributable to PJ) the silence is followed by initiation of repair; in this case to establish the referent of <u>there</u>. As discussed in 3.2, there is a preference for self initiation of repair, other initiation being the dispreferred option. Thus, the silence can be seen to be an indication of a dispreferred form coming up. Schegloff, Jefferson and Sacks (1977) report that other-initiations are regularly withheld a bit past the completion of trouble source turn thus giving rise to an extra opportunity in an expanded transition space, for the speaker to initiate self repair. However, in neither case does JJ initiate repair. In contrast to both EN (6.1.2) and AD (8.1.1), JJ does not interpret attributable silences as indicating a problem with her presentation.

There were six sequences in which there was silence attributable to JJ. One of these was similar to that given above, with the silence being followed by other initiation of repair:

(ii)

34 PJ ...what about the shopping this weekend

(4.6)

35 JJ what about it

36 PJ when shall we do it

327 JJ oh (3.7) well (4.1) [wə] what about [tə 'təmə] tomorrow

It is interesting to note that PJ tolerates a very long silence (4.6 seconds) without initiating repair on his T34 presentation. As Levinson (1983) states, where a turn is conditionally relevant, when it fails to occur it is noticeably absent and inferences can be drawn "either of the sort 'no response means no channel contact', or, if that is clearly not the case, then 'no response means that there's a problem'." (1983: 320). Silences of 4.6 seconds in this sequential context are very rare in the conversation of normal interlocutors precisely for the reason that they set up inferences and therefore lead to the subsequent interaction developing in the light of those inferences. What is so interesting in this excerpt is that PJ tolerates JJ's attributable silence until she produces her turn.

There were other tokens in the conversation where silences attributable to JJ occurred which cannot be accounted for as a marker of dispreferred other initiation of repair coming up because after the delay JJ produced a conditionally relevant turn:

(iii)

95 PJ is there anything you [f] you fancy having in for your (1.3) meals for next week

(5.9)

96 JJ [wə] well when especially when when you're off erm (6.2) we can [aʔ] well (2.5) have something (3.2) a little bits [s] little bits of (2.3) nice things

It appears that PJ is not interpreting silences which are attributable to JJ as marking a problem which requires him to self repair or as marking a dispreferred turn coming up. It appears that in this conversation the interlocutors were very tolerant of silences; a strategy which may have developed to cope with the impact of JJ's language impairment on interaction. It is important to note that this is a joint strategy; while PJ can be seen to be tolerating these silences JJ is actually "producing" them by delaying the start of her turn. It is very interesting to note that there was only one such inter-turn silence in the conversation with LP. It therefore appears that JJ is sensitive as to which conversational partners she can use these silences with. Indeed, LP did inference from the failure of a conditionally relevant second part that there was a need to repair:

(iv)

148	LP	do you ever write them down
		(1.3)
149	LP	to try and remember them
		[
150	JJ	'hhhh .hhhhh* I'm [stə] still having (.) trouble to do that you see

After a 1.3 second silence LP adds to her utterance. This is in marked contrast to the tolerance of much longer silences by PJ.

Excerpts such as *(ii)* and *(iii)* above provide evidence that in conversation with JJ, PJ does not interpret silences as a marker of a dispreferred turn coming up. There was one sequence in the conversation in which PJ did repair his turn after an attributable silence. T97 is a clarification of JJ's previous turn for which either acceptance or rejection is conditionally relevant:

(v)

97	PJ	at lunch time
		(2.5)
98	PJ	y'mean
		[
99	JJ	yeah

After a 2.5 second silence PJ starts to clarify his previous turn in overlap with JJ's acceptance. In this case PJ's contribution is not neutral with respect to the inferences set up by attributable silence. It is possible that PJ's judgements about how to interpret silences depends upon the potential difficulty that he predicts JJ is going to have in producing a response; in this excerpt all that is required is a minimal response, while in excerpts *(ii)* and *(iii)* where long silences are tolerated, expanded turns are conditionally relevant.

To summarise, the contributions of both PJ and JJ appeared on most occasions to be neutral to the inferences that can be set up by unfilled pauses in a position where the silences which they create are attributable. For silences attributable to JJ, it is suggested that PJ allowed time for JJ to respond which she may need given her language impairments. It is proposed that tolerance may be influenced by PJ's judgement of the potential difficulty that JJ is going to have in producing a response. It is also suggested that JJ's use of silences can be seen to be strategic in that it appears that she may be sensitive to interlocutors who will tolerate a delayed response without setting up inappropriate inferences. Thus, there was only one case of attributable silence in the conversation with LP.

For the two silences attributable to PJ, it is not clear why JJ did not interpret the silences as an indication of the need for repair. One possible explanation is that this reflects loss of knowledge of turn taking rules. Given the evidence of preserved knowledge for all other aspects, this explanation does not seem plausible; a more likely explanation is that JJ and PJ have developed a general strategy of tolerating silence in their discourse.

10.1.3 Analysis of major and minimal turns

Figure 10.1 displays the proportion of major turns produced by the interlocutors. In the JJ/PJ conversation the interlocutors produced equivalent proportions of major turns and in the JJ/LP conversation JJ produced a greater proportion (57%). This is very similar to the pattern of distribution of major turns in AD's conversations (see 8.1.2 above). The greater production of major turns by JJ in the conversation with the researcher follows the pattern found for both other subjects and can be linked with the differing nature of the two conversations (see 6.1.3). As for AD, despite her language impairments JJ continued to participate actively in conversation without relying on the use of minimal turns. This is in contrast to EN's reliance on minimal turns in the conversation with her relative (see 6.1.3 above). A comparison of use of minimal turns by the three aphasic interlocutors makes clear that the use of such a strategy arises as a consequence of both the activity of the conversational partner and the aphasic subject. This issue is taken up again in Chapter Eleven.

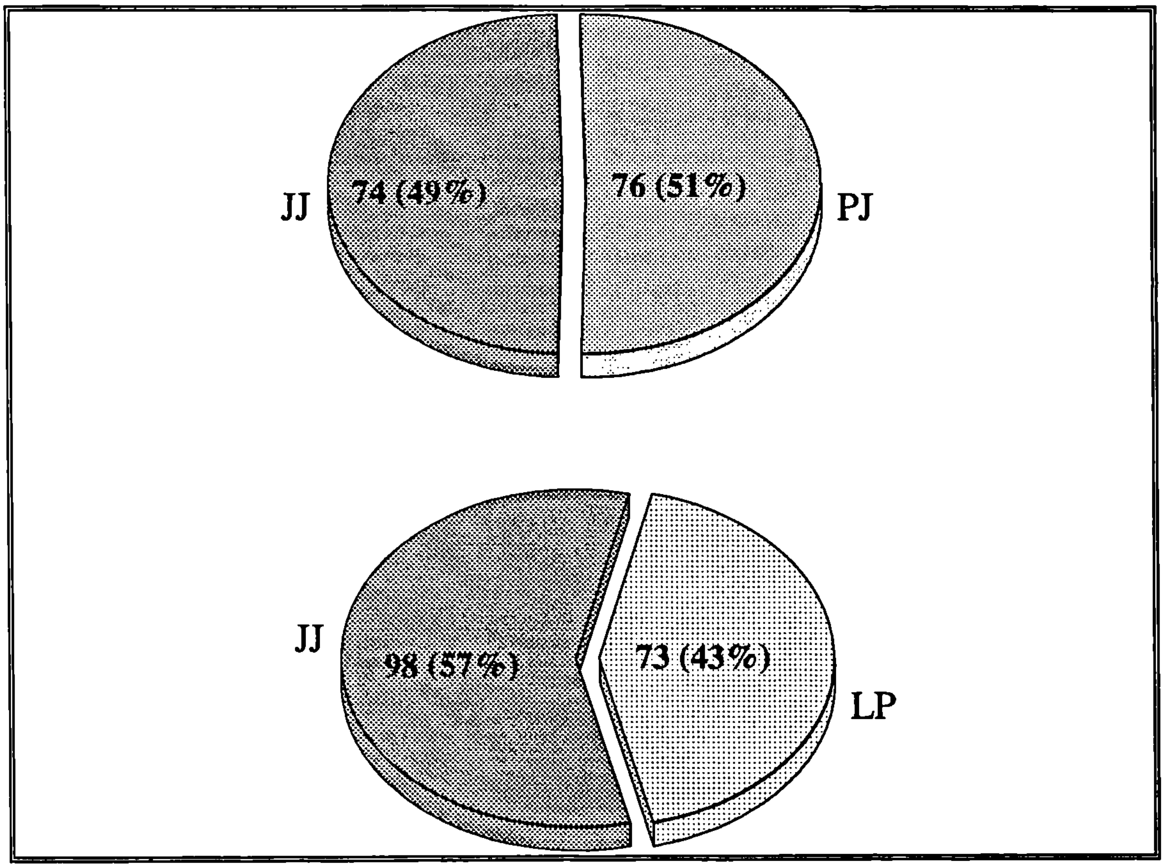

Figure 10.1: The proportion of major turns produced by JJ and her conversational partners

10.2 Analysis of self repair

10.2.0 Preliminary orientation

In this section, an examination of JJ's use of the four types of self repair identified and described in 4.4.3 is undertaken. The structure of the section follows that developed in 6.2, with an account of the quantity of use, the possible links between usage and underlying cognitive neuropsychological impairments, and the outcome in terms of success or failure for each of the self repair patterns. As discussed in 4.4.3, a comparison of the aphasic subjects' usage of a particular pattern of self repair to that of the normal interlocutors is used to decide whether usage can potentially be linked to the subject's cognitive neuropsychological impairments.

10.2.1 Replacement repairs

Quantity of replacement repairs: JJ's usage of this repair pattern differed across the two conversations with a greater proportion of major turns containing this repair pattern in the conversation with LP (24%) than in the conversation with PJ, where 15% of major turns contained this repair pattern. This follows the trend found in both other subjects' use of this repair (see 6.2.1 and 8.2.1) which was interpreted as arising from the contrasting nature of the two conversations .

In both conversations, the proportion of JJ's major turns containing this repair type exceeded the range of usage for the normal interlocutors (2% to 14% of major turns). It is therefore reasonable to suggest that JJ's cognitive neuropsychological impairments gave rise to more frequent usage. In the next sub-section the nature of the trouble source giving rise to JJ's replacement repairs are examined in an attempt to link their usage to specific cognitive neuropsychological impairments.

Links between the use of replacement repairs and underlying cognitive neuropsychological impairments: Although JJ produced a greater proportion of replacement repairs in the conversation with LP, since there was no identifiable difference in the nature of the trouble sources between them, the two conversations will be discussed as a whole.

Fourteen replacement repairs (34% of this repair type) dealt with a phonological error as illustrated below where JJ is trying to produce Breamish:

(vi)

148 JJ you know when we went to to (2.1)
[bi 'bivən bi bi bri 'brivən 'brivən]

The production of replacement repairs to deal with phonological errors can be linked with the finding in the cognitive neuropsychological assessments (see 9.1.3 to 9.1.5) that JJ has an impairment involving the phonological output buffer. A similar manifestation of impairment at this level of processing was also found for subject AD (see 8.2.1).

Twelve tokens (29% of this repair type) dealt with words cut off despite no audible error, a further 12 tokens (29% of this repair type) dealt with replacement of both free and bound grammatical morphemes. There was also one token involving replacement of a lexical item (2% of repair type). All these forms of replacement repairs were found in the conversational turns of the normal interlocutors (4.4.3), making it difficult to identify any clear link with JJ's cognitive neuropsychological impairments.

Success of replacement repairs: 26% (seven) of the replacement repairs in the conversation with LP and 29% (four) of the replacement repairs in the conversation with PJ failed. Looking at the failures as a whole, the largest proportion (eight tokens) arose in attempts to replace phonological errors which it has been suggested arise as a consequence of the identified deficit at the phonological output buffer. The repair attempts can be seen to fail because the conversational partner initiated collaborative repair as is illustrated in the following example:

(vii)

88 JJ...they're (1.3) er ['vɒlətrə 'vɒlə vɒ]

[

89 LP oh* it's voluntary

The remaining three failures were of different kinds including one on a preposition where the conversational partner initiated collaborative repair in overlap of the replacement repair and one on a pronoun in which the replacement pronoun subsequently had a further replacement repair carried out on it.

Summary: JJ's usage of replacement repairs exceeded that of the normal interlocutors, suggesting that greater usage arose as a consequence of her cognitive neuropsychological impairments. This conclusion is supported by an examination of the trouble sources, the commonest being phonological errors, indicating a link with the identified impairment in processing at the level of the phonological output buffer. The majority of failures arose from the initiation of collaborative repair on replacement repairs dealing with phonological errors.

10.2.2 Abandoned clauses followed by subsequent clauses

Quantity of repairs: JJ's use of this repair pattern exceeded that of the normal interlocutors with 13% of her major turns in the conversation with LP and 14% of her major turns in the conversation with PJ containing abandoned clauses followed by subsequent clauses (range of normal interlocutors, 1% to 5%). It therefore seems reasonable to suggest that JJ's cognitive neuropsychological impairments gives rise to the utilisation of this repair strategy.

Links between the use of abandoned clause followed by subsequent clause and underlying cognitive neuropsychological impairments: As noted in 4.4.3, it is difficult to establish for an individual case the nature of the trouble source giving rise to this form of repair although, as already noted above, JJ's greater usage of this type of repair than the normal interlocutors does indicate a link between its usage and cognitive neuropsychological impairments.

As there was no identifiable difference in the use of this repair strategy between the two conversations, the tokens will be considered as a whole. In all, 15% (four) of the clauses were abandoned after the production of an auxiliary verb with a further 15% (four) being abandoned after the production of subject plus the inflectional 3s morpheme. These are similar to the abandonment identified in the conversational data of subject EN (6.2.2). Similarly to EN, it was proposed in 9.2.2 above that JJ's abandoned clauses arose as a consequence of failures in lexical retrieval. This proposal took into account the evidence of ability to produce complete and appropriate predicate argument structures in conjunction with the findings of the assessments of picture naming (9.1.4 above) that JJ is impaired in accessing the phonological output lexicon. In further support of this proposal, a large number of abandoned clauses followed by subsequent clauses occurred with delays, for example:

(viii)

88 JJ they don't (1.2) erm (1.8) they're (1.3) er ['vɒlətrə 'vɒlə vɒ]

[

89 LP oh* it's voluntary

It seems plausible to suggest that the clause is abandoned after the auxiliary verb, because of a failure in lexical retrieval of the verb.

22% (six tokens) of clauses were abandoned after production of the verb, 19% (five tokens) after the subject with the remaining 19% (five tokens) abandoned at other positions in the clause. For all of these it is difficult to link their occurrence with the cognitive neuropsychological impairments identified in Chapter Nine although it is plausible, given the findings of the cognitive neuropsychological assessments that at least some of these arise as a consequence of lexical retrieval problems.

Success of repairs: There were five failures in the conversation with LP (33% of repair attempts) and six failures in the conversation with PJ (46% of repair attempts). Looking at the failures across the conversations around half of the failures arose from the subsequent clause also being abandoned and being followed by a subsequent clause. For the other half, collaborative repair was initiated by the conversational partner as is seen in *(viii)* above. Thus, failure arose in this case because JJ did not succeed in producing a subsequent clause which could be accepted immediately.

Summary: JJ's greater use of this repair pattern than the normal interlocutor indicates that usage may arise as a consequence of cognitive neuropsychological impairments. Some tokens are indicative of problems in lexical retrieval giving rise to its use. These appear to be similar to tokens identified in subject EN's conversations. Failures arose from both the initiation of collaborative repair by the conversational partners and from JJ abandoning the subsequent clause and initiating a further clause.

10.2.3 Repetition repairs

Quantity of repair: JJ produced a greater proportion of repetitions in her major turns than the normal interlocutors. In the conversation with LP, 27% (26) of major turns contained repetitions, while in the conversation with PJ, 31% (23) of major turns contained this repair pattern (range of normal interlocutors 0% to 12%). It therefore seems reasonable to suggest that a relationship exists between JJ's cognitive neuropsychological impairments and the usage of repetitions.

Links between the use of repetition repairs and underlying cognitive neuropsychological impairments: JJ's usage of repetition was similar to EN's (see 6.2.3) in that the majority were short, involving only one word and only one repetition of that word. This contrasts to the long repetitions produced by AD which, it was suggested, was a useful strategy to hold onto the floor and avoid the conversational partner either initiating collaborative repair or glossing over the turn in progress (see 8.2.3 above).

Examining the repetitions of the two conversations as a whole, 50% (30) of repetitions co-occurred with delays in the same clause. This is similar to the repetitions produced by EN for which 69% co-occurred with delays and in contrast to AD for who only 12% of repetitions co-occurred with delays.

Given the evidence of JJ's impaired access to the phonological output lexicon (see 9.1.3 to 9.1.5 above), it seems plausible to suggest that her extensive use of repetitions is linked to their effect of allowing more time for lexical search. This is supported by an examination of some tokens:

(ix)

134	JJ	aha well it's it's the (1.5)
135	PJ	council=
136	JJ	=aha

(x)

124	JJ	the [faʊn] fountain (1.2) the fountain (3.0) eee I don't know I'm very I'm not very sure

In *(ix)* the repetition occurs before a noun phrase. The delay after the determiner followed by the initiation of collaborative repair is suggestive of problem in lexical retrieval. In *(x)* JJ is attempting to give the name of the speech after stroke club that she is a member of. After repetition of fountain she abandons her attempt, clearly indicating a failure in lexical retrieval.

Success of repetition repairs: In JJ's conversation with LP, 18% occurred in abandoned clauses (six tokens) and in her conversation with PJ, 11% occurred in abandoned clauses (three tokens). A discussion of the problems of deciding upon the success of editing terms when a clause is abandoned and followed by a subsequent clause is given in 4.4.3. For EN it was proposed (in 6.2.3), given the evidence for an impairment in lexical retrieval, that editing terms in abandoned clauses can be seen as failures. This is because, assuming the editing term has been functioning to give more time for lexical retrieval, abandonment can be seen as an indicator of the failure of the use of repetition or delay repair to resolve the trouble source. Given that a similar lexical retrieval impairment has been identified for subject JJ, a similar account may hold. It should be noted, however, that a smaller proportion of JJ's repetitions occurred in abandoned clauses than did EN's.

For the remainder of repetition repairs, 70% in the conversation with LP (19 tokens) and 63% in the conversation with PJ (15 tokens) were successful. Failures arose because of the initiation of collaborative repair. Most commonly this arose from a delayed lexical search with the conversational partner coming in to offer a collaborative completion as is seen in *(ix)* above.

Summary: Given JJ's greater usage of this repair pattern than the normal interlocutors it seems likely that there is a link with her underlying cognitive neuropsychological impairments. While a greater proportion of repetition repairs were found in JJ's conversations than EN's, a number of similarities were found between the two subject's use of repetitions.

10.2.4: Delay repairs

Quantity of repairs: JJ's use of this repair pattern exceeded those of the normal interlocutors, with 47% of her major turns in the conversation with LP, and 45% in the conversation with PJ containing one or more filled or unfilled pause (range of normal interlocutors, 0% to 9%). This suggests that JJ's cognitive neuropsychological impairments are giving rise to the use of this repair pattern.

Links between the use of delay repairs and cognitive neuropsychological impairment: In all there were 69 delays in the conversation with LP and 53 delays in the conversation with PJ. As the position of the delays was found to be equivalent across the conversations, the position of the delays are reported as a whole. The largest proportion (49%) of delays were found just preceding a lexical item as is shown in the following example:

(xi)

65	JJ	well Asda's good for (1.7) beef so we can (2.3) get it on (1.8) er tomorrow night

There are three delays in this turn, all of which occur before lexical items; the first and third before a noun and the second before a verb. The finding from cognitive neuropsychological assessments that JJ has an impairment at the level of the phonological output lexicon (9.1.3 to 9.1.5) indicates that a lexical retrieval deficit could account for the occurrence of delays before lexical items. A similar hypothesis was put forward for subject EN (see 6.2.4) who also produced a large number of delays in her conversational turns.

16% of the delays in JJ's turns occurred at the start of a turn. The production of a filled pause is a device which can be used by an interlocutor to indicate that they are taking the floor while still giving "processing time".

A further 7% of delays occurred between an abandoned clause and a subsequent clause. As discussed in 4.4.3, it is not possible to discern what has given rise to this repair type, which in turn makes it difficult to attribute the underlying cause for a delay. The remaining 28% of turns occur in a variety of other positions within the turn Some of these occur as filled pauses between clauses when JJ was taking an extended turn at talk:

(xii)

7 JJ no none at all I find that's the hardest thing really er I've just....

In this position the filled pause can be seen to be functioning to hold onto the turn. If the turn had not been filled, LP may have taken a turn at this point rather than allowing JJ to continue holding the floor.

Delays also included in the "other" category were those which occurred before preposition phrases and before embedded clauses. It is not possible to attribute these to underlying deficit; syntactic or lexical processing could give rise to delays in such positions.

An examination of the length of delays shows that JJ produced long delays in her conversational turns. In the conversation with LP, while 43% of the delays consisted of a short filled pause, or an unfilled pause not exceeding one second, the remaining 53% exceeded one second. In the conversation with PJ, 91% of the delays exceeded one second. Indeed, a large proportion of these involved unfilled pauses of three or four seconds. Delays of this length within turns are extremely unusual in normal conversational turns. There was a striking difference in the proportion of long delays between the two conversations. There are two plausible explanations for this difference. The first is that JJ is aware of differences in tolerance between interlocutors and therefore controls the length of delays produced accordingly. Alternatively, LP may initiate collaborative repair, thereby terminating the delay. Information regarding the relative success of delays in the two conversations should allow the second possibility to be tested out. If there is a higher proportion of failed repairs in the conversation with LP because of initiation of collaborative repair, this would support the second explanation.

Success of repair: There were similar patterns of success across the two conversations although there were more successes in the conversation with LP in contrast to PJ (55% and 45% respectively). This, therefore, indicates that rather than the smaller proportion of long delays arising in conversation with LP because LP initiates collaborative repair early on, JJ is changing the length of delays produced according to her conversational partner. Tolerance of delays by JJ and PJ has already been established for their occurrence in attributable silence position (see 10.1.2 above). It would appear that this tolerance also extends to delays within turns. The higher proportion of successful repair in the conversation with LP in contrast to the conversation with PJ shows that this greater tolerance does not lead to a greater success in the use of delay repairs.

The vast majority of failures in both conversations arose from the conversational partner instigating collaborative repair when JJ was searching for a word as illustrated in the following excerpt:

(xiii)

128	JJ	Whickham (1.5) the (2.3) [kə] the (2.6)
129	PJ	the baths

After the final 2.6 second unfilled pause in JJ's T128, PJ produces a candidate completion. As noted in the discussion of repetition repairs above, whether the conversational partner comes in to initiate repair influences the success of a self repair. In excerpt *(xi)* above there are three unfilled pauses. On this occasion, however, PJ does not initiate collaborative repair and as JJ is eventually able to retrieve the lexical items required, they are seen as successful. The issue of conversational partner is discussed further in 10.3 below when collaborative repair is examined in more depth.

Summary: JJ used delay repair to a much greater extent than the normal interlocutors, the length of the delays also being greater than found in the conversational turns of the normal interlocutors. It is likely that these two findings arise from the impact of impaired lexical retrieval identified in cognitive neuropsychological assessment. JJ appeared to control the length of delays that she produced, depending on the interlocutor. The production of longer delays in the conversation with PJ did not result in a higher rate of success for this pattern of self repair, however. In both conversations around half of the delay repairs failed.

10.3 Analysis of collaborative repairs

10.3.0 Preliminary orientation

The presentation of the analysis of collaborative repair follows the framework developed in 6.3 and utilised in 8.3, with frequency of collaborative repair sequences presented in 10.3.1, links between the initiation of collaborative repair and underlying cognitive neuropsychological impairment discussed in 10.3.2, and the issue of mode of resolution of collaborative repair sequences addressed in 10.3.3. Similarities and differences between JJ's two conversations are discussed throughout the section.

The findings of the analyses of JJ's conversation are compared to the findings of the analyses of conversations of both EN and AD (which have been explicated fully in 6.3 and 8.3 respectively) throughout the section and similarities and contrasts are commented on.

10.3.1 Frequency of collaborative repair in JJ's conversation

In JJ's conversation with the researcher, 16 collaborative repair sequences were initiated on JJ's turns. Precisely the same number of collaborative repair sequences were initiated by JJ's relative, PJ in their conversation. The issue of the differing strategies used by interlocutors to deal with problematic turns has already been discussed in 8.3.1 above. PJ used a similar strategy to that used by LP in all her conversations and by RE in her conversation with AD, in that he initiated collaborative repair rather than glossing over problematic turns, as was done by EN's conversational partner BC.

In 8.3.1, three possible influences on the differing strategies of BC and RE were proposed. These were first, the influence of knowledge shared by the interlocutors; second, the influence of impact of the subject's cognitive neuropsychological impairment and their manifestation in conversation; and finally, the influence of personal discourse styles of the subjects' conversational partners. What do the frequency of initiation of collaborative repair in JJ's two conversations add to the assessment of the relative importance of these possible influences?

As discussed in 8.3.1, while the level of knowledge shared between interlocutors may influence the choice of strategy, a high level of shared knowledge does not invariably lead to the selection of a strategy of glossing over problematic turns in preference to a collaborative repair strategy. This caveat to the "shared knowledge" explanation of different strategies is supported by the findings for JJ's two conversations. Despite clear differences between the relative and the researcher in the quantity of knowledge shared with EN, a similar strategy of dealing with trouble sources was found in both conversations.

The second proposal (that the manifestation of cognitive neuropsychological impairments may influence the strategies used by the conversational partner to deal with problematic turns) has been discussed in relation to the differing usage of editing terms by EN and AD (see 8.1.3). JJ's use of editing terms shares a number of similarities with that of EN (see 10.2.3 and 10.2.4). First, she produced a large number of delays, many of which were longer than one second. Second, the repetitions that she produced were short (involving single repetitions of one or two words) and half of these co-occurred with delays. Given similar manifestations of lexical retrieval impairments (through the use of editing terms) for EN and JJ, it appears that manifestation of cognitive neuropsychological impairment does not necessarily determine the strategies of the conversational partners. The use of other self repair patterns must, however, also be taken into account.

JJ has an impairment in access to the phonological output buffer which manifested itself in replacement repairs which sometimes failed (see for example *(vii)*, p.380). Such errors are specific and usually a lot of information about the target word is contained in the phonemic paraphasias of both the trouble source and the attempted repair. Resolution of collaborative repair is therefore very quick, involving a small amount of collaborative effort. EN had very few such failed self repair attempts. Although apparent apraxic problems gave rise to replacement repairs, the self repair attempts were usually successful. Thus, there were a greater number of trouble sources which required a small investment of collaborative effort to repair in JJ's conversational turns. In contrast, EN produced a much higher proportion of abandoned clauses followed by subsequent clauses than JJ. As discussed in 6.3, collaborative repair of these failed self repair attempts often involved establishing a general understanding of the whole presentation which required a much greater investment of collaborative effort than more focused repair issues. Such trouble sources may indeed influence the interlocutor to avoid collaborative repair where possible and instead gloss over the problematic presentation. It therefore appears that the manifestation of cognitive neuropsychological impairments may indeed be an important influence on the interlocutors' strategies.

Finally, the possible influence of the differing discourse styles of the interlocutor must be considered. In 10.1.2, it was noted that in their conversation both PJ and JJ were tolerant of long delays. It was proposed that this was a strategy which had been developed by the interlocutors in light of JJ's language impairments and the high proportion of delays occurring in her conversational turns. This contrasts with BC who was very intolerant of delays and used them as an opportunity to take the floor, often glossing over EN's turns (see 6.2.4 below). This contrast clearly demonstrates that individuals may have certain discourse styles. Indeed, it is likely that interlocutors use different discourse styles with different interlocutors and in the case of communication with aphasic subjects, interlocutors may develop certain styles for interaction with them. This has important implications for the issue of indirect intervention and will be taken up again in Chapter Eleven.

JJ initiated two collaborative repair sequences on the turns of PJ in their conversation. These involved requests for clarification on first pair parts of adjacency pairs (see *(ii)*, p.374 for an example). They demonstrate JJ's ability to identify when she needs further information, as well as her ability to initiate collaborative repair. In her conversation with LP there were no initiations. This follows the trend found in AD's conversations, with some initiations by AD in his conversation with his relative but no initiations in his conversation with the researcher. It seems plausible that the absence of collaborative repair in the conversation with LP arises as a consequence of the differing nature of the conversations with the researcher in comparison to the relatives (see further 8.3.1).

10.3.2 Links between the initiation of collaborative work and underlying cognitive neuropsychological impairment

In this section, the collaborative repair sequences that occurred in JJ's conversations with LP and with PJ will be examined as a whole as there were no identifiable differences between the two conversations with respect to the nature of the trouble sources giving rise to collaborative repair.

The majority of collaborative repairs initiated on JJ's turns were focused on particular words. This is similar to what was observed in AD's conversations (8.3.2) but different from the collaborative repair sequences initiated on EN's turn (6.3.2), which were often dealing with achieving a general understanding of a multiply repaired turn.

Overall, 53% (17) of the collaborative repair sequences in JJ's two conversations arose after a very obvious word search (marked by metalinguistic comments) or delays before a lexical item. The impairment in access to the phonological output lexicon identified from cognitive neuropsychological assessments (see 9.1.3 to 9.1.5 above) clearly manifested itself in the occurrence of these collaborative repairs. Examples of collaborative repair sequences arising after apparent lexical retrieval problems are given in *(xiv)* (p.395) and *(xvi)* (p.398) in 10.3.3, where the mode of resolution of such sequences is examined.

A further 9% (three) of the collaborative repair sequences arose from the use of ambiguous referring expressions. In addition, there were also further examples of vague referring expressions giving rise to collaborative repair within the longer collaborative repair sequences (see T198, *(xiv)*, p395 below for illustration). In the analysis of sentence production, JJ was shown to use a significantly greater proportion of pronouns to refer than the control subject (see 9.2.3). This was proposed to be a manifestation of JJ's impairment in access to the phonological output lexicon. Thus, this impairment can again be linked with the occurrence of collaborative repair work. Similar collaborative repair sequences were found for both EN and AD (see 6.3.2 and 8.3.2 below).

Phonemic paraphasias gave rise to 16% (five) of the collaborative repair sequences. Collaborative repair of phonological errors also occurred in some of the longer collaborative repair sequences which had originally arisen because of lexical retrieval problems. These repair sequences can be seen as a manifestation of the impairment that JJ has in access to the phonological output buffer (identified in the assessment of the single word processing, see 9.1.3 to 9.1.5). Collaborative repair dealing with such trouble sources were also observed in AD's conversation (see *xix*, p.326). Illustration of collaborative repair arising from this type of trouble source in JJ's conversations is given in *(xv)*, p.396 and *(xvii)*, p.400 below.

For the remaining collaborative repair sequences (22%, seven tokens) it is not possible to identify a link with JJ's cognitive neuropsychological impairments. Four involved collaborative completion of JJ's turn by the interlocutor despite no indication that JJ would run into difficulties completing the presentation herself. Similar examples were found in EN's conversation with LP (see 6.3.2). It was suggested that given EN's level of conversational problems, the conversational partner may utilise this collaborative strategy when they are able to propose a collaborative completion, in order to avoid protracted self repair which may arise if she had to complete the presentation herself. The same explanation of collaborative completion is plausible for JJ.

The small number of collaborative repair sequences initiated by JJ on the normal interlocutors' turns is congruent with the findings from the assessments of both single word and sentence comprehension (9.1.2 and 9.3) that auditory comprehension is only mildly impaired. Thus, JJ was similar to EN who initiated no collaborative repair sequences and who demonstrated good auditory comprehension in cognitive neuropsychological investigation. AD differed in initiating a greater number of collaborative repair sequences which, as noted in 8.3.2, can be linked with his impaired auditory comprehension identified in cognitive neuropsychological assessment.

10.3.3 Mode of resolution of collaborative acceptance phases

The majority of initiators of collaborative acceptance phases found in JJ's conversations were demonstrations of understanding reached. Thus, as found in the conversations of both EN and AD (6.3.3. and 8.3.3 respectively) the principle of least collaborative effort was being observed by the aphasic subjects' interlocutors through the use of the strongest initiator of the acceptance phase.

As noted in 10.3.2 above, the nature of the trouble sources giving rise to collaborative repair in JJ's conversations were on the whole focused on a single lexical item. The same was found for the majority of collaborative repairs initiated on AD's conversational turns. For AD, the fast resolution of most instances of collaborative repair sequences was proposed to arise partly as a consequence of the specific nature of the trouble sources, with the demonstration of understanding simply involving the supply of a word which AD can either reject or accept (see 8.3.3 above). Fast resolution was observed in some of the collaborative repair sequences found in JJ's conversations. A number of sequences were, however, extended. One reason for extension was also observed in repair sequences in AD's conversations (see *(xiv)*, overleaf). The use of repetition to accept a demonstration of understanding reached on occasions gave rise to further phonological errors. Production of phonemic paraphasias in repetition can be seen as a manifestation of both AD and JJ's impairment in access to the phonological output buffer. As the errors also have to be dealt with before the closing down of the repair sequence, the use of repetition results in extended collaborative sequences. The extension was not focused on achieving a level of understanding of the original presentation sufficient for current purposes. Rather, it was focused on correction of errors.

Extension of collaborative repairs was not only seen as a consequence of JJ's impaired repetition. Extension of collaborative repair also arose because JJ focused on correcting herself to a level beyond that needed to establish that her interlocutor had understood the original presentation. This is illustrated in the following example:

(xiv)

194 JJ it's (0.7) now let's the (2.1) oh my goodness what do they call it I'll tell you

(1.0: *goes to look for leaflet which contains name)*

195 LP is it like a community bus

196 JJ yeah

(2.8: *JJ continues to search)*

197 JJ where are you

(2.6: *JJ continues to search)*

198 JJ do you know my husband do does these things

199 LP what he's tidying up

200 JJ yeah he's always for ever

201 LP {hehehe}

202 JJ and I don't know where it is but anyway you know what I mean

[

203 LP it's like a commun*ity bus

[

204 JJ yeah*

erm and I get home......

In T194 JJ runs into a problem in lexical retrieval of the name of the transport that takes her to the speech after stroke club. In order to deal with this failure she attempts to utilise an external aid by looking for the leaflet that will have the name she is trying to retrieve. LP provides a demonstration of understanding reached in a question format (T195) and JJ apparently accepts this with an acknowledgement token in T196. This does not, however, complete the acceptance phase as the interlocutors do not move onto the next relevant contribution. JJ continues to search for the card. T197 to T201 can be seen as a side sequence filling the time while JJ finds the card to complete her original presentation in T194 (the side sequence also contains collaborative repair work in T199-201 arising from a vague referring expression). In T202 JJ gives up the search with an appeal for acceptance from LP with <u>but anyway you know what I mean</u>. LP in T203 produces the same demonstration of understanding reached that she produced in

T195, in overlap with JJ. JJ provides acceptance through an acknowledgement token followed by a move to the next relevant contribution (T204). Again the focus of JJ's turns are in producing what she has failed at rather than simply the issue of LP reaching understanding sufficient for current purposes. If this were the issue, the repair work on this turn could have finished after acceptance of LP's T195 demonstration of understanding reached. There are other examples of collaborative acceptance phases being extended by JJ for reasons beyond that of establishing understanding sufficient for current purposes.

Extension of collaborative repair sequences arose not only as a consequence of JJ's focus on achieving "correct language production". Examples were found in the conversation with PJ which demonstrate that the impetus for this focus can arise from the conversational partner as illustrated in the following example:

(xv)

148 JJ [mi] meal in (1.3) you know when we went to to (2.1)
[bi 'bivən bi bi 'brivən 'brivɛn]
[
149 PJ Breamish

150 JJ mhm

151 PJ Breamish

152 JJ mhm

153 PJ [brim]

154 JJ [brim brim]

155 PJ [brim]

156 JJ [brim]

157 PJ [iʃ]

158 JJ [iʃ] Breamish

159 PJ aha {cough}

160 JJ we came past it (1.5) er and it's called....

In T148, JJ is attempting to repair phonological errors. PJ provides a demonstration of understanding reached in overlap of JJ's attempts to self repair in T149 and JJ accepts this with an acknowledgement token in T150. This does not, however, complete the acceptance phase of the contribution because in T151 PJ does not accept JJ's previous acceptance (through moving onto next relevant contribution or by the production of an acknowledgement token) which would ultimately mark acceptance of the original presentation. Instead he repeats his previous turn. JJ again produces an acknowledgement token in T152 but PJ still does not allow completion of acceptance and continues with repetition of the first and then the second syllables of Breamish for a further six turns until JJ has repeated the whole word in T158. Finally, PJ provides acceptance through an acknowledgement token in T159, thus, allowing the close down of the acceptance phase. JJ is then able to make the next relevant contribution 11 turns after the presentation containing the trouble source.

As in some of the collaborative repair sequences found in the conversation with LP this collaborative repair sequence appears to be extended for reasons beyond the that of establishing that PJ has understood JJ's presentation sufficient for current purposes. T150 to T157 focus on JJ producing the word that gave rise to the repair. The impetus for this focus on achieving "correct" language production differs, however, from the conversation with LP in that it is not initiated by JJ but by her conversational partner. There are several collaborative sequences which are prolonged in this way. The same phenomenon can be seen in T86 to T94 in *(xvii)*, p.400 below. This can be seen to be violating the collaborative principle in that by continuing collaborative work beyond that required for current purposes, collaborative effort is not being minimised. There were no examples of LP extending completion in this way in her conversation with JJ.

All of the excerpts discussed so far have involved initiation of the collaborative acceptance phase by demonstration of understanding reached. This illustrates that for the majority of the time JJ's presentations provided enough information for her interlocutors to produce a strong acceptance phase initiator which minimised the collaborative repair required (although it has been suggested that both JJ's and PJ's concern with producing a "correction" can lead to extension of the collaborative work). There was, however, a small number of examples in which LP and PJ had to initiate collaborative repair using the weaker acceptance phase initiator of a question. An examination of one of these excerpts shows how this results in longer collaborative acceptance phases although it also demonstrates how the interlocutors used all their resources to achieve acceptance as efficiently as possible:

(xvi)

226	LP	has he had a job over the summer or
227	JJ	yeah he's he's (2.1) well he finished er was it a week ago or two weeks no it it'll just be over the week* now erm (1.5) he (0.9) was doing for the (3.5)
		[
228	LP	right
	JJ	it's er now then (0.6 the [ff] (2.8) the nuts=
229	LP	=mm {laughter}
230	JJ	sorry but I'm trying to (0.6) the
		[
231	LP	is* it anything to do with his course
232	JJ	no* nothing at all {laughter} 'hhh er::m (1.8) it's (0.8) er: hospital (1.5)
		[
233	LP	no
234	LP	Queen Elizabeth
235	JJ	no it's over it's over this way
236	LP	Prudhoe
237	JJ	thank you
238	LP	right
239	JJ	I now I cannot get that out do you know that is one of the things* I cannot
		[
240	LP	yeah
	JJ	get it out
		[
241	LP	yeah*{hehe}

242 JJ what is it again

243 LP Prudhoe

244 JJ Prudhoe Prudhoe Prudhoe that's it and erm {cough} he just tried 'cause he he he just couldn't get anything at all

JJ produces an extended turn at talk (T227). LP produces acceptance of the first part of it with an acknowledgement token in overlap (T228). In the following part of T227, JJ runs into trouble reporting who her son has been working for. After a long delay she produces the nuts. LP produces mm followed by laughter in T228. It, however, becomes clear from the subsequent turns that this has not completed acceptance of the presentation as JJ continues with her attempts to self repair (prefaced by an apology) in T229. It appears that LP's acknowledgement token is marking recognition that a protracted repair sequence is in progress and that she is not at this point going to initiate collaborative repair. This particularly clearly illustrates the strength of a sequential analysis in which functions of turns are judged in terms of what follows in the conversation rather than by defining *a priori* the function of particular forms.

After a 0.6 unfilled pause in JJ's T230, LP does initiates collaborative repair in T231. There is not enough information in JJ's presentation for LP to produce a demonstration of understanding reached. Instead she produces a question to obtain more specific information. JJ provides an answer to this in T232 and then continues after protracted delay to provide some information (hospital) which allows the collaborative process to progress. LP suggests a possible hospital in T234 (which functions as a demonstration of understanding reached). JJ rejects this and provides further information in T235 (utilising a deictic referring strategy). This gives rise to LP providing a further demonstration of understanding reached which is this time successful as is marked by JJ's T237. LP's acknowledgement token following this (T238) can be seen to function to accept both JJ's acceptance and the original presentation which has been the focus of the collaborative work. This pair of minimal turns is typical of the closing down of complex repairs as discussed in 6.3.3.

In T239 to T244, JJ's concern with producing the correction herself is apparent and it is only after she has repeated Prudhoe in T244 that the conversation progresses on the topic of her son's job. It is of interest to note that after 16 intervening turns, JJ is able to keep track of the topic and continue.

This excerpt shows particularly clearly the collaborative principle in operation. Although not able to make this presentation suitable for immediate acceptance, JJ cannot be said to be taking a passive role in the repair procedures. She is able to provide information which are similar to the "hints" described by Lubinski, Duchan and Weitzer-Lin (1980). Each pair, however, contributes to the completion of the acceptance phase supporting the treatment of the whole sequence as a whole rather than as isolated repair attempts which succeed or fail.

In the above excerpt, the provision of circumlocutory information about the word she was trying to retrieve allowed LP to offer a strong initiator of the collaborative acceptance phase. The following excerpt shows that JJ was sometimes so focused on retrieving the lexical item that she did not provide this type of information which may have helped faster resolution of the collaborative repair:

(xvii)

69 JJ and I'll tell you what I want I need some (2.4) o::h (2.7) it's it's a [də di]

70 PJ [də]

71 JJ a (2.4)

72 PJ to eat

73 JJ no it's a (2.9) (it's not) a [dɪ] a death no

74 PJ a death you don't want a death

75 JJ {laughter} shush I'm thinking it's a (1.9) death no {heh}

76 PJ er: (1.4)

77 JJ [dɛʃ] no

78 PJ dish

79 JJ dish thank you dish (1.4)

80 PJ washer

81 JJ wipe wipe

82 PJ a dish wipe

83 JJ wiper aha

84 PJ a dish cloth

85 JJ mhm

86 PJ a what

87 JJ er what

88 PJ dish cloth

89 JJ dish (1.0)

90 PJ cloth

91 JJ cloth cloth

92 PJ dish cloth

93 JJ dish cloth

94 PJ fine

95 JJ erm because Steven...

In T69, JJ has a problem in lexical retrieval in which all she achieves is retrieval of the first phone of the word. PJ initiates collaborative repair by repetition of this. As discussed in 4.4.4, repetition is a weak acceptance phase initiator in that it does not result in a quick completion of acceptance and this can be seen in this sequence. JJ in T71 makes another attempt to retrieve the word she is searching for. After a 2.4 second unfilled pause, PJ comes in with another presentation to contribute to the collaborative repair sequence. This time he produces a question to elicit information about the word

JJ is searching for. JJ deals with this in T73 with no and then continues her attempts to retrieve the item. She produces a verbal paraphasia death which has the initial sound of the target which she rejects. In T74 PJ repeats the verbal paraphasia and comments on it which elicits laughter from JJ who then continues to search, producing the same verbal paraphasia. PJ initiates a turn with a filled pause but fails to produce a presentation (T76) and JJ comes in with a phonemic paraphasia which she rejects in T77. This provides enough information for PJ to provide a demonstration of understanding reached in T78. JJ accepts that this is the word that she is looking for with a repetition and thank you before continuing her search. After a 1.4 second unfilled pause PJ initiates a further demonstration of understanding reached with a collaborative completion in T80. It becomes clear that he has not reached the correct understanding when JJ produces a different completion in T81. PJ provides a demonstration of understanding reached in T82 which JJ modifies slightly and then marks acceptance of with an acknowledgement token. However, as in *(xv)* above, PJ does not allow the completion of the acceptance phase until JJ has correctly repeated the item giving rise to the collaborative repair work.

Besides the issue of PJ extending the work in the acceptance phase which has already been discussed in relation to *(xv)*, this excerpt is of interest for what it demonstrates about the initiation and contribution to collaborative repair. There are a number of different acceptance phase initiators in this sequence, with repetitions (T70, T74), requests for further information (T72) and demonstrations of understanding reached (T78, T80, T84) as well as failed attempts (T76). The progression to stronger initiators of the acceptance phase can be seen to arise from JJ's self repair attempts which although having failed, do provide extra information which allow PJ to put forward a candidate understanding. In this example, JJ is intent on lexical search and does not provide information which may have allowed PJ to provide a candidate understanding earlier as is seen in *(xvi)* above taken from the conversation with LP. There were, however, sequences in the conversation with PJ where JJ offers information to help PJ put forward a demonstration of understanding reached as is seen in the following excerpt:

(xviii)

117 JJ anyway I'll tell you where we're supposed to be going erm (1.0) in a few weeks er from (7.0) erm what do they call it [wə] (2.0)

118 PJ work

119 JJ no from the tuesday

120 PJ group

[

121 JJ [wə]

122 JJ aha what do they call it

123 PJ er [faɷn faɷn]

[

124 JJ the [faɷn]* fountain (1.2) the fountain (3.0) ee I don't know I'm very I'm not very sure

125 PJ okay well where are you going....

In JJ's T117 there is evidence of problems in lexical retrieval with a seven second unfilled pause followed by filled delay and comments. She finally produces [wə] followed by a two second unfilled pause after which PJ initiates collaborative work by demonstration of understanding reached through completion. This completion utilises the partial phonological attempt produced by JJ. However, in T119 JJ rejects it and then goes on to provide information which allows PJ to produce a correct demonstration of understanding reached in T120. JJ accepts this and then asks for the exact name of the group

In T119 and T122 JJ contributes to the collaborative repair to achieve quicker resolution of the acceptance than would have been achieved if she had simply continued to search, leaving PJ to attempt to collaborate with very little information to base his attempts on as is seen in *(xvii)* above.

At the end of this repair sequence we again see JJ's focus on providing the "correct" name leading to a continuation of the sequence until she aborts this process in T124 with ee I don't know I'm not very sure which PJ accepts in T125. Thus, it can be seen that abandonment of repair is a collaborative endeavour in itself, requiring negotiation between the interlocutors.

10.4 Summary of findings of the conversation analysis

The findings of the various analyses carried out on JJ's conversations can be summarised with reference to the three main issues identified in Chapter Six from the analysis of EN's conversations and used in the summary of the analytic findings from AD's conversation in 8.4. To recap, these issues are; evidence of preserved knowledge of conversational management procedures; manifestations in conversation of the cognitive neuropsychological impairments identified; and the effect of the interlocutor on the development of the interaction.

The findings reported in this chapter confirm both the suggestions reported in the literature (1.2.1) and the findings from the analysis of both other subjects in this project (Chapters Six and Eight) that aphasic subjects retain knowledge of conversational management procedures. There was clear orientation to turn taking rules. Although in the conversation between JJ and PJ, the interlocutors appeared to be neutral to the inferences set out by unfilled pauses in attributable silence position, this was argued to reflect a conversational strategy developed to deal with the impact of JJ's language impairments on the interaction rather than to reflect loss of knowledge in turn taking. Similarly, while the repair in JJ's conversations differed from that found in normal conversation, with use of greater proportions of self repair as well as the production of numerous complex collaborative repair sequences, these differences were proposed to arise as a manifestation of cognitive neuropsychological impairments rather than from a lack of awareness of how to organise repair work. As for both of the other subjects investigated in this study, JJ's use of repair demonstrates the active utilisation of this conversational management procedure to compensate for her impairments. It was proposed, however, that her preoccupation with production of a "correct" utterance sometimes gave rise to extended repair work which could be seen to violate the principle of least collaborative effort.

JJ's cognitive neuropsychological impairments were manifested in the use of both self and collaborative repair. It was proposed that impaired access to the phonological output lexicon could be seen to impact on JJ's conversation in her use of the self repair patterns of abandoned clauses followed by subsequent clauses, delays and repetitions as well as the occurrence of collaborative repair work dealing with failures in lexical retrieval, including clarification of the referents of vague referring expressions. JJ's impairment in access to the phonological output buffer also appeared to impact on conversation through the use of the self repair pattern of replacements as well as in collaborative work to resolve phonological errors. In particular, this latter deficit appeared to result on some occasions in the extension of collaborative repair work.

In JJ's conversation there was clear evidence of the influence of conversational partner on the interaction. This differed from the impact identified from the comparison between EN's two conversations (see Chapter Six) in which EN was found to take a passive role in the conversation which was proposed to arise from her relative's strategy of glossing over potentially problematic turns rather than initiating collaborative repair work. PJ did initiate collaborative repair work on JJ's turns in a similar way to LP (and AD's relative, RE) and, in the conversation, PJ and JJ contributed a similar number of major turns. The proposals made in 8.3.1 to explain the differing strategies used by the relative BC and relative RE were considered in relation to the findings from the conversation analysis of JJ. These supported the suggestions made in 8.3.1 that both the nature of the aphasic subject's cognitive neuropsychological impairments as well as the conversational partner's individual discourse style may influence the development of the interaction and, in particular, the sharing of the conversational burden.

Two differences between JJ's conversations with her relative and with the researcher demonstrated the influence of conversational partner. In JJ's conversation with PJ both interlocutors appeared to be insensitive to the inferences set up by attributable silences in contrast to the conversation with LP. As noted above, it was proposed that this was a strategy that had developed between PJ and JJ. JJ appeared to be sensitive to the styles of different conversational partners (in the variation of their tolerance of such delays). This is evidenced by the production of far fewer delays in "attributable positions" in the conversation with LP.

A further difference in JJ's two conversations was seen in the variable procedures for the resolution of collaborative repair, with PJ frequently not closing down the sequence until JJ had correctly produced the word herself. This was not seen in any of the collaborative repair sequences with LP.

The findings of these differences between the interlocutors have therapeutic implications for the development of strategies for both the aphasic person and his or her conversational partner. These are discussed in Chapter Eleven.

Chapter Eleven

DISCUSSION

11.0 Introduction

The major objective of this study is to investigate the manifestations of cognitive neuropsychological impairments in the conversation of three aphasic subjects. The findings from this are expected to provide information relevant to an integrated approach to the management of aphasia which takes account of both linguistic and communicative functioning in assessment, treatment and evaluation of treatment.

Two complementary analytic approaches, derived from two very different theoretical orientations, have been applied in pursuit of the study's objective. First, a comprehensive cognitive neuropsychological investigation of each of the subjects' processing of single words and sentences was undertaken. Second, an analysis of the subjects' discourse with two different partners, applying conversation analytic principles was carried out. This focused on the areas of turn-taking, self repair and collaborative repair. Throughout the second strand of analyses, attempts were made to identify the impact on these areas (if any) of the impairments found in the cognitive neuropsychological investigations.

This Chapter starts with a summary of the main findings of the study which have already been reported in detail in Chapters Five to Ten. This is presented in two parts. In 11.1 a summary of the cognitive neuropsychological impairments of each of the subjects and their manifestation in conversation is provided. Also included in this section is a brief summary of the cognitive neuropsychological findings which are of theoretical and methodological interest to the development of models of language processing. In 11.2 other issues arising from the conversation analysis, relating to pragmatic abilities and strategies of the conversational partners, are reviewed.

The final half of the chapter moves from the summary of results to address the implications and limitations of the findings to the provision of an integrated approach to aphasia management. In 11.3 the implications of the findings for deficit-focused therapy are examined. The issue of compensation-focused therapy is discussed in light of the findings in 11.4. The chapter concludes with an examination of the implications of the findings for assessment and evaluation of treatment in 11.5

11.1 Manifestations of cognitive neuropsychological impairments in conversation

11.1.0 Preliminary orientation

Very little attention has been paid in the literature to the impact of specific language impairments on functional communication. This has been one of the chief foci of this study and in this section an evaluative account of the most significant findings is provided. Impairments affecting auditory comprehension are discussed in 11.1.1, followed by an examination of impairments affecting spoken production in 11.1.2. Within each section, the findings of the assessments of single word level and sentence level assessments are considered in tandem, as an impairment in the former will impact on the latter. The impact on conversation is examined through the findings of the self repair analysis, the collaborative repair analysis and the influence on turn-taking and the production of major turns.

As a consequence of the detailed cognitive neuropsychological investigations undertaken in this study, a number of findings of methodological and theoretical interest have emerged. These findings do not influence the main focus of the study which is to explore the relationship between cognitive neuropsychological impairments and conversational ability and therefore, whilst of interest, they will not be explored in depth. Instead a brief summary is provided in 11.1.3 which refers the interested reader to the appropriate sections of the chapters where detailed results are reported.

11.1.1 Impairments to levels of processing influencing auditory comprehension

Subject AD demonstrated impaired access to the semantic system from auditory input, despite demonstrating intact semantic processing when the task was presented via the written modality. It was proposed that this either arose from impaired access from an intact phonological input lexicon to an intact semantic system or alternatively as a consequence of impaired auditory short term memory. The same modality effect was also found in sentence comprehension tasks, with a higher level of performance for written versions of the assessments. It therefore appears that the impairment compromising performance on the synonym judgement task (impaired access to the semantic system or impaired auditory short term memory) is also compromising sentence comprehension. It is apparent, however, that AD has other impairments to sentence processing as his performance for the written versions of assessments was also impaired. Further difficulties were identified through assessment in mapping thematic roles in converse relation sentences and reversible sentences with both verb and preposition predicates.

For AD it is not possible to identify links between very specific impairments (for example, problems in thematic role mapping for converse relation verbs) and manifestations in the conversation as identified in the conversation analysis. It is possible, however, to identify a more general manifestation of AD's impaired auditory comprehension in the occurrence of sometimes extended collaborative repair sequences initiated by AD to clarify his conversational partners' turns.

Subject EN demonstrated a mild semantic impairment for low imageability items in assessment of single word processing. No manifestations of this impairment were identified in the analysis of the conversational data. In contrast to AD, EN had relatively preserved sentence processing abilities. This difference can be seen to be reflected in the absence of collaborative repair sequences initiated by EN to clarify her interlocutors' conversational turns.

Subject JJ showed both intact access to the semantic system and intact semantic processing in assessment of single word processing. She did, however, show some mild impairment in sentence processing. JJ appears to have specific problems in mapping of thematic roles for preposition predicates as well as problems in handling gaps coindexed with the subject of the sentence in sentences with adjective predicates. Despite these deficits, however, there were no manifestations in either of her conversations of this impaired auditory comprehension. This clearly demonstrates that the sentence processing abilities which are shown to be impaired in assessments are not necessarily essential to comprehension in conversation. This issue will be taken up again in 11.3.1 when the validity of targets of deficit-focused therapy is considered.

11.1.2 Impairments to levels of processing influencing spoken language

EN is the only subject who had any identifiable impairment in semantic processing. As discussed above, this took the form of a mild impairment for low imageability items. This could be expected to compromise lexical retrieval for low imageability items. As EN also has an impairment in access to the phonological output lexicon which affects retrieval of even high imageability words, it is not possible to determine whether the manifestations of impairments in lexical retrieval arise as a consequence of the mild semantic deficit or as a consequence of impaired access to the phonological output lexicon.

All three subjects demonstrated some level of impairment to the processes involving the phonological output lexicon. They differed, however, in both the precise nature of the impairment and in its severity. Subjects EN and JJ are both impaired in access to the phonological output lexicon, identifiable from impaired performance on oral picture naming. From analysis of sentence production, it was proposed that the impairment in access to the phonological output lexicon also gave rise to impaired sentence production, with failures in lexical retrieval necessitating abandonment of clauses. In addition, both subjects were found to use a significantly greater proportion of pronouns than full noun phrases in the realisation of referring expressions than the control subjects. It was suggested that this also arose as a consequence of impaired access to the phonological output lexicon.

In both subjects' conversations this impairment could be seen to manifest itself in a number of ways. First, the greater use (than the control subjects) of the self repair patterns of repetitions, delays and abandoned clauses followed by subsequent clauses could be linked with this deficit. Second, when the use of editing terms did not succeed in giving enough time to achieve successful lexical retrieval this gave rise to either loss of the floor (as in EN's conversation with BC) or collaborative repair (as in EN's conversation with LP and both of JJ's conversations). Similarly, problems in the production of a clause subsequent to an abandoned clause also gave rise to collaborative repair.

In the conversation with BC, EN constantly lost the floor as a consequence of her extensive use of editing terms which had the ultimate effect of forcing her into a passive role in the conversation. In the conversation with LP, the majority of collaborative repair sequences arose as a consequence of her impairment in lexical retrieval. Some of these simply involved the supply of a word that EN was unable to access or a clarification of a deictic referring expression's referent. A large proportion, however, were concerned with establishing a general understanding of EN's whole presentation which often contained multiple attempts to self repair with little lexical content.

In JJ's conversations, collaborative repair was also observed to arise as a consequence of impaired access to the phonological output lexicon. This involved collaborative work to supply the word JJ had failed to retrieve, in addition to collaborative work to establish the referents of vague referring expressions. There were no sequences, however, which involved the establishment of general understanding as found in EN's conversation with LP. A comparison of the percentage of abandoned clauses followed by subsequent clauses shows that not only did EN use this repair pattern to a greater extent than JJ, but her use of it failed on a greater number of occasions. It is multiple occurrences of these types of failures which gave rise to the usually complex repair sequences required to establish a general understanding of a turn for EN. This suggests that JJ's lexical retrieval deficit is less severe than that of EN's as the repairs are focused upon a single word rather than dealing with multiply repaired, lexically empty turns.

An interesting question to ask is whether the apparent difference in severity judged from the impact of the deficit in the conversation could be detected from performance on cognitive neuropsychological assessments. Comparison of the percentage of naming responses correct within five seconds on the revised Kay naming test for the two subjects shows a similar level of impaired performance (EN, 71%; JJ, 69%). A comparison of the number of correct responses made with unlimited time to name, however, does show a difference in performance between the two subjects. While JJ successfully named 96% of the items eventually, EN was only successful for 86% of the items. Given the intolerance of delays in conversation, it is perhaps surprising that a greater success in retrieval when over five seconds are allowed results in less impact of the lexical retrieval problem in conversation. A qualitative examination of the nature of the subjects' delayed responses allows exploration of the differing manifestations of lexical retrieval impairments on conversation. A total of 41% of JJ's delayed correct responses for the revised Kay naming assessment contained phonological errors. For these delayed correct responses, it is likely that JJ has accessed the lexical representation. The delay in producing a correct response arises from a processing impairment involving the phonological output buffer (see below). In contrast, EN produced a very small number of phonological errors, suggesting that delayed correct responses occurred solely as a consequence of the impairment in processing at the phonological output lexicon. In conversation, the provision of some phonological information allows quicker resolution of the repair than failure in lexical retrieval. Assessment measures (i.e. percentage correct within five seconds) superficially suggest that the mixed nature of JJ's impairment in producing spoken words results in an equivalent level of impairment to EN whose problem in producing spoken words arises mainly from impaired access to the phonological output lexicon. From the conversation analysis it becomes clear, however, that the manifestation of an impairment in access to the phonological output lexicon has more severe interactional consequences than the manifestation of a milder impairment in access to the phonological output lexicon combined with an impairment in access to the phonological output buffer. This could also be detected in the qualitative analysis of the cognitive neuropsychological assessment data.

Subject AD's impairment in phonological output lexicon processing appeared to be of a different nature to that seen for subjects EN and JJ. On picture naming assessments, subject AD demonstrated a much milder impairment in access to the phonological output lexicon (on the revised Kay naming test he named 93% of the items within five seconds and 100% of the items when given unlimited time). He was impaired in naming for only very low frequency words. From the findings of the sentence production analysis, however, it was proposed that AD had a more severe lexical retrieval impairment when lexical retrieval has to be integrated into the sentence production process, which gave rise to both the production of semantic paraphasias and the production of anomalous predicate argument structures. Both of these could be seen to arise as a consequence of lexical mis-selection errors.

From the self repair analysis of the conversational data it was suggested that AD's impairment in lexical retrieval is manifested in the use of abandoned clauses followed by subsequent clauses, repetitions and delays. AD's use of these self repair patterns can be seen to differ from that of the other two subjects in a number of ways. AD used repetitions in a greater proportion of his turns and used longer repetitions than either of the other subjects. In contrast, he produced delays in a smaller proportion of his turns and produced shorter delays than either of the other subjects. AD's use of the self repair pattern of abandoned clause followed by subsequent clause also differed from the other two subjects in that he produced a greater number of abandoned clauses followed by subsequent clauses without any delay between the two. In addition, while a number of EN and JJ's abandoned clauses arose after the production of the subject of the sentence and an auxiliary verb, AD, in the majority of cases, produced a greater part of the clause before abandonment. This variation can be accounted for in two ways. The first involves differing strategies to deal with trouble sources in the interaction. The second is that the different nature of AD's lexical retrieval deficit results in a different manifestation. EN and JJ's lexical retrieval deficit gave rise to a number of total failures in lexical retrieval which resulted in long delays. In contrast, while AD also had a few failures of lexical retrieval in his conversation, there were also a number of mis-selections which were not prefaced by delays. In addition, the differing nature of AD's lexical retrieval deficit can also be used to explain the different nature of the use of abandoned clauses followed by subsequent clauses. While EN and JJ had to abandon clauses because of failures in lexical retrieval, AD was more likely to make mis-selection errors. These may have given rise to the production of clauses which did not adequately express what was intended at the message level and which in turn resulted, on some occasions, in abandonment of one clause and initiation of another.

These differences in use of self repair strategies have an impact on the manifestation of lexical retrieval impairments in collaborative repair in conversation. In contrast to the conversations of EN and JJ, a very small number of collaborative repairs concerned the provision of a word that AD had failed to retrieve. The absence of long unfilled pauses can be seen to decrease the probability of initiation of this form of collaborative repair. In common with the other two aphasic subjects' conversations, there were a small number of collaborative repair sequences focused on the clarification of vague referring expressions. For EN and JJ this type of trouble source type could be predicted from the findings of the analysis of referring expressions as both subjects used a significantly greater proportion of pronouns than full noun phrases to realise referring expressions than the matched control subjects. In contrast, AD showed no significant difference in realisation of referring expressions and it is of interest to note, therefore, that collaborative repair sequences, focused on vague referring expressions, occurred in his conversations.

Collaborative repair sequences dealing with lexical mis-selection errors arose in AD's conversation with RE. All of these dealt with replacement of single lexical items in which the predicate argument structure was not anomalous. These can be seen to link directly with the nature of AD's lexical retrieval deficit. As expected, given the different nature of their lexical retrieval impairment, similar repair sequences were not found in the conversations of either of the other subjects. Whilst AD produced anomalous predicate argument structures in conversation (which it was suggested may arise from impaired lexical retrieval), these did not have any interactional consequences as they did not directly become the focus of collaborative work.

AD's occasional repeated use of the self repair pattern of abandoned clause followed by subsequent clause (also linked with AD's lexical retrieval deficit) gave rise to two collaborative repairs dealing with clarification of long rambling turns. These bear a resemblance to the collaborative repairs initiated on EN's turns, although her turns were of a different nature, with numerous filled and unfilled delays, abandoned clauses and little lexical content.

Moving onto an examination of processing at the phonological output buffer, subjects AD and JJ had impairments at this level of processing as identified by assessments of all output tasks involving manipulation of word length. While there were some interesting differences in the effect of the mode of input (repetition, reading or picture naming) on the proportion of errors (see 11.1.3 below), these subtle differences did not influence the way that the deficit manifested itself in conversation and will not be considered here. The manifestation of impairment for both subjects occurred in the use of the self repair pattern of replacement repairs. In addition, the position of a number of delays and repetitions, either preceding a phonological error or following a phonological error and preceding an attempted replacement repair, suggest that some of the editing terms produced by the subjects arose as a consequence of the deficit. Impairment at the level of the phonological output buffer also manifested itself in collaborative repair sequences when attempts at self repair failed. Furthermore, the use of repetition to provide acceptance in some collaborative repair sequences resulted in extending the sequence as a consequence of the nature of the deficit (see further 11.2.2 below).

Assessment of single word production for subject EN suggested a mild apraxia of speech. This manifested itself in conversation in the use of a small number of replacement repairs, the majority of which were successful. It therefore appears that this mild impairment did not have a large impact on the conversation.

Impairments in sentence production have already been discussed for the three subjects, all of whom had some level of impairment as a consequence of deficits in lexical retrieval. For EN and JJ this was the only impairment of sentence production identified. AD, however, had other hypothesised impairments. It was proposed that some of the anomalous sentence structures that he produced could be explained in terms of impaired inhibitory connections between competing constituent frames. It has already been proposed above that production of anomalous predicate argument structures may also have arisen as a consequence of impaired lexical retrieval. It is not possible, however, to distinguish between these two explanations; both seem equally valid.

As noted above, there were no collaborative repairs dealing directly with anomalous predicate argument structures. It was suggested, however, that such anomalous structures may result in the use of abandoned clauses followed by subsequent clauses as AD identified failure to communicate what was intended at the message level.

Analysis of AD's Cinderella narrative also identified impairments in sentence production which could not be accounted for in terms of the model of sentence production being used in this investigation. These included the extensive and anomalous use of multiple embedding giving rise to incoherent utterances and over-ellipsis in conjoined sentences and subordinate clauses. The anomalous use of embedding did not manifest itself in conversation (see 11.1.3 for comment on the impact of the method of eliciting data for sentence production). While examples of over-ellipsis were found in the conversational data, these did not have any interactional consequences as they did not interfere with achieving the acceptance of presentations. This issue is taken up again in 11.3 when the validity of the target of deficit-focused therapy is considered.

11.1.3 Cognitive neuropsychological findings: theoretical and methodological issues

In an exploration of the impact of cognitive neuropsychological impairments on aphasic conversation it was necessary to undertake a comprehensive examination of all aspects of language processing involved in the comprehension and production of spoken language. The combined examination of both single word and sentence processing ability is often not found in the cognitive neuropsychology literature where researchers focus on a specific aspect of processing. The findings of this study have, however, demonstrated that comprehensive examination can be a fruitful approach. For example, it has allowed the exploration of the influence of lexical retrieval deficits on sentence production. For subjects EN and JJ, it was proposed that the impairment in access to the phonological output lexicon, identified in assessments of single word processing, accounted for impaired sentence production (see 5.2.4 and 9.2.4 respectively). In contrast, for subject AD, the findings of the sentence production analysis could not be accounted for by his performance on single word assessments. Instead it was proposed that his ability to retrieve from the phonological output lexicon is impaired when the retrieved item has to be integrated into a sentential frame (see 7.2.4).

Another illustration of the strength of comprehensive examination of the subjects' language processing arises from the differential findings for the different output tasks of naming, oral reading and repetition for subjects AD and JJ. It has been proposed in the literature that better performance in oral reading than in repetition could be accounted for in terms of the permanence of the visual stimulus in contrast to the transient auditory stimulus for repetition (Caplan, Vanier and Baker, 1986). The poorer performance of JJ in oral reading than in repetition in contrast to the reverse pattern for AD, demonstrates that the temporal nature of the stimuli for the different tasks does not satisfactorily account for all patterns of differential performance. Instead, it was proposed that differential performance for the same word stimuli could be accounted for in terms of the patterns of impaired and intact lexical and non-lexical routes for the different tasks (see sections 7.1.5 and 9.1.4). It is proposed, on the basis of these findings, that both subjects have an impairment in access to the phonological output buffer rather than in the processing of the buffer itself.

A further finding of theoretical interest is the effect of imageability for EN and JJ on the number of phonological errors produced in oral reading (see 5.1.4 and 9.1.4 respectively). The impact of a variable associated with semantic processing on phonological output processes clearly offers support for the interactive activation mode of processing.

The final issue arising from the cognitive neuropsychological findings which will be addressed is a methodological one. For subject AD, the elicitation method for sentence production greatly impacted on the data obtained (see 7.2). Specifically, his performance was more impaired in narrative production than was found in conversation. It is clearly important that mode of elicitation and the processing demands that these make need to be taken into account in the interpretation of findings in terms of cognitive neuropsychological models.

11.2 Further issues arising from the conversation analysis

11.2.0 Preliminary orientation

This investigation makes a new contribution to the study of aphasic discourse in its utilisation of a data-driven approach in contrast to the theory-driven approaches which predominate in the aphasiology literature (Perkins and Lesser, 1993). The precise nature of the cognitive neuropsychological impairment plays a large part in determining the impact of aphasia on conversational interaction as has been highlighted in 11.1. Another important factor that also has implications for the way that language impairment impacts on interaction is the strategies adopted by the two interlocutors to deal with the consequences of language impairment. In this section, the most significant findings of the conversation analysis relating to this factor are evaluated. In 11.2.1, the status of the aphasic subjects' preserved conversational abilities is considered. In 11.2.2, the role of the two interlocutors in the sharing of major turns is examined. Finally, the influence of the interlocutors on the use and resolution of collaborative repair is examined in 11.2.3. A number of actions attributable to one or other of the interlocutors which influence these phenomena can be identified. As is very evident from the analysis carried out in this study, however, conversation is a collaborative endeavour and the separation of the influence of the two interlocutors is arbitrary. It is the way that the actions of the two are co-ordinated which is paramount. In light of this, the aphasic and normal interlocutors' behaviours are considered together. Throughout this section the strengths of a data-driven approach in gaining an understanding of the organisational principles operating in aphasic discourse emerge.

11.2.1 Evidence of retained knowledge of conversational management procedures

The findings of this study support the proposal (see for example Holland, 1991; Glosser, Weiner and Kaplan, 1988) that aphasic subjects retain knowledge of conversational management procedures. Looking first at turn-taking, all three subjects demonstrated the ability to handle accurately timed turn transition, and showed sensitivity to overlap. For two subjects (EN and AD) there was evidence of orientation to the significance of attributable silences. In addition, all subjects demonstrated knowledge of the organisation of repair, both through numerous attempts to carry out self repair as well as through the contribution to collaborative repair sequences.

While the findings of this study support the proposal made in the literature that knowledge of conversational management procedures is intact in aphasia, the findings also allow rejection of the common assumption that pragmatic abilities (as defined in 1.2.0) are relatively preserved. Intact pragmatic knowledge is not enough to ensure unimpaired pragmatic functioning. This has already been amply highlighted in 11.1 in the high proportion of both self repair and collaborative repair arising as a consequence of cognitive neuropsychological impairments. Pragmatic functioning is, however, influenced in ways other than greater proportions of repair. Language impairments were found to influence the aphasic subjects' ability to manage conversations so that, although there was clear orientation to the management procedures, this did not necessarily mean that conversations were managed in the same way as "normal" conversations. Three major findings which illustrate this will be considered in turn.

First, despite evidence of intact knowledge of the rules governing turn-taking, EN in her conversation with BC was often unable to repair turns that were initiated with editing terms rapidly enough to hold the floor. As a consequence of this, over a quarter of her attempted turns in this conversation failed to contribute to the conversation.

Second, in the conversation between JJ and PJ, the interlocutors were neutral to the inferences set up by pauses in an attributable silence position. It was proposed on the basis of the conversation analysis that interlocutors may modify their orientation to normal conversational management procedures as a consequence of the impact of language impairment on pragmatic ability. This does not indicate lack of knowledge of the procedures but rather that pragmatic functioning of the aphasic subject may be aided by modifications to the normal interactional rules.

Finally, modification of the management procedures was also seen in the use of collaborative repair for all three subjects' conversations. As a consequence of their language impairments, repair sequences with more complex organisations than those found in normal conversation occurred routinely in the aphasic subjects' conversations.

For all three of these findings, the impact of language impairments and modifications to the conversational management procedures were not automatic as is clearly demonstrated both by variations between aphasic subjects and variation between the two conversations of a single aphasic subject. The important factors of the behaviour of the conversational partner and the behaviour of the aphasic subject on the interaction are examined further in the next two sections.

11.2.2 Influence of interlocutors in the sharing of major turns

Looking first at a comparison of each of the subjects' conversations with the researcher and with their relative, all subjects produced a greater proportion of major turns in the conversation with the former than in the conversation with the latter. This general trend was attributed to the differing nature of the two conversations. In the conversations with the researcher, information about the subject was elicited with little information about the researcher being broached. In contrast, in the conversations with the relatives, topics for which there was a large amount of shared background knowledge predominated and talk was not exclusively focused on the aphasic subject.

Looking at the differences between the conversations for the three subjects, the contrast in proportion of major turns for each subjects' two conversations was particularly striking for EN. While in subjects AD and JJ's conversations with their relatives, the number of major turns were shared relatively equally, EN was found to take a passive role in the conversation with her relative. She produced only 30% of the major turns and over a quarter of these could be seen to have failed in contributing to the conversation.

From the analysis of EN's conversations and a comparison with the conversation analysis of the other two subjects, three factors were identified as influencing the way that the contributions to conversation are distributed in a particular interaction. These were; shared knowledge of the interlocutors; the influence of the form of cognitive neuropsychological impairments; and individual discourse styles.

The contrast in proportion of major turns between EN's conversations with the researcher and with her relative allowed identification of the first factor; the influence of shared knowledge on the treatment of potential trouble sources in conversation. The researcher dealt with trouble sources in the interaction by initiating collaborative repair to resolve the trouble source, achieving acceptance of EN's problematic utterance and allowing the conversation to progress. In contrast, her relative, BC was intolerant of potentially problematic turns and for over a quarter of her attempted major turns he took the floor, glossing over EN's attempts to make a presentation. This avoidance of collaborative repair resulted in the failure of her attempts to contribute to the interaction and consequently, her turns did not shape the following interaction. Since she was often not allowed enough time to complete turns in conversation with BC, it is not perhaps surprising that EN fell back on a strategy of relying on minimal turns to contribute to the conversation.

The different way that BC and LP treated EN's potentially problematic turns can be seen to partly relate to the quantity of shared knowledge that exists between interlocutors. EN and BC discussed topics about which they had a high level of shared knowledge. In contrast, EN and LP talked about topics involving EN of which LP has little or no background knowledge. Thus, for LP it would be difficult to gloss over problematic presentations and still maintain the conversational flow as the information that EN was attempting to provide in her presentation was often necessary to the continuation of the topic. In the conversation with BC, there was enough shared knowledge of the topic for BC to continue talking on it without a severe disruption of conversational flow. It is of great interest to note that EN's reliance on minimal turns in her conversation with BC is not simply her own strategy. Rather it arises as a consequence of the joint activity of both conversational partners. This finding, which only emerges after detailed analysis of the interaction, clearly highlights the necessity of an analytic framework which treats interaction as jointly negotiated.

An examination of both JJ and AD's conversations with their relatives showed that a high level of knowledge shared by interlocutors does not invariably lead to the strategy of glossing over potentially problematic turns. Both relatives initiated a number of collaborative repair sequences to deal with the aphasic interlocutors' problematic turns rather than glossing over them. A further influencing factor on treatment of problematic turns identified was the form of cognitive neuropsychological impairments and the way that they are manifested in conversation. The occurrence of long delays within conversational turns results in greater vulnerability to the loss of the floor. As discussed in 11.1 above, EN and JJ produced greater proportions of long delays in contrast to AD. In addition, EN produced a greater proportion of turns with abandoned clauses followed by subsequent clauses. When these were repaired, this sometimes involved establishing a general understanding of the whole presentation. This requires a much greater investment of collaborative effort than more focused trouble sources which require the provision of a single lexical item. For both JJ and AD, a large number of collaborative repairs involved these potentially more easily resolved trouble sources. It can therefore be seen that different cognitive neuropsychological deficits (or different levels of severity of the same deficit) lead to different trouble sources requiring different investments of collaborative effort. It is possible that when repair requires a large investment of collaborative effort, the conversational partner may avoid collaborative repair and instead gloss over problematic presentations.

The final factor that can be identified as playing a role in the way that problematic turns are handled is the one of variation in individual discourse styles; that is strategies specific to the interlocutor. There has been relatively little work in this area as the conversation analysis literature tends to focus on the establishment of general patterns governing conversation. A small number of studies, however, have revealed that individual variation does exist in the use of minimal turns (e.g. Tottie, 1990, Jefferson, 1984, see 3.1.2). It is possible that interlocutors differ in their use of strategies to deal with potentially problematic turns. Thus, JJ's relative PJ is much more tolerant of delays than EN's relative, BC. It was proposed that PJ and JJ have developed this strategy in the light of JJ's language impairments which gives rise to a high proportion of delays. In contrast, EN and BC have clearly not developed a strategy of tolerating delays. This contrast between these two conversations clearly demonstrates that interlocutors may develop certain styles to interact with aphasic interlocutors. This has very important implications for compensation-focused therapy approaches, in the development of conversational management strategies for both the aphasic interlocutor and their conversational partners. This issue is taken up again in 11.4 below.

11.2.3 The influence of the interlocutors on collaborative repair

Collaborative repair is a conversational resource that is drawn upon in all the conversations analysed in this investigation. As established in 11.1, it is a mechanism which can be used to compensate for the impact of cognitive neuropsychological impairments on aphasic discourse.

The analysis of collaborative repair for the three subjects' conversations in this study demonstrates the attractions of the framework offered by Clark and Schaefer's (1987, 1989) model of contributions to conversation for exploring the organisational principles underlying aphasic repair. The complexity of a number of the sequences analysed offers support to the proposal made in 3.2.3 that repair in aphasic conversation cannot be satisfactorily explained in terms of normal models of repair (Schegloff, Sacks and Jefferson, 1977) if this is applyed in a categorical manner. It also clearly demonstrates the absolute necessity of examining aphasic discourse as a jointly negotiated endeavour rather than focusing on the errors of the aphasic subject. In addition, the strength of a sequentially oriented analysis has been shown, in particular the need to look beyond just one turn to decide on the success or otherwise of repair.

To recap on the application of Clark and Schaefer's model to aphasic conversation, it was proposed in 3.3 that the principle of least collaborative effort appears to be operating in aphasic conversation, in that the linguistically impaired partner is more likely to need to embark on collaborative work with the interlocutor to achieve acceptance of a presentation. This will require less collaborative effort than if the aphasic partner works in isolation to try and design an immediately acceptable presentation, a task which may be beyond his or her linguistic abilities. Thus, we find a large number of often complex collaborative repair sequences that are initiated on the aphasic subjects' presentations in all of the conversations analysed in this investigation. In the same way that BC can be seen to be taking a greater share of the conversational burden than EN through the production of a greater proportion of major turns, the use of collaborative repair also involves the conversational partner taking a greater part of the conversational burden by supporting the aphasic subjects' contributions to the interaction and ensuring that acceptance is achieved for them.

The principle of least collaborative effort predicts that the conversational partner's initiation of the acceptance phase should precisely reflect the state of understanding reached, with the strongest initiator used so that the repair sequence can be directly focused. For all the subjects' conversations, orientation to this was found with the majority of initiators of collaborative sequences being demonstrations of understanding reached. As is illustrated in *(xxi)*, p. 236 above, interlocutors use this strongest form of initiation of collaborative repair even when the problematic turn apparently contains little information on which to base a demonstration of understanding reached. This illustration of the way that the aphasic subjects' conversational partners can take a larger part of the conversational burden by initiating collaborative repair is not meant to imply that the aphasic subjects take a passive role in which they relinquish a large part of their responsibility of communication to the unimpaired conversational partner. As is illustrated particularly well by the analysis of the longer and more complex collaborative repair sequences, resolution is a truly collaborative endeavour. Indeed, the separation of the influence of the normal conversational partner from the influence of the aphasic conversational partner is arbitrary as it is the way that the actions of the two are co-ordinated which is paramount.

The aphasic subjects can be seen to influence and take an active role in achieving efficient resolution of collaborative repair in a number of ways. A major influence identified in this study is the loci of the subjects' cognitive neuropsychological impairments. Provision of a correct demonstration of understanding reached by the conversational partner is more likely when a phonemic paraphasia or semantic paraphasia is encountered than when a failure in lexical retrieval gives rise to multiple abandoned clauses. Thus, a larger number of complex collaborative repair sequences were observed in EN's conversations than AD's conversations. This is because some impairments' manifestations intrinsically contain more information which can be used in the resolution of collaborative repair than others.

In addition, the resolution of collaborative repair was found to be influenced by specific cognitive neuropsychological deficits in the closing down of a sequence. Specifically, in

AD and JJ's conversations, their impairment in accessing the phonological output buffer interfered with achieving immediate resolution. This arose when the aphasic interlocutors attempted a repetition to provide acceptance of a demonstration of understanding reached that had previously been provided. Their impaired repetition abilities gave rise to an extension of collaborative repair with a repair sequence dealing with a phonemic paraphasia embedded within the superordinate repair sequence (see, for example, excerpt (*xxvi*): p.332).

The aphasic interlocutors were also found to contribute to the more efficient resolution of collaborative repair through strategies which circumvented their impairments. Thus, subject EN circumvented a failure in lexical retrieval using intact processing of graphemic output to write in the air (see *xxiv*, p.240). All the subjects were observed providing circumlocutory information which aided their interlocutors in providing a correct demonstration of understanding reached (see, for example, *xxix*, p.249; *xviii*, p.403). In addition all subjects were observed using proforms and vague referring expressions to refer (see, for example, *xxi*, p.236). This can be seen as a manifestation of a lexical retrieval deficit, although it is less clear-cut in this case whether this is a conscious strategy to deal with the deficit or simply a symptom of language deficit. Both interpretations are possible.

The efficient resolution of collaborative repairs depends on more than the information provided by the aphasic subject. It also requires the co-ordinated action of the conversational partners in their use of this information to resolve the collaborative repair or, when this is not possible, to move it further towards completion. This co-ordinated action is particularly apparent in a number of the longer, more complex collaborative repair sequences such as excerpt (*xvi*), p.398. An interesting contrast is found between excerpts such as this one, in which the aphasic interlocutor can be seen to use strategies such as circumlocution and deixsis to circumvent his or her impairment, and those in which he or she focuses solely on achieving self repair (e.g.

(xvii), p.400f.). In the latter situation, very little information is available to the normal interlocutor thus making collaborative repair attempts less efficient than they could possibly be. This issue is taken up again in the consideration of compensation-focused therapy in 11.4.

As discussed in 3.3, the principle of least collaborative effort involves the balance of cost and benefit in deciding whether to initiate collaborative repair. When an aphasic interlocutor appears to have difficulty producing an immediately acceptable presentation, the conversational partner has decide whether collaborative effort will be minimised by allowing more time for the aphasic interlocutor to self repair or through the initiation of collaborative repair. Schegloff, Jefferson and Sack's (1977) finding that in repair in normal conversation other repair is dispreferred (and is often withheld) supports the idea that greater effort in designing a presentation minimises effort in achieving acceptance which can be seen to minimise overall collaborative effort. Given the impact of language impairments on aphasic subjects' ability to quickly achieve self repair, it is more likely that the normal conversational partners will conclude from their costs-benefit analysis that initiation of collaborative repair will more effectively minimise collaborative effort as it may indeed be beyond the aphasic interlocutors' ability to achieve an immediately acceptable presentation. In both EN and JJ's conversations, initiation of collaborative repair through collaborative completions by both the researcher and the relative occurred. While such completions are observed in normal conversation (Clark and Schaefer, 1989) it seems probable that a greater number are initiated on EN and JJ's turns to minimise collaborative effort by avoiding protracted (and possibly unsuccessful) self repair. A number of completions were found, however, which were unsuccessful in minimising collaborative effort because the completion had not been what was intended by the aphasic interlocutor (cf. excerpt *(xxii)* ,p.238). Thus, it is necessary for the interlocutors to balance the benefit of initiating collaborative repair early with the risk of it resulting in the cost of more collaborative effort. In particular, the cost of initiating collaborative repair with a wrong demonstration of understanding reached is that (as Schegloff (1979) points out in his discussion of the preference for self repair) when repair work occurs in the next turn it results in the sequential *implicativeness of the current turn being displaced for at least* one turn. Indeed, displacement carries the risk of the possible loss of the sequential implicativeness of the turn as is seen in *(xxviii)*, p.248. The issue of whether more collaborative effort is expended when collaborative repair is too readily initiated is taken up again in 11.4 in the consideration of developing communicative strategies in compensation-focused therapy.

It is clear from the preceding discussion that, in the conversations analysed for this research, the interlocutors generally upheld the principle of least collaborative effort. Some examples of divergence from this principle were, however, observed in both of JJ's conversations. This arose on different occasions as a consequence of the actions of both the normal interlocutor and the aphasic interlocutor in their orientation to the principle of working together to achieve understanding sufficient for current purposes. This is illustrated in *(xv)*, p.396.

In JJ's conversation with LP, examples were found where JJ extended the collaborative repair because of her focus on producing what she had failed at rather than simply working towards achieving a mutual understanding sufficient for current purposes (e.g. *(xiv)*, p.395 and *(xvi)*, p.398). Excerpts such as these offer a further demonstration of the collaborative nature of conversation. Clearly, co-ordinated effort is required to achieve a successful close-down of collaborative work. In these examples one interlocutor (the aphasic one in *(xv)*, the normal one in excerpts *(xiv)* and (*xvi*)) has been satisfied that the criterion of understanding sufficient for current purposes has been achieved and has initiated closing down of the sequence. The conversational partner clearly has a different agenda in terms of what is sufficient for current purposes and to this end the sequence is extended until the interlocutors mutually agree to close down the collaborative repair. This extension of repair work will be considered in relation to compensation focused therapy in 11.4 below.

11.3 Implications of the findings for the provision of an integrated approach to the management of aphasia: Deficit-focused therapy

11.3.0 Preliminary orientation

In this section the role of deficit-focused therapy in offering an integrated approach to aphasia rehabilitation is considered. The theoretical perspective which leads to a deficit-focused approach is that of cognitive neuropsychology. As discussed in Chapter One, the strength of this approach is that both assessment and intervention have as their basis a well-developed theoretical framework. The major weakness is that such an approach looks at language as a decontextualised object. The tasks used in assessment and treatment are often heavily abstracted from the demands that the aphasic person faces in his or her communicative environment. There is a need, therefore, to look for ways of evaluating the validity of both assessment and therapy methods and to determine whether the employment of this management approach improves communicative ability.

Whilst the findings of cognitive neuropsychological investigations are of interest in relation to theoretical issues of language processing, they are also of value in a clinical context for the information that they provide about the nature of the aphasic person's communication handicap. It is assumed that the processing deficits which are identified from cognitive neuropsychological assessment compromise the aphasic person's ability to communicate in his or her social setting. Arising from this assumption is a further assumption that deficit-focused therapy targeted at remediating these processing deficits will reduce the communication handicap. The validity of these assumptions (both of which embody the supposition that there is a direct link between cognitive neuropsychological deficit and communication handicap) is assessed in this section.

The manifestations of cognitive neuropsychological impairments in conversation explored in this study (see 11.1 above) can be used to examine the validity of cognitive neuropsychologically motivated assessment and therapy. In 11.3.1 the validity of assessment is addressed and consideration is given to the question of whether specific processing impairments (identified from cognitive neuropsychological assessment) give rise to a communication handicap. The validity of deficit-focused therapy and how this can be measured is addressed in 11.3.2.

11.3.1 The validity of cognitive neuropsychological impairments as targets of deficit-focused therapy

In this section the assumption that all cognitive neuropsychological impairments have an impact on functional communication is addressed through the examination of manifestations of such impairments in conversation undertaken in this investigation. A two-way distinction between the presence or absence of the impact of a cognitive neuropsychological impairment on functional communication is too crude. Rather, the investigation of manifestations and how effectively they are dealt with by the interlocutors in the discourse allows an evaluation of the level of handicap that a specific cognitive neuropsychological deficit gives rise to. This investigation, in its utilisation of a conversation analytic approach, has demonstrated a method of exploring such issues.

Evaluation of the level of communication handicap arising as a consequence of particular deficits has implications for management. If a cognitive neuropsychological deficit is not seen to handicap the aphasic person in communication then it is inappropriate to make this a focus of treatment. If the deficit can be seen to be severely handicapping communication then intervention may be appropriate. The decision regarding intervention is not, however, clear-cut. First, it is necessary to consider how effectively the interlocutors are handling the manifestations of the cognitive neuropsychological deficits. Have they developed strategies to deal with their consequences thereby minimising the communicative handicap for the aphasic interlocutor? Alternatively, does the manifestation handicap communication? This question can only be effectively tackled by an assessment approach which takes into account the collaborative nature of conversation. Such an approach is offered in the conversation analytic framework utilised in this investigation. The strength of such an approach in contrast to other "functional assessments" is discussed in 11.4 below. A second issue to consider is whether a deficit-focused therapy technique aimed at remediation or compensation for an impaired processing module is viable. This issue is discussed further in 11.3.2 below. The impact of cognitive neuropsychological impairments on conversation for the three subjects in this study (already summarised in 11.1 above) will be considered in relation to the determination of whether the various deficits are appropriate targets of therapy.

With regard to impairments involving auditory comprehension, AD was proposed to have deficits at both a single word level and sentence level. Manifestations of specific impairments with particular sentence constructions identified in cognitive neuropsychological assessment were not found from the conversation analysis. There was, however, a general manifestation in the production of sometimes extended collaborative repair sequences initiated by AD to clarify his conversational partners' turns (see for example, excerpt *(xxviii)*, p.334). In assessment, EN and JJ were also found to have some deficits in auditory comprehension. EN demonstrated a mild central semantic impairment for low imageability items and a mild level of impairment in sentence processing was identified. JJ was found to have a mild impairment in processing of certain sentences. In particular, processing of preposition predicates was impaired. Despite the deficits identified, however, no specific manifestations were found in the conversational data of EN or JJ.

Therefore, all three aphasic subjects demonstrated some impairment to auditory comprehension on cognitive neuropsychological investigation. The assessments used allowed the accurate location of deficits in terms of models of language processing. For EN and JJ, however, there were no identifiable manifestations of these impairments in the analysis of conversational data. In these two cases, it would appear that their comprehension deficits are not appropriate targets of therapy as they do not have an apparent adverse impact in conversation. It would appear that both EN and JJ are able to utilise abundant contextual information available in conversation to compensate for linguistic processing deficits apparent in a decontextualised assessment. Therefore, for these two subjects, the identified processing impairments influencing auditory comprehension would not make appropriate priority targets of therapy[7]. Treatment aimed at these areas could not be expected to enhance functional communication, although it may improve performance on cognitive neuropsychological assessments.

For subject AD, the appropriacy of identified impairments as targets of therapy is not so clear-cut. While manifestations of specific deficits were not identified, a general impact in conversation was found in the occurrence of collaborative repair sequences focused on AD establishing understanding of his conversational partners' presentation. The decision regarding the appropriacy of making AD's impairment a target of therapy depends upon a balance of cost and effect. Since it is necessary to assess how severely the deficit is impairing AD's communication, it is necessary to consider how effectively AD and his interlocutors appear to be dealing with the manifestation. In this case, it would appear that the interlocutors are able to deal with it relatively effectively. AD is able to identify when he requires clarification and initiates collaborative repair effectively and his conversational partners respond appropriately. In all cases, the manifestation of the deficit is dealt with economically, resulting in satisfactory mutual understanding such that when this is not achieved immediately and the understanding is not essential for current purposes, AD's misunderstandings are sometimes allowed to

[7] Such impairment may interfere with subjects' ability to participate in other activities involving language; for example following a political debate on the television. Clearly, it is important to collect information about such activities that clients used to participate in and with respect to which they now feel they are impaired. It is assumed, however, that for the majority of clients, conversational interaction would be the most important context for remediation.

ride. As discussed in Chapter Eight, this is a normal conversational phenomenon, although the normality of such occurrences is only apparent when utilising a data-driven approach. Using one of the theory-driven assessments of pragmatics which dominate the literature, such events may be seen as "inappropriate". Further discussion of the advantage of a data-driven perspective to the analysis of aphasic discourse is given in 11.4 below. In the determination of whether AD's auditory comprehension deficits are appropriate targets of therapy, it is also necessary to consider the effectiveness of any therapy in reducing communication handicap. This issue will be discussed further in relation to deficit-focused therapy in 11.3.2 and in relation to compensation-focused therapy in 11.4.2.

Moving onto specific deficits which influence spoken language production, while EN has a mild semantic impairment for low imageability items, manifestation of this was not identifiable in EN's conversations. This suggests that this deficit is not an appropriate target of therapy, as remediation (as measured through cognitive neuropsychological assessment) could not be expected to improve functional communication as it does not apparently affect this.

All three subjects were impaired in access to the phonological output lexicon and this deficit clearly manifested itself in all of the conversations, although to differing degrees and forms dependent upon the precise nature of the deficit (see 11.1 above). This suggests that this deficit may be considered as an appropriate target of therapy for all of the subjects, although the nature of the impact on the conversation may influence the management decision in terms of deficit-focused or compensation-focused therapy as will be discussed further in 11.3.2 and 11.4.2 below.

Subjects AD and JJ were also found from cognitive neuropsychological assessment to have impairment in access to the phonological output buffer. For both of them this deficit manifested itself in conversation although the extent to which this impacted on the discourse varied depending on the management of it by the interlocutors. Overall, the manifestation of this impairment had less impact than that of impaired access to the phonological output lexicon. Therefore, decisions regarding treatment would involve the evaluation of the level of handicap arising from the manifestation of an impairment of this nature.

It was proposed that EN had a mild apraxia of speech from performance on some of the speech production assessments. While this manifested itself in the conversation, it had a very minor impact as EN was often able to self repair. Thus, this deficit may not be seen as having a severe enough impact on EN's communicative ability to be considered as a direct target of therapy.

All the subjects had an impairment in sentence production as a consequence of impairments in lexical retrieval. For AD, this was seen as a specific deficit of lexical retrieval in a sentence context. In addition, for subject AD a number of other deficits were found. Some of the anomalous sentence structures that he produced could be explained in terms of impaired inhibitory connections between competing constituent frames. While anomalous structures arose in AD's conversations, they appeared to have a minimal impact on the conversation in that they never became the focus of collaborative repair work. In addition, impairments in sentential embedding and in ellipsis, which were identified from the analysis of the Cinderella narrative, did not manifest themselves in conversation. As noted in 11.1.3 it appears that these deficits arose as a consequence of the demands of the narrative task. From a clinical point of view, given the absence of their manifestations in AD's conversations, they do not appear to be valid targets for therapy.

From this consideration of the various cognitive neuropsychological deficits of the three subjects, it can be seen that we cannot assume that all deficits are valid targets of therapy. It is imperative that we evaluate the impact of an impairment on the aphasic person's functional communication. First, some impairments (e.g. EN's semantic impairment for low imageability items, JJ's impairment in thematic role mapping of sentences with preposition predicates) had no apparent *manifestation* in conversation. These are clearly not priority targets of therapy because they do not identifiably handicap the aphasic subject's conversation. Therefore, therapy could not be expected to result in improvement in functional communication (although it may result in better performance in terms of cognitive neuropsychological reassessment).

Whilst those impairments which manifest themselves in some way in conversation are potentially appropriate targets of therapy, it is still necessary to consider the size of impact on communication. Clearly the precise nature of a cognitive neuropsychological impairment is an important factor in determining the impact. This is very well illustrated by the different effects of word finding difficulties on EN and JJ's conversations despite similar quantitative scores on the revised Kay naming test (see 11.1.2 above). Only when performance is examined qualitatively (and in the context of the findings of other assessments) is it seen that the different forms of naming impairments (defined in terms of a cognitive neuropsychological framework) actually provide an explanation of the difference in severity of impact on conversation.

The nature of cognitive neuropsychological deficits is an important factor in determining the impact of aphasia on an aphasic person's communication. In addition, as has clearly emerged from the summary of most significant findings from the conversation analysis in 11.2 above, the behaviour of the interlocutors in handling manifestations of impairments is also paramount in any consideration of the severity of a deficit's impact and its appropriacy as a target of therapy. Further consideration is given to the issue of the influence of interlocutors in 11.4 below when the role of compensation-focused therapy in offering an integrated approach to aphasia rehabilitation is considered.

11.3.2 The validity of deficit-focused therapy

In the previous section consideration was given to the identification of valid targets of therapy using a cognitive neuropsychological framework. Not surprisingly an examination of the aphasiology literature shows that when a cognitive neuropsychological framework is used to guide assessment, it is predominantly used to guide treatment. This almost exclusively leads to deficit-focused therapy in which the aim of treatment is either restoration of impaired processing or substitution through cognitive relay (see 1.2.2). As Seron, Van der Linden and de Partz (1991) have suggested, it should not be assumed that a cognitive neuropsychological analysis of an aphasic person's disorders is irrelevant to a compensation-focused approach and its relevance is discussed further in 11.4 below. There is, however, an overwhelming bias in the literature for cognitive neuropsychologically guided assessment to lead to deficit-focused therapy.

In the same way that it is necessary to consider the validity of deficits as targets of therapy, there is also a need to look at the validity of therapy itself. Does deficit-focused therapy, guided by cognitive neuropsychological principles, improve the aphasic person's functional communication? Clearly this question cannot be directly addressed by the findings of this investigation, which is not a therapy study. Implications for this issue do, however, emerge from this investigation. In order to tackle this question it is necessary to have some method to evaluate whether therapy aimed at remediating specific language impairments does in fact improve functional communication. It would appear that the framework utilising conversation analytic principles developed in this investigation could contribute greatly to this task. Specific issues relating to assessment and evaluation are addressed in 11.5 below. In the remainder of this section, the validity of therapy is examined in relation to some examples of deficit-focused therapy which have been described in the literature.

The single case study methodology harnessed in a cognitive neuropsychological approach to aphasia therapy offers a clear way to evaluate efficacy and can indeed be seen to be one of its major strengths (see 1.2.1). In the majority of therapy studies reported in the literature, proof of specific treatment effects are provided, with improvement for the treated function but no improvement for untreated functions. These improvements, however, usually involve synthetic assessment measures such as semantic categorisation (Behrmann and Lieberthal, 1989), synonym judgement (Byng, 1988), picture naming (Nettleton and Lesser, 1991) and narrative production (Byng, 1988). In none of the above studies were measures employed to evaluate the impact of the improvements on assessment measures of functional communication. This state of affairs is further reflected in the following comment made at the end of a (positive) review of the proceedings of a British Aphasiology Conference in which all the papers had a cognitive neuropsychological orientation:

> "There is only one aspect that is unfortunately ignored in all papers: the therapy effects on spontaneous speech. Although I do realise that it is difficult to assess spontaneous speech, not to mention to establish improvement, some analysis might have been useful because it is this aspect of speech with which the patient has to cope." (Bastiaanse, 1992: 332)

The assumption in the studies with research designs which allow the unequivocal demonstration of the efficacy of cognitive neuropsychologically motivated therapy is that improvements on synthetic assessment tasks automatically result in an improvement in functional communication. The question that we need to ask is whether this assumption is valid, because if it is not then the therapy itself has no validity. As Bastiaanse (1992) points out, it is with spontaneous speech that the aphasic person has to cope. We will briefly consider the ecological validity of three deficit-focused therapy studies motivated by cognitive neuropsychology which have been described in the literature, starting with remediation of auditory comprehension deficits and moving onto remediation of spoken language impairments.

Looking first at therapy targeted at a single word level, Behrmann and Lieberthal (1989) describe treatment of a globally aphasic client which involved reactivation of semantic knowledge. The client, CH was found to have a supra-modal semantic impairment. On a semantic categorisation task, he only performed significantly above chance for one out of six semantic categories. He was given fifteen hours of therapy for three semantic categories, which initially involved teaching general features of the categories and then the specific identification of its members. A significant improvement was found in CH's ability to categorise items which had been used in treatment (60 items) and there was generalisation to untreated items in the same semantic category for two of the three categories treated. No improvement was found in the categorisation of untreated categories. In the discussion of their findings Behrmann and Lieberthal state:

> "The positive outcome demonstrated by this study is encouraging for speech therapists working with subjects with global aphasia. Recently, the trend in therapy for global aphasia has been to opt for compensatory strategies rather than to employ direct remediation procedures. Alternative modes of communication such as gestural systems and environmental modification have become increasingly popular as a means of minimising the effects of severe aphasia (Collins, 1985) and relatively little research on new linguistic rehabilitation techniques has been undertaken. This study, like other cognitive neuropsychological studies, represents a direct attack on the specific linguistic dysfunction. The underlying problem, in this case a severe semantic deficit, was identified and a theoretically guided, tailor-made intervention programme was successfully implemented. Indeed, such an

outcome satisfies Darley's (1972) call for the demonstration of effective therapy." (1989: 296-297).

In terms of improvement of performance on semantic categorisation tasks it is clear that therapy is effective. The question of whether the therapy has resulted in any functional improvement for CH is not, however, addressed. Given the difficulty of the task, this is perhaps not surprising. This question is, however, too important to the management of aphasia to ignore. How can an informed decision between the compensation-focused approaches to treatment (which Behrmann and Lieberthal report dominate treatment of global aphasic clients) and deficit-focused approaches (which they imply deserve more attention as effective techniques) be made if no information can be obtained regarding their relative effectiveness in improving the client's communication?

It is necessary to consider how the question of impact on functional communication can be tackled. First, one could ask whether CH's improvement in categorisation of sixty items has increased his auditory comprehension for those items. If this were the case then it is likely that in his everyday communication, he will now be able to comprehend these words. If the therapy has only increased broad semantic knowledge for these items, then further semantic work will be needed to establish comprehension of specific items. The length of time that this would take must be considered. It is then necessary to evaluate the usefulness of comprehending these items. Is it likely that they are words that he will come across in everyday communication, resulting in more effective communication for CH and his interlocutors? What number of words would CH have to be retaught to achieve an improvement in functional communication and how long would this take to achieve?

For CH, who has no intelligible speech, it is clear that the analysis of functional communication developed in this research project would not be an appropriate technique to use for evaluation as he has very little spoken language. The data-driven principles central to the analysis which allow the treatment of communication as a collaborative endeavour would, however, be invaluable to the evaluation of changes in functional communication. It would be necessary to use video-recording techniques so that all modes of communication could be taken into account. The issue of pragmatic assessment of severely impaired aphasic clients is taken up again in 11.5 below.

The next therapy programme to be considered involved remediation of sentence comprehension and sentence production. Byng (1988) describes treatment of BRB, a client with Broca's type aphasia. Extensive cognitive neuropsychological investigation led Byng to hypothesise that BRB was impaired in mapping thematic roles which gave rise to impaired comprehension of reversible sentences as well as impoverished sentence production. Therapy involved teaching the mapping relations for reversible sentences with preposition predicates. After two weeks of therapy, reassessment showed an improvement in BRB's comprehension of all kinds of reversible sentences, indicating that he had learnt to map thematic roles. In addition, comparison of a structural analysis of his production of the Cinderella narrative before and after treatment revealed production of sentences with greater structural complexity after the mapping therapy, with fewer holophrastic utterances and a greater proportion of verbs with two arguments realised. Reassessment of an untreated language function showed no improvement, indicating specific treatment effects.

As for Behrmann and Lieberthal's (1989) study, the rigorous design of this study allows demonstration of the effectiveness of therapy in terms of cognitive neuropsychological assessments. No information about BRB's functional communication is, however, provided in the paper. Jones (1986) describes a therapy programme for a similarly impaired client (BB) in which the focus was also teaching thematic role mapping. Jones reports that BB's comprehension was "functional" in everyday situations through the support offered by pragmatic and contextual cues. It therefore seems likely that the improvement observed after treatment in performance on assessments of sentence comprehension would not give rise to improved everyday communication for either BRB or BB. The change in sentence production from the production of predominantly holophrastic utterances to the production of a range of predicate argument structures could, however, be expected to improve functional communication if the improvement found in the Cinderella narrative generalised to spontaneous speech. Byng does not report whether this is the case. In this current research study, the striking differences that were found in the sentence production of subject AD for the different tasks of conversation and narrative production suggest that equivalence of production for different forms of elicitation cannot be taken for granted. This is also supported by Jones' finding that after mapping therapy BB's improvement in sentence production was still much better in picture description than spontaneous output, which she accounts for in terms of the increased processing load of conceptualisation necessary for the latter. She does report, however, that after treatment he became a much more confident communicator. It would seem likely that the analysis techniques developed in this research should allow detection of the impact of this treatment on functional communication. It might be expected, for example, that BRB and BB after such therapy may have more quickly resolved collaborative repair sequences in their conversation as a consequence of the greater linguistic resources that they would have to draw upon, as well as an increase in the proportion of major turns that they produce as confidence in their ability to communicate increases. These are clearly very speculative suggestions and the findings would be expected to be dependent on the communicative strategies of both the aphasic interlocutor and his conversational partners.

In contrast to the two above therapy studies which have involved restoration, the final study to be considered involves harnessing cognitive relay. Bruce and Howard (1987) describe a study involving five aphasic subjects with an impairment in access to the phonological output lexicon which gave rise to a lexical retrieval deficit. They were often able to access the first letter of the orthographic representation and three subjects benefited from phonemic cues from the therapist. They were not, however, able to utilise their own retrieval of initial letters by themselves converting them into a phonemic cue. The therapy involved training the subjects to operate a computer which provided phonemic cues for nine letters over five sessions. They were required to press the right key for a picture's initial letter, listen to the speech sound produced by the computer and then name the picture. Evaluation of therapy showed that four of the patients were naming the pictures used in treatment significantly better after the therapy programme and for two of these there was generalisation of the skill to untreated words. The fifth subject, PAB, appeared to have internalised the strategy of generating his own phonemic cues from initial letters so that his naming had improved so dramatically that he did not need to rely on the computer.

The differing outcomes of this therapy programme have different implications for the validity of therapy. Clearly, the most promising outcome was that of PAB who has learnt a strategy which can be applied to all words. For this case, however, it is still necessary to ask whether the ability to use this strategy in the synthetic task of picture naming can also be harnessed in lexical retrieval in conversation. Is PAB able to effect the strategy quickly enough to self repair or does the time taken lead to his interlocutor initiating collaborative repair or even the "glossing over" strategy observed in this research in the analysis of EN's conversation with BC (see *(vii)*, p.215)? There is clearly a need to evaluate the impact of therapy on functional communication and it is suggested that the analysis techniques developed in this study would provide a valuable tool.

For the two subjects whose naming improved with the use of the computer and generalised to untreated words, the validity of therapy depends upon the practicality of the use of a computer in everyday communication. This will depend on a number of factors, including cost, portability and, as in PAB's use of internalised cueing, speed of response. Putting aside the practical issues of portability and cost, the benefits of the use of the computer in everyday communication could also be evaluated using the principles of analysis developed in this study. This would allow the examination of precisely how the aphasic and normal interlocutors collaboratively used this prosthetic aid in the joint negotiation of discourse.

Finally, for the two cases who showed significant improvement for naming the pictures used in therapy, but showed no generalisation to untreated words, the same issues with the item-specific improvement arising for Behrmann and Lieberthal's semantic therapy (discussed above) apply. Are the number of items that it is feasible to treat going to have a detectable impact on functional communication?

In the discussion of these three deficit-focused therapy programmes motivated from cognitive neuropsychology, the aim has not been to imply that they are invalid therapies which have no effect on functional communication. Rather, the point of the discussion has been to underline the need to look for ways of evaluating the change in functional communication so that the relative effectiveness of deficit-focused and compensation-focused therapy can be compared. Application of the data-driven analysis procedures harnessed in this study would allow a precise examination both of the way that deficits are manifested before therapy and the way that the effects of deficit-focused therapy change these manifestations and change the way that the interlocutors deal with the effects of aphasia. This type of precise information should show us the way forward in achieving a truly integrated approach to aphasia management. For example, it may be appropriate following the teaching of a relay strategy (such as self-generated phonemic cues, Bruce and Howard, 1987) to work with the aphasic client and his primary conversational partner(s) on altering conversational management strategies so that the aphasic interlocutor has enough time to use the relay strategy and self repair. In order to identify the need for developing specific conversational strategies, however, it is necessary to identify precisely the way that the interlocutors are currently handling the language impairments. In the next section, compensation-focused therapy is examined further.

11.4 Implications of the findings for the provision of an integrated approach to the management of aphasia: compensation focused therapy

In this section the role of compensation-focused therapy in the provision of an integrated approach to aphasia rehabilitation is considered. The use of a pragmatic approach to aphasia rehabilitation leads almost exclusively to this therapeutic orientation (see section 2.4). This contrasts with a cognitive neuropsychological orientation which (as discussed in 11.3 above) leads almost exclusively, to a deficit-centred therapeutic approach. As a consequence, this section will be predominantly concerned with the findings of the conversation analysis although reference will be made to the cognitive neuropsychological analysis where appropriate.

It was proposed in 1.5 that the two theoretical orientations of cognitive neuropsychology and pragmatics could be seen as complementary in their application to the investigation and rehabilitation of aphasia. The major weakness of a cognitive neuropsychological approach is that the issue of ecological validity of assessment and treatment is not addressed. This can be seen to be the major strength of a pragmatic approach which addresses precisely this issue in examining, as its subject matter, the aphasic person's communication in his or her social setting. In 11.3 above it was proposed that this weakness of the cognitive neuropsychological approach could be tackled through the integration of a pragmatic analysis with the cognitive neuropsychological investigations in order to achieve ecologically valid management decisions.

The major weakness of the pragmatic approach to the investigation and remediation of aphasia is the tenuous theoretical bases of the majority of the numerous pragmatic assessment techniques presently available in the literature and the lack of guidance offered by the majority of these to remediation. In this section consideration will be given to the contribution of the findings of this research in dealing with this weakness of the pragmatic approach. In 11.4.1, the strengths of the CA-motivated analysis developed in this study as a possible method of assessment, in contrast to the theory-driven procedures predominant in the current literature will be evaluated. In 11.4.2 the implications of the findings of the analysis to the development of compensatory strategies in both the aphasic person as well as his or her conversational partners will be considered.

11.4.1 Identifying valid targets of compensation-focused therapy

It was proposed earlier, following a review of the relevant literature, that a data-driven approach has the most to offer to an investigation of pragmatic ability in aphasia (see 1.2 above). In this section the specific strengths of a data-driven approach which have emerged from the analysis carried out in this study will be discussed.

The most important strength of a CA-motivated analysis of aphasic discourse is that it can be seen to address precisely the level of pragmatic functioning which appears to be impaired in aphasia. The findings of this study concur with the consensus in the literature that aphasic subjects have preserved abilities in the areas of logical, inferential and textual organisation as well as retained knowledge of conversational management procedures (see 11.2.1 above). They also clearly demonstrate, however, that intact pragmatic knowledge is not enough to ensure unimpaired pragmatic functioning. As highlighted in 11.2.1, language impairments were found to influence the subjects' ability to manage conversation so that, although there was clear orientation to "standard" management procedures as described in the CA literature, this did not necessarily mean that their conversations were managed in the same ways as "normal" conversation. The data-driven approach used in this study allows the exploration of the interaction between specific cognitive neuropsychological impairments and the impact that they have on the interaction as well as allowing the exploration of the way that these manifestations are handled by the interlocutors. In contrast, the theory driven approaches of assessments of pragmatic abilities in aphasia which predominate in the literature do not allow exploration of the relationship between language impairments and pragmatic functioning. Instead, pragmatic behaviours are categorised and considered in isolation. The problems and limitations of the theory-driven approaches in creating categories for analysis have already been outlined in 1.2.

The data-driven analysis used in this study demonstrates how CA deals with the minor details of conversation (for example, minimal turns, silences, and repair mechanisms) and examines their interactional consequences. Most pragmatic theories treat such details as "messiness" and abstract away from them. While such phenomena appear as categories in some "top-down" observation schedules, they are typically looked at in isolation and a judgement of appropriacy of occurrence is required. This contrasts with the CA approach utilised in this study which allows exploration of their function in the interaction and of the relationship between their occurrence and the subjects' language impairments.

The CA-motivated approach utilised in this study also demonstrates the strength of a sequential analysis which allows judgements regarding interaction to be made on the basis of what happens in the following turns. Thus, the success of either self repair or collaborative repair depends on whether positive evidence of understanding (and continuation of the discourse) is displayed. This offers very strong validity (which appeals to the behaviour of participants rather than the judgement of the analyst) in comparison with the ratings of appropriacy employed in top-down observation schedules. This criterion of success in interaction allows consideration of effective communication strategies. It has already been pointed out above that in aphasic discourse different management procedures may operate which allow the interlocutors to deal with the manifestations of language impairments. Thus, the use of top-down judgements of appropriacy (e.g. Penn, 1985a; Prutting and Kirchner, 1987) or correctness (e.g. Holland, 1980) which imply comparison to a norm are clearly problematic since, as the findings of this study have shown (see 11.2), deviation from what is normal does not equate with failure of communicative ineffectiveness. The debate between normal and effective communication is discussed further in 11.5 below.

A further important strength of the data-driven analysis used in this investigation which follows on from the use of a sequential analysis is the emphasis on the joint negotiation of interaction. Throughout the analyses of the three subjects, discourse is repeatedly seen to develop as a consequence of the co-ordinated actions of the two interlocutors. Thus, EN's reliance on minimal turns in her conversation with BC can be seen as a strategy for which both interlocutors are jointly responsible. Furthermore, the resolution of often complex collaborative repair sequences for all subjects illustrates very clearly the joint negotiation of conversation. All of the top-down assessments of pragmatic ability ignore this fundamental property of communication, concerning themselves instead with a decontextualised consideration of the aphasic person's utterances.

All of the strengths of the data-driven approach to the investigation of pragmatic abilities in aphasia outlined above have important implications for the management of aphasia. The use of a data-driven approach firstly allows exploration of the impact of language impairment on communicative ability thereby addressing the precise level of pragmatic ability typically experienced by aphasic interlocutors. This information can inform either deficit-focused therapy or compensation-focused therapy. In contrast, since the top-down pragmatic assessments do not address the relationship of language impairment to pragmatic ability, no implications can be drawn with respect to deficit-focused therapy. In addition, the sequential analysis used in this study provides a detailed and precise understanding of the way that the interlocutors are managing the discourse. This understanding is invaluable to the development of compensation-focused therapy since it allows the identification of useful communication strategies. Assessment regarding the impact of cognitive neuropsychological deficits also provides some information to help discriminate strategies over which the aphasic interlocutor has control from symptoms of the language impairments which arise as a consequence of brain damage. In contrast, the insight that is offered by top-down assessments of pragmatic abilities is much more limited. At best they provide a superficial identification of pragmatic strengths and weaknesses without exploration of how or why these arise. Unless an integrated approach is applied which uses cognitive neuropsychology, there is a risk of inappropriate identification of symptoms of impairments as ineffective strategies which need to be eliminated (see the discussion of Penn, 1985b in 1.2.3 above).

The emergence from this study of the need to treat interaction as a collaborative endeavour also has implications for compensation-focused therapy approaches. In particular it highlights the need to develop compensatory strategies not only in the aphasic person but also in his or her primary interlocutors. While the idea of what is often referred to as environmental therapy is not in itself a new one (see 1.2.3), the analysis carried out has further implications regarding its implementation. First, the level of understanding offered by data-driven analysis provides an invaluable insight into how strategies might be developed for both interlocutors, as will be exemplified in 11.4.2 below. In addition, in 11.2 above, it was proposed that (as the findings of this research clearly show) conversation is a collaborative endeavour and the separation of the influence of the two interlocutors is arbitrary and unrealistic. This suggests that in compensation-focused therapy in which conversational strategies are being developed and modified to achieve more effective communication, separation of therapy for the aphasic and normal interlocutor is arbitrary and more effective results may be obtained from working with the interlocutors together to develop collaborative strategies.

One of the most important advantages of the data-driven approach over the pragmatic assessments currently available in the literature is that it allows exploration of the relationship between language impairments and communicative ability which, it has been proposed, is essential to the understanding of the level of pragmatic impairment that is found in aphasia. Thus, in the same way that analysis of communicative ability was proposed in 11.3 to be important to the selection of valid deficit-focused therapy, information regarding cognitive neuropsychological deficits is also necessary for compensation-focused therapy to be motivated from a conversation analysis. The analyses carried out in this research study and their implications to management of aphasia strongly indicate the need for an integrated approach to aphasia therapy.

It has been stressed that in assessing pragmatic ability a crude identification of what the aphasic client can or cannot do is not enough to guide rationally motivated therapy. Instead, a qualitative analysis which allows exploration of the interactional mechanisms operating in aphasic discourse is required. It is proposed that a CA-motivated analysis offers this. The need for a qualitative analysis can be seen to mirror the situation found in the analysis of language deficits. Cognitive neuropsychological models have allowed aphasia therapists to move from identification of surface symptoms (for example, anomia) to the precise description of the underlying reasons for these symptoms (e.g. impaired semantic processing, impaired access to the phonological output lexicon). This, in turn, has allowed the development of more effective remediation. In the same way, a precise description of the management of aphasic discourse offered by a data-driven analysis provides an understanding of the underlying reasons for communicative impairment which in turn can feed into the development of more effective remediation. The type of guidance offered by the analyses developed and applied in this research project is examined in 11.4.2 below.

11.4.2 Implications of the findings to the development of communicative strategies

In 11.2, it was concluded that interlocutors may modify their orientation to normal conversation management procedures in order to aid the conversational functioning of the aphasic interlocutor. However, variation between the conversations of the different subjects as well as between the conversations of the same subject demonstrates that such modifications are not automatic. These two findings have important implications for compensation-focused therapy. First, it appears that interlocutors differ in their spontaneous development of strategies. Thus, work to develop effective strategies is appropriate when analysis suggests that more effective communication could be achieved through modification of the interlocutors' conversational management procedures. Second, the modifications found suggest that effective communication is a more realistic and appropriate target of compensation-focused therapy than "normal" communication. Third, ways of achieving effective communication can be pinpointed by identifying the modified conversational management procedures which contribute to effectiveness in aphasic discourse and looking for ways of developing these through therapy with clients who do not currently use them. In this section, the issue will be exemplified through the findings of the analysis carried out for this research study. A summary of the major findings of this has already been provided in 11.2 above.

Reliance on minimal turns

The first strategy which we will consider is that of the aphasic person relying on minimal turns to participate in conversation. This was observed in EN's conversation with BC. On the basis of the analysis carried out, it was proposed that this strategy could not be attributed to one or other of the interlocutors. It is the co-ordinated action of both which gives rise to its use. EN's inability to rapidly self repair were dealt with by BC by glossing over potentially problematic presentations. This in turn forced EN into a passive role which resulted in her participating in conversation through the use of a large proportion of minimal turns (see 6.1.3). Three factors were identified as influencing the way that contributions to conversation are distributed in a particular interaction; shared knowledge of the interlocutors, the influence of the form of cognitive neuropsychological impairments, and individual discourse styles (see 11.2.2).

In making decisions about targets of therapy, it is necessary to consider whether or not reliance on minimal turns is considered by EN to be handicapping. The issue of the right of the aphasic client to choose how they will deal with their language handicap is debated in 11.5 below. It may be that in some contexts, aphasic clients may wish to rely on minimal responses. If this is the case, it may be important to look at the first factor identified (the issue of shared knowledge) as an attempt to employ this strategy with an unfamiliar interlocutor may be problematical if there is not enough shared knowledge for the interlocutor to maintain the conversation.

If the client decides that he or she does not want to use this strategy of participating in conversation an examination of the two further factors influencing the use of this strategy can be considered. The first factor, cognitive neuropsychological deficit, may not be possible to modify although deficit-focused therapy based on the cognitive neuropsychological deficit may be appropriate. The way that the aphasic interlocutor deals with the deficit may, however, be possible to modify so that the manifestation does not render attempts to hold the floor so vulnerable to being glossed over. This could be tackled in two ways. First, EN's major language impairment is a lexical retrieval deficit. If direct work on remediating impaired access to the phonological output lexicon is not appropriate, work with her primary conversational partners in achieving more effective collaborative repair may allow her to make a greater contribution to the conversation. The more extensive use of collaborative repair work may be a more constructive way for the conversational partner to take a greater share of the conversational burden than through the production of a greater proportion of major turns. The ways that effective collaborative repair strategies can be developed is discussed further below.

Floor-holding strategies

A second approach to compensation-focused therapy may be appropriate if it is likely that, given enough time, EN will succeed in making a presentation. This is the development of signals which communicate her desire to hold onto the floor. Further analysis of non-verbal behaviour may provide guidance on how this could be achieved. Findings in the literature suggest that manipulation of eye gaze as well as hand movement may be fruitful areas to develop (Ahlsen, 1985, Crockford, 1991). In 11.4.1 above, it was proposed that the strong evidence emerging from the findings of this study for the collaborative nature of conversation indicated the appropriacy of working jointly with the aphasic client and his or her primary interlocutor(s). This applies to the development of floor holding strategies. The third factor, that of individual discourse styles, identifies the importance of the behaviour of the conversational partner on the emergence of this strategy. BC is not tolerant of delays in the interaction. This can be contrasted to JJ's relative PJ, who has clearly learnt to modify the treatment of silence in the light of JJ's language impairments (see 11.2.2). Thus, in conjunction with work developing floor-holding strategies, work with the conversational partner in heeding these signals and learning to be more tolerant of silences would be necessary.

Collaborative repair strategies

The remainder of the strategies arise from the various findings from the analysis of collaborative repair. The finding of a large number of often complex collaborative repair sequences in the conversations analysed in this research indicates that this is a valuable resource which can be drawn upon. For interlocutors to adhere to the principle of least collaborative effort, the aphasic interlocutor should provide as much information as possible in the presentation requiring repair work. In conjunction, the conversational partner should use the strongest initiator of collaborative repair possible. Looking first at the provision of information by the aphasic interlocutor, it was found that while all the aphasic subjects had a number of strategies for providing information in their presentation which compensated for the manifestations of cognitive neuropsychological deficits, in some collaborative repair situations the subjects appeared to be so focused on self repair that they did not employ these strategies (e.g. compare excerpts *(xvi)*, p.398 and *(xvii)*, p.400). This variation suggests that work to encourage the systematic application of a range of strategies when faced with a manifestation of a cognitive neuropsychological impairment may result in the quicker resolution of repair. A number of useful strategies were found to be used by the subjects. Both EN and JJ used graphemic information to compensate for failures in lexical retrieval. EN used writing in the air, while JJ used oral spelling. The appropriacy of developing or encouraging greater use of this sort of strategy will be very much influenced by the potential success of the strategy. This in turn will be limited by the presence of impairments to the cognitive neuropsychological processes involved in carrying this out. Thus, the need for an integrated approach to aphasia management which takes account of both language processing and communicative limitations is again demonstrated.

All three aphasic subjects were observed to circumlocute, although they varied in the specificity of the information provided. It is possible that a framework could be developed with the aphasic interlocutor to guide him or her in the provision of systematic information. In addition, all three aphasic subjects were found to use proforms and vague referring expressions. However, as noted in 11.2.3, it is not clear in this case whether this is a conscious strategy to deal with a failure in lexical retrieval or a symptom of the language deficit. An examination of the repair contexts in which it occurs should offer guidance regarding management decisions. Thus, if the use of proforms to refer gives rise to long and complex repair sequences, work to develop strategies which reduce collaborative effort needed may be appropriate; for example, encouraging the aphasic interlocutor to draw upon the context through pointing to referents may result in more efficient repair.

The effective use of these strategies by the aphasic subject in compensating for language impairments manifesting in their presentations requires the co-ordinated action of their conversational partner so that the information is used to achieve completion of collaborative repair as efficiently as possible. Thus, it seems appropriate that work developing and refining strategies should be co-ordinated with practice for the primary interlocutor(s) in using this information. In EN's conversation with BC, there was very little collaborative repair work carried out and EN took a relatively passive role in conversation. Co-ordinated work with EN to use strategies which would allow her to provide more information in conjunction with training her interlocutors to use this information as a basis for effective collaborative repair would be expected to reduce EN's communication handicap and facilitate EN taking a more active role in interaction.

Augmentative communication aids

In addition to developing the strategies that are already observed in use by the subjects and their interlocutors, compensation-focused therapy may also involve teaching new communicative strategies. One important possibility is the use of an augmentative communication system, particularly in the case of more severely impaired clients. It is not appropriate to provide a review of this rapidly developing field here (see Garrett et al, 1989 and Newell, 1992 for innovative examples of different communication aids with aphasic subjects). The point to be made in relation to this research is that data-driven analysis offers a precise means of examining the way in which the use of such an aid can be integrated into discourse. Both interlocutors will need to modify their conversational management procedures so that work on managing novel modes of communication is appropriate.

Eliminating unnecessary extension of collaborative repair

While in the majority of collaborative repair sequences interlocutors appear to orient to the principle of least collaborative effort, as summarised in 11.2.3, a number of examples were found in the conversations analysed in which the interlocutors' actions could be seen to extend collaborative repair. The first case of this arose from the aphasic subject's interlocutors providing an incorrect collaborative completion of the subject's presentation. It was proposed that it is important for interlocutors to balance the benefit of initiating collaborative repair too early with the risk of it resulting in the cost of more collaborative effort. For interlocutors who produce a large number of premature initiations of collaborative repair, training in balancing cost and benefit may be appropriate.

Further examples of the extension of collaborative repair which can be seen as a violation of the principle of least collaborative effort are observed in JJ's conversations. Examples were found of both JJ and PJ extending collaborative repair in order to achieve correct language production despite clear evidence that mutual understanding of the original presentation had been reached. The question to be asked here is what criteria of sufficient for current purposes are being applied by the interlocutors? In conversation, where communication is the aim, the establishment of understanding should be sufficient. The correction of language failures after understanding has been achieved through collaborative work should not be relevant. For interlocutors who regularly overtly correct errors when they do not impair communication, discussion of the possibly disruptive effect on communication of such strategies may be appropriate. It may be useful to draw their attention to the fact that the speech of so-called competent communicators is full of false starts and revisions and that an expectation of error-free speech is unrealistic. In addition, aphasia therapists should be aware of the model of communication which they employ in therapy sessions. The distinction between, on the one hand, deficit-focused therapeutic tasks which may legitimately entail the demand of "correct" language production and on the other hand, conversation, where the criterion of success is establishing mutual understanding, should be made clear.

Examples were found in the conversations in which misunderstandings were not dealt with and failures in an attempt to retrieve a particular name were aborted, but these should not be seen as failures in the conversation. Rather, they can be seen to represent orientation to the principle of least collaborative effort, since the understanding or name was not essential for current purposes. Teaching interlocutors to tolerate these failures of misunderstanding may be useful.

To summarise, in this section specific implications for compensation-focused therapy arising from the analyses of the conversations carried out in this study have been discussed. The discussion has been by no means exhaustive, but it does illustrate the capacity of a data-driven analysis to offer guidance for intervention. It must be acknowledged that much as cognitive neuropsychological analysis does not determine how to achieve deficit-focused therapy, the analysis of conversational ability does not define how compensation-focused therapy might be implemented. There is clearly a need for carefully evaluated therapy studies which explore the implementation of this approach. As Lesser and Milroy (1993: 327f.) have suggested, however, the insight offered by a data-driven analysis into how the interaction is managed does allow therapists a clearer idea of what they might profitably teach to both clients and carers.

11.5 Implications of the findings for the provision of an integrated approach to the management of aphasia: issues of assessment, evaluation and treatment

11.5.0 Preliminary orientation

The findings of this research have implications for two major issues in aphasia management. First, the findings demonstrate a rationally motivated analysis of pragmatic ability in aphasia (the strengths of a CA-motivated analysis in offering guidelines for both assessment and rehabilitation have been outlined in 11.4 above). Second, the research identifies the need for the development of an integrated approach to aphasia therapy which combines the strengths of the applications of the two theoretical approaches of pragmatics and cognitive neuropsychology. The need for the integration of the two approaches in providing effective therapy has been outlined in both the discussion of deficit-focused therapy (11.3) and compensation-focused therapy (11.4). In the aphasiology literature, these two areas have been treated as alternatives and while aphasia therapists may draw on various approaches in the treatment of a specific client, the need for systematic integration of approaches in assessment and remediation has not been addressed.

This investigation does not seek to offer a detailed model for an integrated approach to assessment and therapy. As has been explored in 11.3 and 11.4, however, the findings do give rise to implications for the provision of an integrated approach which offers guidance for further research in the development of a model of integrated aphasia management. In this final section, various issues relating to the development of the CA-motivated analysis used in this research for the clinical assessment of aphasic clients, as well as for the evaluation of efficacy of treatment, are outlined. In 11.5.1 the practicality of the analysis as a clinical assessment tool is examined. The use of the analysis as a tool for evaluating efficacy is addressed in 11.5.2.

11.5.1 Conversation analytic techniques employed in this investigation as an assessment tool

A number of issues need to be considered in examining of the suitability of analytic techniques as an assessment tool. First, it is necessary to consider the practicality of collecting naturalistic conversation for analysis. This is clearly essential if the findings of the analyses are going to provide the clinician with valid information regarding pragmatic functioning which can be used as a basis for planning therapy. The problems encountered in this study have been described in 4.4.1. In particular, collection of conversation with the spouse where both were retired and at home was difficult, as sitting down and talking at length was not a typical daily activity.

This obstacle was resolved by recording a conversation with another member of the family who did participate in extended conversation with the aphasic subject on a regular basis. It has to be acknowledged, however, that for the purposes of guiding remediation it is more appropriate to collect conversational data involving the partner with whom the aphasic client has most contact. This, in most cases, will be the spouse. An alternative solution may be to obtain a recording using a radio microphone and voice switch. This would avoid creating the artificial situation of the two having to sit down and talk, a situation not typical of their everyday behaviour. Instead, it would be possible to record all conversation over several hours. Wells (1985) has used a comparable technique to collect naturalistic data from pre-school children. Clearly there are a number of potential difficulties with this technique. First, there is the issue of invasion of privacy. The interlocutors would need to be offered the opportunity to erase any of the recording that they wished. Second, the cost of such equipment may be considered prohibitively expensive for routine clinical use.

A further issue which has already been touched on in the discussion of both deficit-focused and compensation-focused therapy (11.3.2 and 11.4.2 above) is the range of aphasic clients that an assessment, based on the analysis carried out in this investigation, would be suitable for. In this study, the three subjects had relatively specific language impairments which permitted communication through spoken language. For clients with more severe aphasia who have little spoken language, assessment on the basis of an audio-recording of conversation is unlikely to be adequate. This does not mean, however, that the analytic techniques are not appropriate to this client group. Data-driven analysis is, by definition, able to handle any form of data. In addition, for these clients, because of the more severe impairments to language processing, it is possible that compensation-focused therapy will be the most appropriate approach to treatment. Thus, there is a strong need for assessment which provides details of the ways that the interlocutors achieve communication and which also takes account of the collaborative nature of conversation. Indeed, two major models in the field of augmentative and alternative communication (A.A.C), the Communication Needs Model and the Communication Participation Model (Beukelman and Mirenda, 1987) stress the critical contribution of the conversational partner to the ability of the communication aid-user to participate in interaction. In their review of A.A.C for adults with acquired severe communication disorders, Beukelman and Garrett (1988) propose that one future direction for A.A.C research is the development of assessment protocols that are sensitive to A.A.C related issues unique to the language impaired client. The data-driven principles oriented to in this study would address such issues. The analysis would allow exploration of the use of gestural and other modes of alternative and augmentative communication along with the way that these are integrated with the spoken language of the conversational partner. Severely impaired aphasic subjects are more likely to need to draw on alternative modes of communication. Therefore, for these clients, a video-recording of the interaction would be necessary. The ease of obtaining naturalistic communication with a video-recorder may be problematic as this is more obtrusive than audio-recording. Further research examining issues of data-collection and analysis with more severely impaired aphasic subjects is clearly warranted.

Two further issues which must be addressed in the consideration of an assessment tool are its reliability and validity. The use of a sequential analysis which allows judgement of success or failure to be made on the basis of what happens in the interaction should give rise to high inter-rater reliability since subjective judgements are avoided. As Lesser and Milroy (1993) have stated in their discussion of the merits of a data-driven analysis of aphasic discourse, "evidence for the analyst's judgement is therefore sought not in measures of probability but in the observable behaviours of participants" (1993: 323). In addition, as noted in 11.4.1, data-driven analysis addresses precisely the level of pragmatic functioning which appears to be impaired in aphasia. This, in combination with assessment data obtained from real communicative situations, offers strong validity.

The final issue to be considered in the evaluation of the practicality of the analysis used in this investigation as an assessment tool is the time that the analysis takes. Clearly, collection of data, its transcription and the carrying out of the various levels of analysis is very time-consuming. Time pressures on the aphasia therapist may make this time-consuming approach appear impractical. It is necessary, however, to consider the value of the information that can be obtained from the analysis and balance the cost in time with the information that it yields. With the wider application of the cognitive neuropsychological framework in aphasia clinics, the need to allocate time to assessment and interpretation of assessments has been generally accepted. This is because the information provided by such an endeavour allows accurate targeting of therapy and a demonstration of its efficacy (although see 11.3). As outlined in 11.3 and 11.4, the information provided by data-driven analysis of conversation also provides information to guide targeted therapy. Thus, the time spent in analysis can be justified as a worthwhile investment. Crockford (1991) concluded from a comparison of three assessments of functional communication that the technique of quantifying conversational behaviours which draws on the principles of conversation analysis, while being more time-consuming than either the Everyday Language Test (Blomert et al, 1987) or the Communicative Effectiveness Index (Lomas et al, 1989), provided important information about the interlocutors' use of strategies which the other two techniques did not.

A partial solution to the time-consuming nature of the analyses used in this investigation is selective use of the techniques. In cognitive neuropsychological assessment an assessment battery is never applied indiscriminately. Specific assessments are judiciously selected on the basis of an initial hypothesis of the locus or loci of impairment (see 1.1.2). In the same way, it is likely that for specific clients particular aspects of conversational management are relevant. Initially listening through the recorded conversation for specific aspects of conversational management which appear worthy of further investigation may allow analyses to be selected which will provide the most fruitful information to guide intervention. Thus, investigation of turn-taking and quantification of major and minimal turns may be appropriate if the aphasic interlocutor appears to be exploiting the use of minimal turns as a strategy for participating in communication. Investigation of self repair strategies (including measures of proportions produced, their success and links with cognitive neuropscyhological impairments) may be valuable if a specific cognitive neuropsychological deficit is being considered as a target of deficit-focused therapy as this would allow an examination of the manifestation of the deficit. These two strands of analysis will not, however, be relevant to all clients. The analysis of collaborative repair yields valuable information about both the manifestations of cognitive neuropsychological deficits and the collaborative strategies that the interlocutors employ to deal with them. Analysis of collaborative repair sequences is likely to provide useful information for all aphasic discourse. It cannot be assumed, however, that this analysis will provide sufficient information in all cases. In EN's conversation with BC there were few collaborative repair sequences. Detailed analysis of turn-taking and use of minimal turns demonstrated, however, that this was not because EN's cognitive neuropsychological impairments do not impact on conversation. Instead it arose from BC avoiding initiation of collaborative repair which resulted in EN taking a passive role in the conversation. Thus, while judicious selection of specific analyses is appropriate, it is important to be aware of interactions between different conversational management procedures. Selection of specific analyses helps avoid the need to carry out transcription of the discourse in its entirety. Specific parts of the discourse which are of relevance can be transcribed. It should also be acknowledged that the foci of the analyses carried out in this study by no means exhaust the possible areas of investigation. Lesser and Milroy (1993: 324ff.) propose a checklist of conversational abilities which provides suggestions of further areas which could be examined.

To summarise, it would appear that the use of a conversation analytic approach to assessment of pragmatic abilities in aphasia is appropriate for use in routine clinical practice. Further research exploring methods of data-collection and the use of such a technique with more severely impaired aphasic clients would be useful.

11.5.2 Conversation analytic techniques as an evaluation tool

In the discussion of both deficit-focused and compensation-focused therapy (11.3 and 11.4 above) it was proposed that data-driven analysis of conversation developed in this investigation could be used to evaluate effectiveness and validity of therapy. In this section the use of the analysis as a tool to measure change over time will be considered.

In a clinical review of pragmatic assessment in aphasia, Manochiopinig, Sheard and Reed (1992) propose that assessments which are based on observation of a conversation are subject to sampling error and, therefore, are unsuitable for the precise measurement of performance over time. This limitation would clearly apply to those analyses used in this investigation which are carried out on conversation. In assessing the validity of this criticism, the question which needs to be addressed through further research is how much variation in conversational management procedures could be expected from one conversation to another. While some variation in the proportion of major turns produced by the interlocutors may be expected, depending on the topic of conversation, the evidence presented in this thesis suggests that collaborative repair strategies or tolerance of silence will not vary greatly for the same interlocutors. Further research would allow investigation of these possibilities.

Providing that the use of the analyses are not rejected for the above reason, it is necessary to address a further fundamental question. Will measures of change over time be qualitative or quantitative and what form will these take? The limitation of quantification has been discussed in 1.2.2. As Lesser and Milroy (1993) have outlined:

> "While a sound qualitative analysis offers a basis for intervention in enabling the therapists to identify accurately areas of strength and weakness, the chief advantage of a quantitative analysis is in facilitating *comparison* of various kinds - for example between the same speaker in different situational contexts or at different times. This allows evaluation of whether intervention has effected any change in communicative behaviour." (Lesser and Milroy, 1993: 328).

This study has demonstrated the usefulness of quantitative measures in drawing comparisons between different speakers. It appears that, provided the limitations of quantitative analyses are held in mind and are interpreted in conjunction with the findings of qualitative analysis, they have a role in the evaluation of therapy outcome. Thus, measure of the proportions of major turns produced by the interlocutors may be appropriate when an aphasic client has previously been relying on the use of minimal turns to participate in conversation. An examination of the proportion of self repairs and more particularly their success may provide an appropriate measure of the success of deficit-focused therapy based on cognitive neuropsychological analysis. Quantification of collaborative repairs may provide relatively limited information. Indeed, a decrease in the number of occurrences may be inappropriate if deficit-focused therapy is not being harnessed (for EN's conversation with BC it was suggested that increasing collaborative repair work may be an appropriate therapy target, see 11.4). Rather, development of strategies which minimise collaborative effort should be reflected in repair sequences that are more quickly resolved. Gerber and Gurland (1989) included a measure of the average duration (in turns) of breakdown-repair sequences in APPLS (see 1.3 above). The qualitative analysis carried out in this investigation, however, suggests that such quantitative measures must be interpreted with caution as the nature of the trouble source clearly has a large impact on the shape of the negotiated repair. In such cases it may be important to ensure a qualitative comparison across conversations. Further research exploring the sensitivity of a CA-motivated analysis to changes in communication after treatment is necessary.

11.6 Concluding remarks: limitations of the study and implications for further research

To conclude, I shall consider the limitations of this study and point to some directions for further research which arise from these.

Generalising strategies to different conversational partners

It has been suggested that the findings of data-driven analyses can offer guidance to both deficit-focused and compensation-focused therapy. Particularly in relation to compensation-focused therapy, the appropriacy of developing conversational strategies on the basis of the client's interaction with one conversational partner in a single context must be addressed. If, as proposed in 11.4, on the basis of the findings of the analysis strategies are taught as a collaborative endeavour, it is necessary to ask whether the client will be able to effectively use the developed strategies with other conversational partners. One way in which this problem could be addressed is by the client requesting modification in conversational strategies from his interlocutor, possibly through pointing to written control phrases. Garrett, Beukelman and Low-Morrow (1989) describe the use by a client with Broca's aphasia of instructions and control phrases within a communication book as part of a multi-modal communication system. Alternatively, the therapist may encourage the primary conversational partner to advise other conversational partners of the strategies that have been developed. This could be backed up with written guidance from the therapist. The number of the aphasic clients' potential interlocutors influences consideration of this issue. Smith (1985) has developed a questionnaire to discover the range of communicative activities and conversational partners that a client comes into contact with. The issue of range of conversational partners requires further research to examine the difference in the aphasic client's discourse with trained and untrained conversational partners after therapy.

Generalising strategies to different contexts

The limitations of collecting data in a single context to guide remediation also needs to be addressed. Smith (1985) concludes from the findings of her survey of communicative activities of dysphasic adults that a functional assessment of dysphasic communication must consider the relevance of a context to each individual client. This research has demonstrated that the variable of conversational partner certainly impacts on aphasic communication. Further research is needed to investigate whether the demands of different communicative contexts necessitate the development of different conversational strategies. In particular, research evaluating the effect of compensation-focused therapy (developed from analysis of conversation) on the client's communication in a number of different contexts should contribute to therapeutic practice. If clients are able to generalise the strategies to a range of communicative contexts, this would suggest that aphasia therapists are justified in working within the environment of dyadic conversation. If generalisation is not achieved, further therapy addressing the particular communication demands of different contexts may be necessary.

Teaching abnormal strategies

A further issue arising from the development of collaborative communicative strategies is the appropriacy of teaching clients and their conversational partners "abnormal" conversational strategies to cope with the impact of aphasia. As Green (1984) has reported, this issue is controversial. It could be argued that aphasic interlocutors should learn to cope in everyday situations rather than becoming reliant on particular communication styles. In response to this point, the findings of this study have demonstrated that the impact of language impairment necessitates alteration of "normal" conversational management since manifestations of impairments arise in the discourse which are not found in normal discourse. Indeed, it would appear that the attempt to continue applying normal conversational management procedures gives rise to problems in aphasic discourse (for example, intolerance of long delays). The use of a conversation analytic perspective in this study has demonstrated that the use of normal conversation as a benchmark for aphasic discourse is not satisfactory. The unique features of aphasic discourse necessitate that it be treated autonomously if a clear insight into conversational management which can be employed in aphasia therapy is to be achieved.

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Appendix A

Experimental repetition assessment (revised from Smith, 1988).

This repetition assessment consists of 95 words and 95 non-words matched for the number of syllables and phonological structure. For the words and non-words there are 20 monosyllabic items, and 25 each of two, three and four syllable items. Number and position of clusters in words and non-words are matched between these groups. Words have been selected without inflectional affixes. The words and non-words were presented to the subjects in this research study on different occasions in the order shown below.

Words	***Non-words***
1) bought	1) [dɔt]
2) classic	2) ['kɹasik]
3) fundamental	3) ['sʊntɑmɪndəl]
4) dominant	4) ['bɒniməmp]
5) novel	5) ['mufəl]
6) combination	6) ['bɒntɪmeɪʃən]
7) forest	7) ['vɒlɪst]
8) pluralism	8) ['blɔləɹɪzm]
9) spot	9) [stɒd]
10) sensitive	10) ['fɒmzitɪz]
11) stomach	11) ['spɑnək]
12) laminate	12) ['ɹanɪmeɪd]
13) plant	13) [klant]
14) reasonable	14) ['liʃənəbəl]
15) capitalist	15) ['tabɪtəlɪst]]
16) nonsense	16) ['mɒnfɛns]
17) block	17) [glɒb]
18) flammable	18) ['slɪnəbəl]
19) conduct	19) ['dɒmpəkt]
20) resolution	20) ['lɛvəɹuʃən]
21) budget	21) ['pʊtʃɛb]
22) profession	22) [klɒ'fɛʃən]
23) criminalise	23) ['trɪmənəlaɪv]]
24) significant	24) [fɪg'nɪsəpənt]
25) typical	25) ['pɪkɪtɛl]
26) wind	26) [lʊnt]
27) frighten	27) ['slaɪpən]
28) belligerant	28) ['dɛlɪtʃəɹəmz]
29) substantial	29) ['fʊbstampəl]
30) conversation	30) ['pɒmzəvɛɪʃən]

31) trust
32) government
33) breakfast
34) generation
35) guess
36) tension
37) contortionist
38) dramatic
39) vest
40) largest
41) pale
42) publication
43) cultural
44) risk
45) crisis
46) wonderful
47) trident
48) tramp
49) negative
50) payment
51) chiropodist
52) shook
53) competition
54) garment
55) protestant
56) stone
57) kennel
58) sufficient
59) metric
60) miraculous
61) ground
62) pliable
63) location
64) taste
65) preparation
66) title
67) conviction
68) Britain
69) republican
70) scalp
71) trepidation
72) critical
73) sunken
74) quick

31) [kɹɪft]
32) ['dɒzənamp]
33) ['plɛkʒəst]
34) ['prɛməɹɛɪʃən]
35) [tɛf]
36) ['kɛmʃən]
37) [tɔmkɒʃənɪst]
38) [prə'natɪk]
39) [fɛzd]
40) ['wɒtʃəst]]
41) [dɔl]
42) ['kʊblipɛɪʃən]
43) [pʊldʒəɹəl]
44) [lɪsk]
45) [kɹɛɪʃəs]
46) ['lʊntəfəl]
47) ['praindəd]
48) [prand]
49) ['mɛtapɪv]
50) ['tɛɪmənt]
51) ['fɔlɒtədɪst]
52) [θɛk]
53) ['tɒmbəkɪʃən]
54) ['pɔmɛnt]
55) ['kɹɒpəspənt]
56) [spɛŋ]
57) ['tɛməl]
58) ['ʃuzɪfənt]
59) ['nɛkɹɪt]
60) [nə'ɹapjələs]
61) [dɹaʊnts]
62) ['taɪədəl]
63) ['rupɛɪʃən]
64) [gɒst]
65) ['blɛbədɛɪzən]]
66) ['daikəl]]
67) ['dɒmɪpʃən]
68) ['drɪbən]
69) ['lɛtubɹəkən]
70) [stald]]
71) ['pɹɛtɪgɛɪʃen]]
72) ['tɹɪpɪtəl]
73) ['ʃʊmpəŋ]
74) [kwɪb]

75) gymnast
76) germination
77) recognise
78) deliverance
79) soft
80) lantern
81) methodist
82) roof
83) solution
84) traditional
85) conventional
86) domestic
87) perfect
88) confidence
89) thimble
90) psychologist
91) moribund
92) truck
93) notice
94) concentration
95) practical

75) ['tʃanməst]
76) ['tʃanɪmeɪʃən]
77) ['lɛtəgnaɪz]
78) [gɛ'ɹaθələns]
79) [vɒst]]
80) ['ɹamtən]
81) ['nafətɪst]
82) [lʊʃ]
83) [fɒɹɛɪʃən]
84) ['prɑbɪʒəməl]
85) ['pɒmsɛnʃənəl]
86) ['pɒnɛftik]
87) ['dɔvɛkt]
88) ['tɒnzɪpens]
89) ['ʃʊndəl]
90) ['θaɪtɒɹɪtʃɪst]
91) ['nɒlɪgənd]]
92) [kɹʊt]
93) ['moʊpɪs]
94) ['tɒmzɪnkɹɛɪʃən]
95) ['krɒptɪpəl]

Appendix B

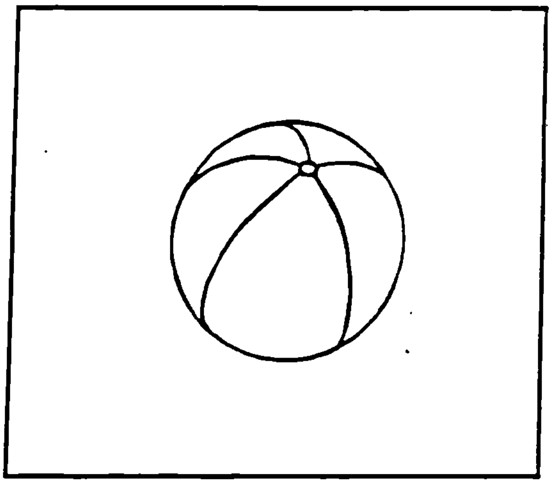
REVISED KAY NAMING TEST

This naming assessment is a shortened version of the Kay naming test (unpublished). It consists of 75 black and white line drawings on 10x15cm cards. The items are divided in three frequency bands (frequency measures form Francis and Kucera, 1981, occurrences per million). High frequency items (H) have a word frequency greater than 100 (mean = 272.04, SD = 176.13, range from 106 to 717). Medium frequency items (M) have a word frequency between 35 and 86 (mean = 55.08, SD = 19.09, range from 27 to 86. Low frequency items have a word frequency of 15 or less (mean = 3.92, SD = 3.73, range from 1 to 15).

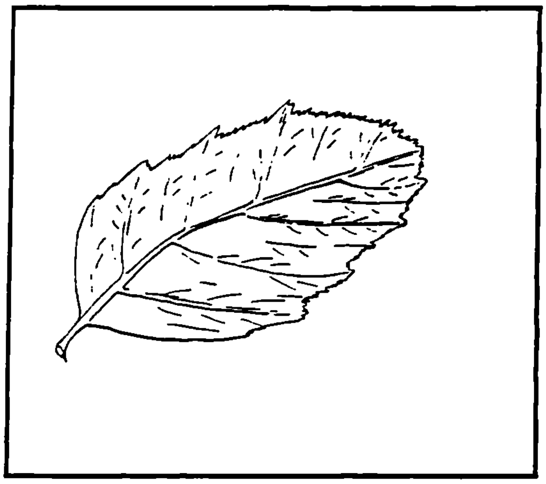
Target	Frequency	Target	Frequency
1. Ball	H.123	34. Vase	L.16
2. Dog	H.147	35. Grapes	L.10
3. Leaf	M.33	36. Bed	H.139
4. Egg	M.47	37. House	H.662
5. Harp	L.1	38. Funnel	L.2
6. Snake	M.70	39 Foot	H.361
7. Girl	H.374	40. Saddle	M.26
8. Kite	L.1	41. Chair	M.89
9. Ship	H.126	42. Easel	L.5
10. Chicken	M.49	43. Cow	M.46
11. Mop	L.2	44. Zip	L.1
12. Snail	L.3	45. Horse	H.203
13. Finger	H.106	46. Skate	L.1
14. Zebra	L.1	47. Car	H.393
15. Tree	H.160	48. Shoe	M.58
16. Knife	M.86	49. Kettle	L.3
17. Flower	M.78	50. Key	M.71
18. Leg	H.126	51. Bridge	H.117
19. Star	M.58	52. Hand	H.717
20. Nun	L.6	53. Church	H.451
21. Bomb	M.68	54. Pliers	L.1
22. Parcel	L.2	55. Fence	M.46
23. Cup	M.58	56. Door	H.348
24. Angel	M.45	57. Clock	M.28
25. Arm	H.217	58. Wig	L.1
26. Glass	H.128	59. Desk	M.69
27. Eye	H.524	60. Piano	M.39
28. Hat	M.71	61. Thimble	L.1
29. Table	H.242	62. Scarf	L.4
30. Cheese	L.9	63. Apron	L.8
31. Owl	L.6	64. Coat	M.52
32. Peg	L.5	65. Pencil	M.38
33. Window	H.172	66. Radio	H.126

Target	Frequency	Target	Frequency
67. Boy	H.409	72. Pram	L.2
68. Train	M.86	73. Web	L.6
69. Book	H.292	74. Tongue	M.39
70. Plane	H.138	75. Tie	M.27
71. Donkey	L.1		

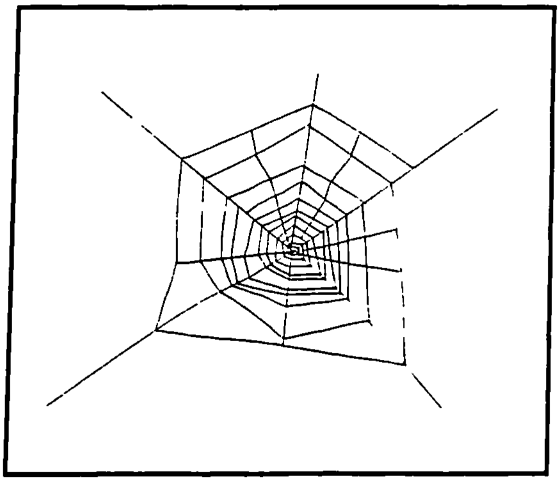
Sample pictures from the revised Kay naming test: (not actual size)



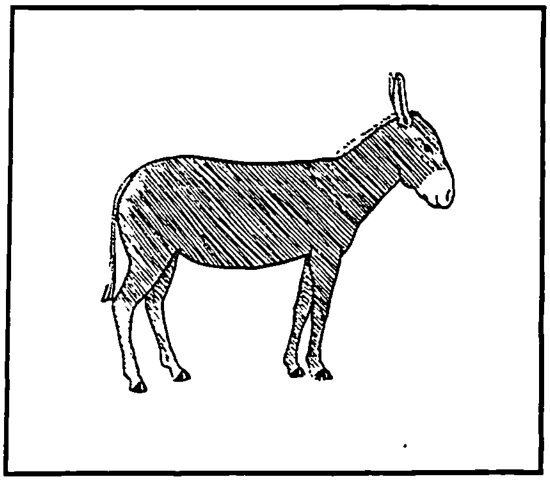
High frequency item; BALL



Medium frequency item; LEAF



Low frequency item; WEB



Low frequency item; DONKEY

VERB AND NOUN NAMING TEST

This naming assessment is revised from Habgood (1989). It consists of 64 line drawings, presented on 10 x 10cm cards, half of which are to elicit naming of nouns and half or which are to elicit naming of verbs. Two sets of items are divided into two frequency bands (frequency measures from Francis and Kucera, 1981; occurences per million). High frequency items (H) have a frequency greater than 50 (for verbs, mean = 164.75, SD = 145.74, range from 52 to 561, for nouns, mean = 144.37, SD = 130.19, range from 52 to 524). Low frequency items (L) have a word frequency of 15 or less (for verbs, mean = 7.56, SD = 5.37, range from 1 to 15; for nouns mean = 7.19, SD = 4.94, range from 1 to 15). The verb and noun pictures were presented in separate blocks in the order presentend below.

	Target	Frequency		Target	Frequency
Nouns			Verbs		
1.	coat	H.(52)	1.	mixing	H.(55)
2.	bucket	L.(11)	2.	robbing	L.(15)
3.	vase	L(15)	3.	licking	L.(14)
4.	chair	H(89)	4.	watering	L.(12)
5.	swing	L(13)	5.	sleeping	H.(97)
6.	book	H(292)	6.	blowing	H.(52)
7.	swan	L(4)	7.	climbing	H.(65)
8.	knife	H(86)	8.	mowing	L.(1)
9.	radio	H(126)	9.	sitting	H.(314)
10.	tree	H(56)	10.	stroking	L.(5)
11.	cheese	L(9)	11.	reading	H.(274)
12.	harp	L(1)	12.	drinking	H.(93)
13.	thumb	L(14)	13.	pecking	L.(3)
14.	eye	H(524)	14.	scrubbing	L.(1)
15.	star	H(58)	15.	writing	H.(561)
16.	grapes	L(10)	16.	washing	H.(83)
17.	snail	L(3)	17.	injecting	L.(13)
18.	ball	H(123)	18.	fainting	L.(1)
19.	funnel	L(2)	19.	hiding	H.(61)
20.	thimble	L(1)	20.	dancing	H.(59)
21.	peg	L(5)	21.	crying	H.(64)
22.	donkey	L(1)	22.	ducking	L.(15)
23.	parcel	L(12)	23.	dialling	L.(4)
24.	desk	H(65)	24.	riding	H.(126)
25.	train	H(86)	25.	juggling	L.(2)
26.	cup	H(58)	26.	singing	H.(120)
27.	table	H(242)	27.	spilling	L.(9)
28.	mountain	H(98)	28.	typing	L.(12)

Nouns			*Verbs*		
29.	shoe	H(63)	29.	mopping	L.(9)
30.	apron	L(8)	30.	walking	H.(287)
31.	nun	L(6)	31.	conjuring	L.(5)
32.	book	H(292)	32.	paying	H.(325)

Alternative responses produced by the control subjects.

Control subject one:

RADIO	wireless
MIXING	stirring
ROBBING	thieving
INJECTING	giving an injection
MOPPING	washing the floor

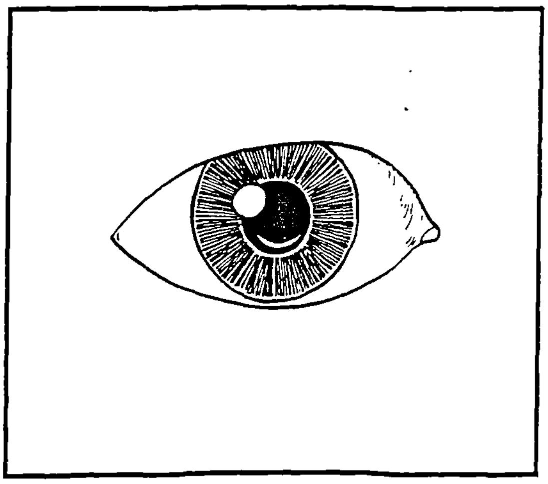
Control subject two:

ROBBING	running, stealing
FAINTING	falling
DUCKING	drowning him
SPILLING	slopping
PAYING	buying, shopping

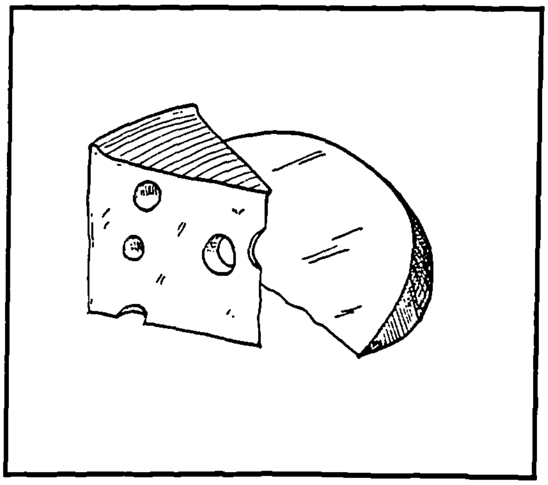
Control subject 3:

DIALLING	ringing
MOPPING	cleaning
PAYING	buying

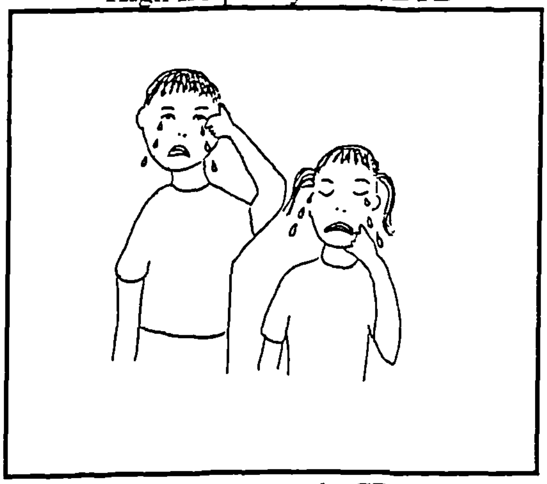
Sample pictures of the naming test
(not actual size)



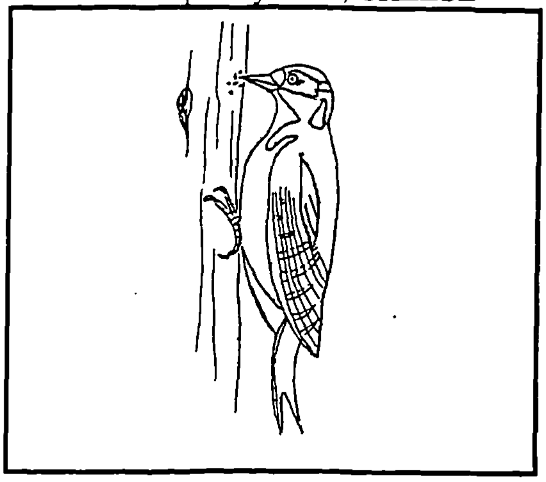
High frequency noun, EYE



Low frequency noun, CHEESE



High frequency verb, CRYING



Low frequency verb, PECKING

Appendix D

LESSER SYLLABIC NAMING TEST (unpublished)

This naming assessment consists of 60 black and white line drawings, presented two to an A4 sheet of paper. Half of the items are monosyllabic names, the other half are polysyllabic names with three or four syllables. Each of these halves are divided equally into three frequency bands (frequency measures from Francis and Kucera, 1981; occurrences per million). Higher frequency items (H) have a range of 39 to 7 (mean = 21, SD = 11.34) for polysyllabic names and a range of 55 to 8 (mean = 20, SD = 14.33) for monosyllabic names. Medium frequency items (M) have a word frequency or one or two for both polysyllabic and monosyllabic names (mean=1.3, SD=0.48 for polysyllabic names; mean = 1.4, SD = 0.52 for monosyllabic names). Low frequency items (L) are names which have no reported frequency count in Francis and Kucera (1981).

Polysyllabic picture names

	Target	Frequency
1.	kangaroo	L.(-)
2.	envelope	H.(24)
3.	octopus	M.(1)
4.	photographer	H.(11)
5.	cathedral	H.(16)
6.	gorilla	L.(-)
7.	crocodile	M.(1)
8.	screwdriver	L.(-)
9.	accordion	M.(1)
10.	caterpillar	M.(2)
11.	cigarettes	H.(38)
12.	thermometer	H.(16)
13.	stethoscope	M.(2)
14.	pelican	L.(-)
15.	abacus	L.(-)
16.	unicorn	L.(-)
17.	helicopter	M.(1)
18.	motorbike	L.(-)
19.	escalator	L.(-)
20.	dominoes	L.(-)
21.	piano	H.(39)
22.	aquarium	L.(-)
23.	daffodil	M.(1)
24.	handlebars	M.(1)
25.	elephant	H.(18)
26.	tomato	H.(7)
27.	pyramid	M.(1)
28.	potato	H.(30)

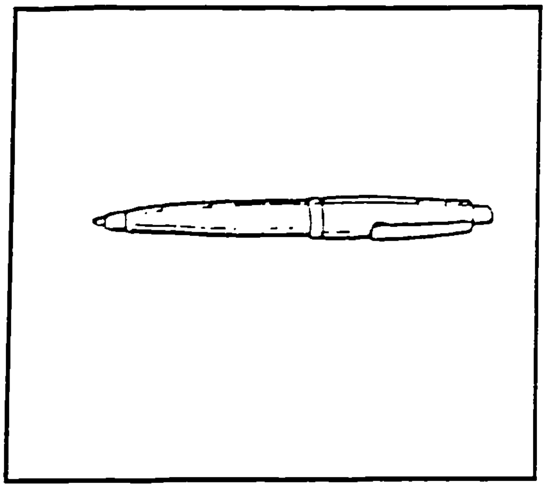
Monosyllabic picture names

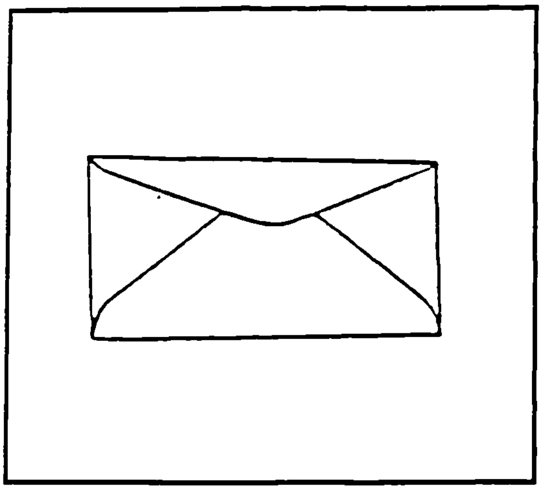
	Target	Frequency
1.	pen	H.(18)
2.	fox	H.(11)
3.	plum	M.(1)
4.	pip	M.(1)
5.	scroll	L.(-)
6.	sphinx	M.(2)
7.	saw	H.(8)
8.	grass	H.(55)
9.	dart	L.(-)
10.	grapes	H.(10)
11.	smock	L.(-)
12.	eel	M.(2)
13.	shroud	L.(-)
14.	clogs	L.(-)
15.	tongs	M.(1)
16.	stork	L.(-)
17.	bath	H.(31)
18.	match	H.(24)
19.	buoy	M.(1)
20.	muff	M.(1)
21.	beak	L.(-)
22.	mouse	H.(20)
23.	bolt	H.(9)
24.	cot	L.(-)
25.	whale	L.(-)
26.	prawn	L.(-)
27.	wasp	M.(2)
28.	harp	M.(1)

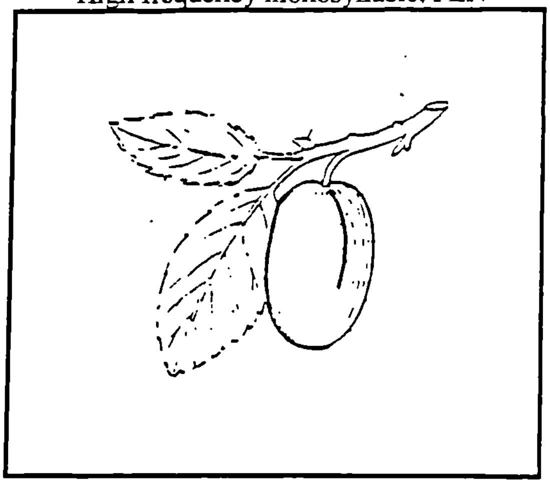
29.	umbrella	H.(11)
30.	parachute	M.(2)

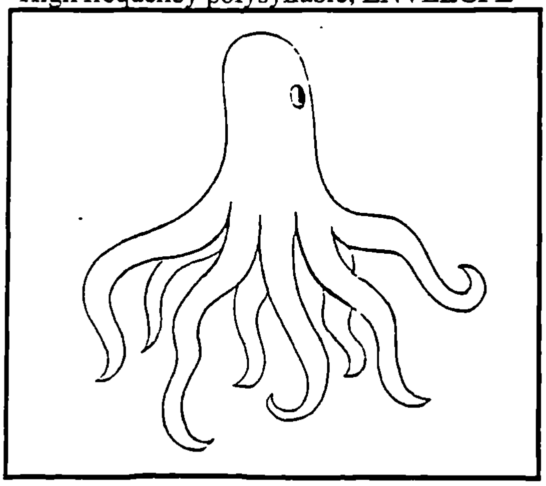
29.	broom	M.(2)
30.	globe	H.(14)

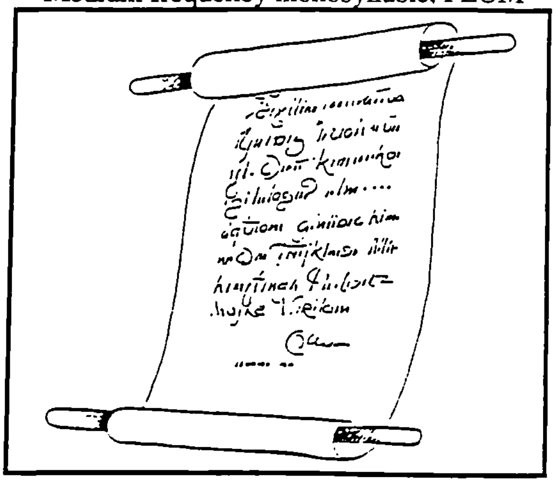
Sample pictures from the Lesser syllabic naming test.

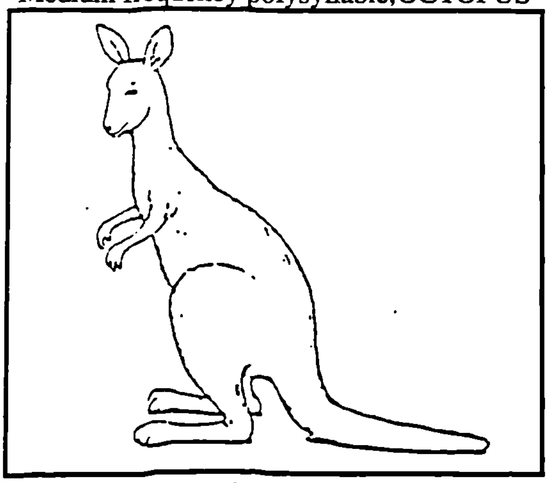

High frequency monosyllabic: PEN


High frequency polysyllabic; ENVELOPE


Medium frequency monosyllabic: PLUM


Medium frequency polysyllabic;OCTOPUS


Low frequency monosyllabic: SCROLL


Low frequency polysyllabic; KANGAROO

Examples of sentence types from PALPA assessments 58 and 59, sentence comprehension

Sentence type	Example of sentence
Reversible directional active verb	The dog's approaching the girl
Reversible directional passive verb	The man's pulled by the horse
Reversible non-directional active verb	The horse's kicking the man
Reversible non-directional passive verb	The girl's watched by the chicken
Reversible comparative adjective	The girl's taller than the dog
Non-reversible active verb	The man's kicking the chicken
Non-reversible passive verb	The man's licked by the cat
Non-reversible comparative adjective	This girl's got more cats
Non-reversible comparative adjective with to- complement	This girl's got more horses to feed
Gapped after verb with subject gap	The girl's considering where to go
Gapped after verb with non-subject gap	The girl's suggesting what to eat
Gapped after adjective with subject gap	The man's keen to see
Gapped after adjective with non-subject gap	The cat's easy to bite
Converse relation verb	The man's offering the money

Appendix F

Transcription conventions for conversational data

[	The point at which the utterances above and below the symbol are produced in overlap
*	The point at which the current turn emerges from overlap.
(0.0)	Pauses or gaps in tenths of seconds
(x syllables)	Inaudible syllables
( )	Uncertain passages of transcript.
[]	Broad phonetic transcription.
hhh	Audible out-breath
'hhh	Audible in-breath
= =	Latched utterances with no gap.
{ }	Non-verbal activity denoted between brackets

Appendix G

Excerpts from AD's Conversations demonstrating retained turn taking abilities

AD demonstrated the ability to take the floor without gap or overlap in the vast majority of turn transitions as illustrated in excerpt *(i)*:

(i)

123 LP so you were in Italy in a hospital in Italy when you had meningitis
124 AD yeah he* took me back straight away yeah
[
125 LP yeah
126 AD (2 syll.)
[
127 LP that must have been pretty horrible
128 AD huh well it had the er {cough} I never gone you see I er er when you think about it now your're thinking....

Where overlap did occur in AD's conversations, it occurred in positions predictable from the turn taking rules and was quickly resolved by one of the speakers dropping out. In *(i)* above, AD drops out in T126 when he and LP simultaneously initiate a turn. In excerpt *(ii)* AD demonstrates sensitivity to the part of the turn which has been overlapped in his recycling of it:

(ii)

184 LP aha
[
185 AD my* my wife is going to [bə baɪ] be left here because I'm going to be a carrier of this

Appendix H

Excerpts from JJ's conversations demonstrating retained turn taking abilities

JJ demonstrated the ability to take the floor without gap or overlap in the vast majority of turn transitions as illustrated in excerpt *(i)*:

(i)

162	PJ	ah I think I remember it yes* yeah
		[
163	JJ	yes
164	JJ	well we're going there for (1.7) a an [a] [bə hɑ] bar meal
165	PJ	bar meal ah that's very nice
		(2.0)
166	PJ	gallivanting about aren't you
167	JJ	yeah {laughter}
168	PJ	that'll save us going on holiday next year
169	JJ	what for
170	PJ	well that'll do for your holidays

Where overlap did occur in JJ's conversations, it occurred in positions predictable from the turn taking rules and was quickly resolved by one of the speakers dropping out. In *(ii)* below JJ has interrupted LP's turn at a possible transition relevance point after the production of a minimal response marking acceptance of JJ's previous turn. LP, however, carries on and JJ drops out immediately thereby minimising the overlap:

(ii)

86	LP	right who* actually runs the runs it then
		[
87	JJ	so

JJ also demonstrated sensitivity to the part of her turn which had been overlapped as illustrated in excerpt *(iii)*:

(iii)

123	PJ	er [faʊn faʊn]
		[
124	JJ	the [faʊn]* fountain (1.2) the fountain (3.0) ee I don't know I'm not very sure