Exploring the Impact of Positive and Negative Emotions on the Performance of Student Interpreters in Simultaneous Interpreting

Thesis

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By

Cen Cong

Student Number: 150685904

Newcastle University

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Abstract

Emotions can affect communication and cognitive processes like attention, memory, and judgment. Previous studies mainly investigated cognitive challenges in simultaneous interpreting (SI) or interpreters' role in emotional situations, but little explored how their performance is affected by emotion. This thesis aims to understand the impact of emotions on interpreters' SI performance by answering three questions: Are interpreters' emotions affected by positive and negative emotional stimuli? If affected, how does it impact their performance in terms of omissions, errors, and incompletions? What are the possible contributing factors?

To address these questions, this study adopted a mixed-method approach, using interviews, skin conductance measurements, and scales. Thirty student interpreters completed a 15-minute English-to-Chinese SI task. Positive and negative music was used to induce their emotional responses before interpreting. Their emotional states were evaluated using the self-assessment scale between tasks, and their skin conductance was measured throughout the experiment to monitor emotional changes. Target speeches were recorded and analysed for occurrences of omissions, errors, and incompletions. Post-SI semi-structured interviews were conducted to gain an in-depth understanding of their emotions and perceptions of performance. Results show that interpreters' emotions were significantly affected by music, which further affected their subsequent interpretation. Interpreters under positive emotions made more referential omissions and conative errors but fewer incompletions, while those under negative emotions made fewer omissions but more conative errors and incompletions. According to Barrett's theory of constructed emotion, Solomon's model of perceptual processing, and Setton's model of SI, such emotional influences could be attributed to the impact of emotion on attention, memory, and information processing, as well as individual differences in emotion perception and expression.

This thesis highlights the need for understanding interpreters' emotions and contributes new knowledge about the process of interpreting through the lens of emotion, which further informs interpreter training and opens new avenues for interpreting studies.

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List of Abbreviations

ABBREVIATION	FULL FORM
AIIC	Association Internationale des Interprètes de Conférence (also International Association of Conference Interpreters)
ANOVA	Analysis of Variance
AR	Arousal
BT	Back Translation
EEG	Electroencephalogram
EG	Emotional Granularity
GSR	Galvanic Skin Response
IELTS	International English Language Testing System)
ITI	Institute Of Translation and Interpreting
LPP	Late Positive Potential
MD	Mean Deviation
PPT	PowerPoint Presentation
RQ	Research Question
SAM	Self-Assessment Manikin
SC	Skin Conductance
SCR	Skin Conductance Response
SCRS/MIN	Skin Conductance Responses per Minute
SI	Simultaneous Interpreting
SL	Source Language
SP	Source Speech
SRL	Semantic Role Labelling
ST	Source Text
TL	Target Language
TP	Target Speech
TT	Target Text
UN	United Nations
VA	Valence
WPM	Words Per Minute

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Chapter 1. Introduction

Over the decades, research in interpreting studies has tended to shift from lexical-semantic analysis of bilingual texts to interdisciplinary studies involving neurolinguistics, psychology, and sociology. As interpreting theories continue to advance, the performance of interpreters has always been of great importance to language users and interpreters themselves. This chapter provides an overview of the background of this research project and highlights the existing literature gap on the current topic, setting the scene for exploration.

1.1 Background

Simultaneous interpreting is a particularly challenging form of interpreting, requiring the interpreter to listen to comprehend the source speech and produce the target speech almost in real-time (Pong, 1995). Extensive research has been conducted to understand the cognitive and linguistic processes involved in simultaneous interpreting.

With the rise of cognitive science in the 1970s, the 20th century saw a surge of research addressing the process of interpreting in translation and interpreting studies. At the early stage, the Interpretive Theory of Translation or the Theory of Sense (Lederer, 1978; Seleskovitch, 1998) held a dominant position in interpreting studies. With further advances in cognitive science, the focus of research shifted to cognitive information processes, particularly on long-term or short-term memory (Gerver, 1971; Gile, 1985). Following the growing applications of pragmatics in translation and interpreting studies, the exploration into SI started to follow a more pragmatic-cognitive approach (Setton, 1999). Over the years, studies found that many factors may hinder interpreters' performance in simultaneous interpreting, such as the lexical complexity of the source speech (Napier, 2004), directionality (Gile, 2005), fast speech rate (Gerver, 2002; Korpal, 2012), and strong accent of the speaker (Cheung, 2013; Lin, Chang and Kuo, 2013). While the cognitive aspects of this process have been extensively studied, the role of emotion in interpreting has received less attention.

Interpreters do not just literally convert words from one language to another. Instead, they are facilitators of communication (Ingram, 1974; Marszalenko, 2016). For effective communication, a crucial element is the emotive or expressive function of language (Jakobson, 1960; Halliday, 1975). It helps to establish connections between individuals by expressing emotions of the self and evoking emotional responses from others (Schwarz-Friesel, 2015). Without expressing emotions, meaning could be twisted or lost in voices. Previous research has found that the professionals hoped that interpreters could provide emotional support or show empathy to clients to facilitate communication, particularly in settings such as healthcare interpreting (Furler *et al.*, 2010; Hsieh and Kramer, 2012). However, the reality is emotive expressions from the professional or the client were often weakened or omitted by interpreters (Farini, 2013; Hadziabdic *et al.*, 2014; Krystallidou *et al.*, 2018; Roter *et al.*, 2020). The lost emotionality in the target speeches may influence the listeners' interpretation of the message conveyed, thereby hindering communication.

Interpreters' choices, intentional or unintentional, may be influenced by the norm of neutrality in the interpreting profession. Neutrality seems to be equivalent to emotionless, and this misconception has been challenged by scholars in recent years as more and more evidence suggests that interpreters were found to hide their emotions in various settings in order to maintain professional distance as per the expectations of institutions (Carstensen and Dahlberg, 2017; Tekgül, 2020). This is in line with the concept of emotional labour, which refers to the management of emotions as part of one's job role, irrespective of their true feelings (Hochschild, 1983). As such, neutrality should be considered as a form of emotional labour (Ayan, 2021). Interpreters should also be considered emotional labourers as they must carefully navigate the emotional dynamics in the conversation and suppress their true feelings when they are dealing with emotionally challenging content. But what would happen when interpreters become emotional?

An increasing number of studies shed light on the influence of meta-emotions on interpreting. Meta-emotion is defined as "emotions about emotions" and is involved in executive functioning (Norman and Furnes, 2014). In one study, the meta-emotions of student interpreters were assessed using the Trait Meta-Mood Scale and Eysenck Personality Questionnaire, which was found to be positively correlated with their interpreting performance (Kang, 2016b). This finding has been further confirmed by (Bao, 2019) in an investigation of the relationship between performance and meta-emotions under noise intervention. The management of meta-emotions can be improved by adopting strategies such as self-suggestion, deep breathing, shifting attention, and emotional regulation (Zheng, 2015; Kang, 2016a). These findings suggest that interpreters' perceptions of emotions can affect their performance in interpreting.

In the context of simultaneous interpreting, only a small number of studies offered insights into the potential impact of emotions on interpreting. For example, researchers found that professional SI interpreters appeared to mimic and experience emotions that were similar to those expressed in an emotional (*sad*) source speech, with statistically significant results from galvanic skin response (GSR) readings and self-reports (Korpal and Jasielska, 2019). However, it is not clear how interpreters' interpreting performance would be affected by such empathy. Another study found that interpreters, especially novice interpreters, paid a significant amount of attention to their emotional states arising from the self-monitoring process (Ivanova, 2000). The influence of such attention allocation on emotional states was not further investigated.

The process of simultaneous interpreting involves a complex interplay of high-level cognitive processes, such as attention and working memory. These processes have been found to be prone to the influence of both negative and positive emotions. Negative emotions, such as fear, anger, and sadness, tend to narrow attention by restricting cognitive resources to specific stimuli (such as those perceived as threats), limiting the processing of non-target stimuli (Easterbrook, 1959; Finucane, 2011; Wang, Chen and Zhang, 2018). positive emotions broaden (Fredrickson, 1998, 2001; Naranowicz, 2022). In contrast, individuals in positive emotional states (e.g., amusement or contentment) tend to attend to a wider range of stimuli with a broader scope of attention (Fredrickson, 1998, 2001; Fredrickson and Branigan, 2005; Naranowicz, 2022) In simultaneous interpreting, the processing of sensory inputs from multiple modalities requires efficient allocation of attention to the inputs that are more relevant to the core message. Such emotional influences on attention may cause attention mismanagement, further hindering interpreters' performance. Regarding working memory, working memory capacity was found to have an impact on interpreters' performance in SI (Zhang, 2009). Exceeding the capacity of working memory could result in the occurrence of errors in simultaneous interpreting (Wehrmeyer, 2022; Zlobina, 2022). Positive and negative emotions can have a significant influence on working memory capacity (Ashby, F. G., Isen, A. M., & Turken, A. U., 1999; Gray, 2001; Storbeck and Maswood, 2016). Positive emotions have been proven to improve verbal working memory capacity, while negative emotions impair (Gray, 2001). In this sense, positive and negative emotions could also have an impact on interpreters' performance through their influences on working memory capacity. However, these have not been empirically investigated in the field of interpreting studies.

The valuable contributions of the previous studies have highlighted the importance of emotions for effective communication. However, the literature currently still lacks a comprehensive understanding of how interpreters' perceptions and experiences of emotions of the speaker and themselves can impact the interpreting process and the quality of their interpreting output. To narrow this research gap, this thesis intends to contribute new knowledge to this area by investigating the influence of valence-opposing emotions, i.e., positive and negative, on student interpreters' performance in simultaneous interpreting.

1.2 Aim and Objectives

This proposed research project aims to explore if and how the emotions of interpreters influence their performance in simultaneous interpreting and what are possible reasons, if there is no influence, to better understand the process of interpreting and the significance of emotional regulation in interpreter training. Specifically, the project would like to address the following questions:

(1) Are interpreters' emotions affected by positive/negative emotional stimuli?
(2) If affected, how does it impact their performance in terms of omissions, errors, and incompletions?
(3) What are the possible contributing factors?

Emotions are powerful "drivers of decision making" (Lerner *et al.*, 2015, p. 816). Understanding interpreters' emotions and their impact on interpreting performance can contribute to research in the fields of interpreting, psychology and linguistics theoretically and practically. First, the results of the project can contribute new knowledge about whether and how positive and negative emotions affect student interpreters' performance in simultaneous interpreting. Second, the methodology of this study provides a reference for subsequent researchers to explore simultaneous interpreting using psychological approaches. Third, research findings can provide insights into the emotional regulation of interpreters, which can further inform interpreter training.

1.3 Thesis Structure

The rest of this thesis is structured as follows: Chapter 2 presents relevant research on the information processing mechanism of simultaneous interpreting, and the role of emotion in human information processing. The study was performed in several phases, so Chapter 3 first introduces the research design, followed by a selection of instruments used in this project, features of participants, as well as collection and analysis of experiments. Chapter 4 presents the main results and findings of the main study, and Chapter 5 discusses the interpretation of the results and explores the theoretical and practical implications of the findings. Finally, Chapter 6 summarises the main findings and contributions of this study and points out potential directions for future research in related areas.

Chapter 2. Literature Review

This chapter aims to provide a general understanding about scholarly works that are relevant to the research topic. This includes not only theories, models, and existing findings about the topic but also methodological approaches to investigating emotion and interpreting performance.

2.1 Emotion and Communication

Emotion is key to communication. This section introduces the fundamentals to understanding emotion, including its definition, types, how emotions are made (Subsection 2.1.1), its role in verbal communication (2.1.2), as well as cultural differences in emotion perception, experience and expressions (2.1.3).

2.1.1 Understanding emotions

Emotions are diverse and complex in its nature. In the field of psychology, emotions have been studied extensively through many different lenses. This section introduces the key background of the terminology, classification, and mechanism of emotion.

(1) Kin terms of emotion

The definition of emotion is complicated, partly because it varies greatly amongst philosophers, psychologists, and sociologists and partly because the term is often not clearly differentiated from its kin terms, such as affect, feelings, and sentiments. To avoid confusion, emotion and affect are used interchangeably and are not differentiated based on the consciousness of the individual in this project. Feelings are related to the subjective aspects of emotions, and sentiment is specifically used to describe the affective characteristics of text. The definition of emotion varies greatly among theories, which will be explained in a later section.

(2) Classification of emotions

Are emotions discrete states or a continuum? This is a commonly asked question in the study of emotions, and the answers to it depend on the conceptualisation of emotions. Emotions are regarded as discrete states in theories such as the Deference-Emotion system (Scheff, 1988), the

Power-Status theory of emotions (Kemper, 2007), and the Justice theory (Hegtvedt and Parris, 2014). For instance, happiness, sadness, anger, fear, disgust, and surprise are regarded as the basic six emotions (Plutchik, 1980; Ekman and Cordaro, 2011; Levenson, 2011). However, there is some disagreement about whether disgust, surprise and other emotions such as interest should be regarded as basic emotions (Oatley and Johnson-laird, 1987; Izard, 2011).

Studying a specific emotional state can be methodologically difficult due to a lack of consistent evidence from literature and the co-occurrence of emotions in real-life scenarios. An individual's response to an event often involves a mix of multiple emotional states at the same time, so it is complicated to determine which specific emotion an individual is experiencing at a specific moment. That is why, in recent years, many scholars have suggested better describing emotions by dimensions (Trnka, Balcar and Kuška, 2011; Fontaine *et al.*, 2016). Regarding the number of dimensions, it is generally believed that emotion has two dimensions, and the most widely adopted two-dimensional model of emotion is the circumplex of affect (Russell, 1980), as shown below.

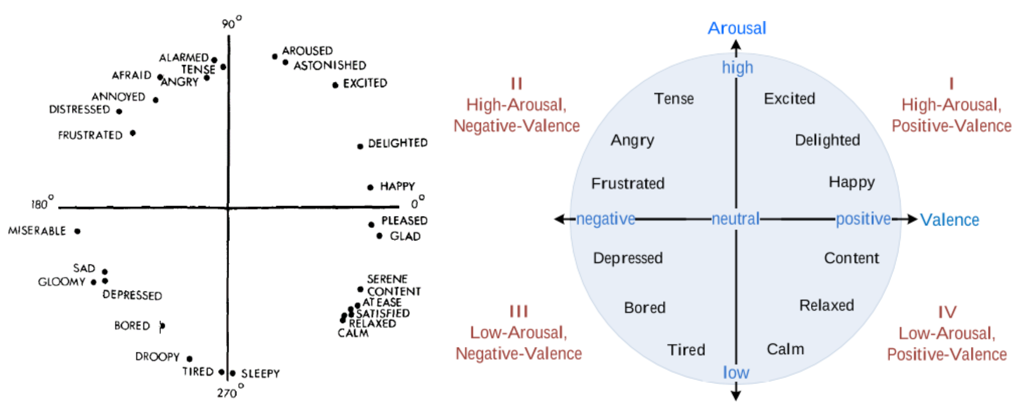

Figure 1. Examples of a circumplex of affect

Left: The Circumplex Model of Affect (Russell, 1980, p. 1164)
Right: Core emotions in the circumplex model (Liu *et al.*, 2018, p. 2)

The above figure shows the original circumplex model of affect proposed by James Russell (left) and its adapted version (right). Emotional experiences can be mapped onto this coordinate system using key words related to emotions, such as sad, depressed, pleased, and delighted. In the model, the horizontal axis relates to the valence of emotion, which describes the extent to which an emotion is positive or negative. It should be noted that while emotions are classified as positive and negative, they do not mean the two extreme ends of affective states but those along the positive-negative continuum. The vertical axis relates to the arousal of emotion, which describes the intensity of emotion (e.g., low or high). Liu *et al.* (2018) illustrated the positions of core emotions in the circumplex model. For example, excited is a high-arousal positive-valence emotion and is in the first quadrant of the coordinate system. The model provides an effective explanation for a wide range of emotions. However, the mapping of emotion-related words depends on individuals' knowledge about emotions, which is crucial in the construction of emotions. The next section will introduce how emotions are made based on theories in psychology.

(3) Mechanism of emotion generation

Many theories of emotion in psychology seek to understand and explain the nature of emotions and how they are made, such as the James-Lange Theory (Lange and James, 1922), the Cannon-Bard theory (Cannon, 1927; Bard, 1934) and the Two-Factor Theory (Schachter and Singer, 1962). While these theories advance our understanding of the complex nature of emotions, the innate nature of emotions was challenged by later scholars, and the social nature of the self has been overlooked in the construction of emotions.

Lisa Barrett's Theory of Constructed Emotion takes a psychological constructionist approach, links emotions with the functions of the brain and addresses the impact of social influences on emotional experiences. This theory challenges traditional views of emotions, which see emotions as innate responses to the emotional stimuli in the world, as in the James-Lange Theory (Lange and James, 1922) and the Cannon-Bard theory (Cannon, 1927; Bard, 1934). Instead, it considers emotions as concepts. Like the concept of an object in our daily life, e.g., a box and a cup, emotions are also concepts—"a collection of embodied, whole brain representations that predicts what is about to happen in the sensory environment, what the best action is to deal with these impending events, and their consequences for allostasis" (Barrett, 2017, p. 16). They are not innate reactions to stimuli but rather are constructed by the brain in a specific way:

> […] physical changes in the natural world (internal physical changes occurring within a

> perceiver, and sensory changes from the world such as from other people's facial muscle movements, actions, the physical surroundings, etc.) become real as emotion (as fear, anger, etc.) when they are categorized as such using emotion concept knowledge within a perceiver.
>
> (Barrett, 2014, p. 293)

In short terms, the brain makes meaning of physical changes through categorisation based on prior knowledge about emotions. In this process of construction, there are two key factors: physical changes and categorisation.

Physical changes could come from either the internal body of the person or the external world. Physical changes in the internal body of the individual constitute emotions. This is consistent with previous theories' emphasis on the importance of physiological responses to stimuli. Skin conductance, for instance, is a type of physiological changes in the body and has been proven a key indicator of emotion. It refers to the measurement of the electrical conductivity of the skin, specifically in relation to changes in sweat gland activity, which is controlled by the sympathetic nervous system (Laine *et al.*, 2009). Skin conductance responses are related to the level of arousal elicited by stimuli. High-arousal emotions (positive or negative) can lead to an increase in the electrical conductivity of the skin, which is characterised by greater amplitudes and shorter rise times of skin conductance responses (Jindrová, Kocourek and Telenský, 2020). Compared to arousal, the valence of emotion does not have such a great impact on skin conductance responses (Dindo and Fowles, 2008; Yang and Liu, 2014). While valence has less impact than arousal of emotion, it's worth noting that skin conductance responses are generally stronger to negative-valence stimuli than positive-valence stimuli. A study found that participants' skin conductance responses were significantly elevated when viewing unpleasant pictures, compared to when viewing neutral or pleasant pictures (Smith *et al.*, 2006).

Both audio and visual sensory inputs can lead to emotional responses of a perceiver. Music, static images, imagery (dynamic), visual film, recall, or a mix of these stimuli are all effective for inducing emotions, and the effectiveness varies depending on the specific emotional states for induction (Siedlecka and Denson, 2019). Film clips, which combine both audio and visual elements, are the most effective type of stimuli for evoking both negative and positive emotions (Fernández-Aguilar *et al.*, 2019). However, audiences from different cultures may perceive the same film very differently as the way of emotional expression differs greatly from culture to culture (Matsumoto, Yoo, Fontaine, *et al.*, 2008).

On the other hand, music communicates emotions across cultures. It was found to be effective in inducing participants' emotional responses (e.g., happiness and sadness) based on results of a 7-point scale and measurements of heart rate and skin conductance level of participants (Ribeiro *et al.*, 2019). Their results show that the valence of emotions reported by participants was in line with the valence of the music they listened to. While emotions returned to a neutral state within 2 minutes in self-reports, the analysis of skin conductance levels revealed that arousal persisted beyond subjective emotional experiences, indicating a prolonged effect of induced emotions and detachment between perceived emotions and physiological arousal.

(4) Categorisation

The theory of constructed emotion gives the central position to conceptual knowledge that is learnt from the past in society, underlining the social nature of emotions embedded in the theory. This is similar to the Two-Factor Theory (Schachter and Singer, 1962), where cognitive appraisal also plays a key role in the emotional experience. What differs is that the theory of constructed emotion highlights the importance of emotional granularity, which describes the individual's ability to differentiate emotions (Barrett, 2004, 2014, 2017). This provides an explanation for individual differences in emotional experiences. The level of emotional granularity is determined by the complexity of a circumplex (as shown below), which is formed by the rating of similarity of each two different words from a "set of 16 emotion-related adjectives", which include *excited, lively, cheerful, pleased, calm, relaxed, idle, still, dulled, bored, unhappy, disappointed, nervous, fearful, alert, and aroused* (Barrett, 2004, p. 266).

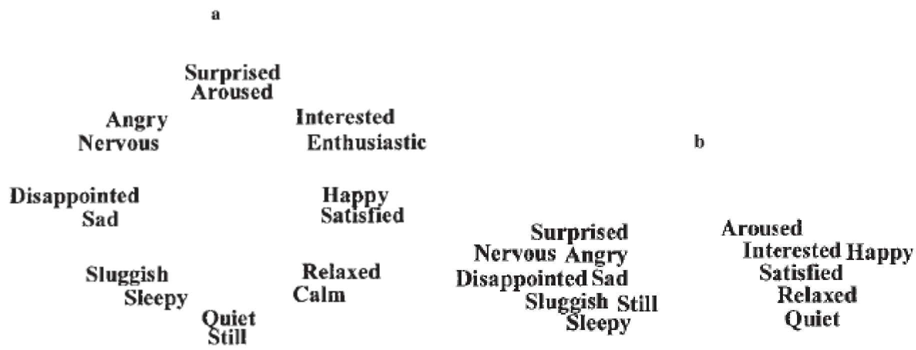

Figure 2. Circumplex of emotions

(Barrett, 2004, p. 267)

The circumplex presents emotion-related words in a circular order, and the complexity of the circumplex suggests the level of emotional granularity. As can be seen from the above, Figure 2 (a) is more complex than Figure 2 (b), so it suggests a higher level of emotional granularity of the subject. Emotional granularity has a positive correlation with the degree of description of emotional states (Suvak *et al.*, 2011). It is believed to be a key to the link between emotions and expressions (Gratz *et al.*, 2018).

The interplay between language, concepts, and prior experiences is a crucial component in the construction of our conscious emotional experiences. Past experience not only affects how we express our emotions but also plays a fundamental role in how we perceive and conceptualise them (Brooks *et al.*, 2017). Individuals draw upon their past experiences to forecast affective reactions, and their previous reliable associations inform these future predictions (Del Popolo Cristaldi, Gambarota and Oosterwijk, 2023). As a result, people with different past experiences may interpret the same emotional cues differently, leading to diverse emotional responses. Conceptual knowledge also is also part of the past experience that shapes our emotional perceptions and expressions. Research found that individuals who reported feeling unpleasant and highly activated when they had readily available knowledge about fear tended to exhibit fear-related behaviours, such as risk aversion (Lindquist and Barrett, 2008). This finding underscores the influential role of conceptual understanding of emotions in shaping one's subjective emotional experiences. Furthermore, it suggests that the embodied nature of emotional experience is influenced by cultural and linguistic factors, rather than being inherent or universal in nature.

2.1.2 The emotive function of language

Language facilitates communication and serves various functions in human interaction. The functions of language have been studied extensively in the field of linguistics, and various models and theories have been proposed to explain the role of language in communication from different perspectives, such as the instrumental view of language in the organon model (Bühler, 1934), the structuralist communicology model (Jakobson, 1960), and the sociolinguistic framework (Halliday, 1975). Despite the diversity, there is a consensus among linguists that the emotive or expressive function of language is a crucial element in effective communication.

According to the theory of communication (Jakobson, 1960), any act of verbal communication consists of six components or factors: addresser, message, addressee, context, code, and contact. The addresser refers to the sender or speaker who initiates the communication, while the addressee is the receiver or listener of the message. The message is the content or information being conveyed, and context refers to the situational or cultural background in which the communication takes place. The code represents the language and its rules used for communication, and contact refers to the physical or psychological connection between the addresser and the addressee during the communication process.

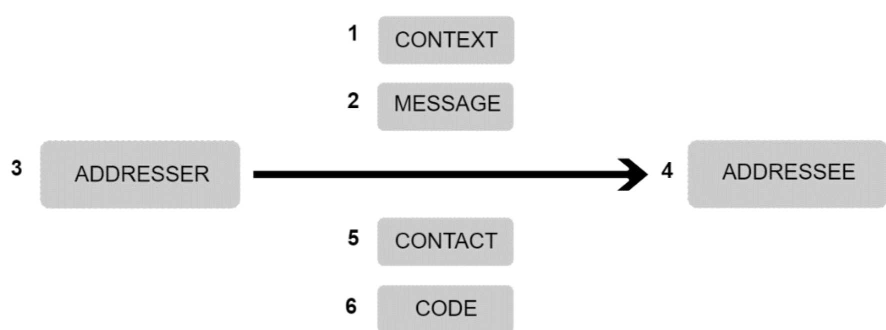

Figure 3. Jakobson's factors of communication
(Middleton, 1990, p. 241)

Each of these factors serves a specific function in the communication process. He identified six functions corresponding to the above six factors: referential, emotive, conative, phatic, metalinguistic, and poetic. The table below summarises the correspondence between factors and functions of language.

Table 1. Factors and functions in Jakobson's theory of communication

No.	Factor	Function	Example
1	Context	Referential	The sky is blue.
2	Message	Poetic	Stay pawsitive.
3	Addresser	Emotive	Wow!
4	Addressee	Conative	Come here.
5	Contact	Phatic	Hello.
6	Code	Metalingual	Do you understand?

The **referential** function corresponds to the context, which aims to provide information and describe the context. For example, deictic words (when/where/who) generally serve the referential function in communication. The **poetic** function draws attention to the aesthetic and creative aspects of language, capturing the artful use of linguistic elements to produce evocative and beautiful expressions. Rhetorical devices, such as parallelism and metaphors, fall into this category. The **conative** function, on the other hand, directs attention to the intention of the speaker to influence the behaviour of the listener, aligning with the appeal function outlined by Bühler. The vocative nouns (e.g., darling) and the imperative verbs (e.g., come over) are typical examples of conative expressions. The **emotive** or expressive function is oriented towards the first person and is concerned with the speaker's emotions, attitudes, and subjective experiences. The **phatic** function of language focuses on "establishing, prolonging, checking out, confirming, or discontinuing the communication" (Holenstein, 1976, p. 155). It is primarily used for maintaining social contact, such as "can you hear me". Lastly, the **metalingual** function is used to discuss language itself as a means of clarifying ambiguity in communication, such as explaining what a word means. These functions are not always distinct and can often intertwine and interact in various ways. The dominance of any one of these factors within an utterance reflects a different linguistic function, emphasising the dynamic nature of language and the diverse purposes it serves in human communication.

Amongst these functions, the emotive function holds great significance, as it aims at directly expressing the speaker's emotions, attitudes, and subjective experiences, highlighting the affective aspects of communication. It should be noted that emotive messages do not necessarily have to be positive or negative, but they could also be neutral. As Klinkenberg (1996, p. 53) suggested, this should include "any message, including the most neutral, reveals the condition of its sender." The emotive function of language is achieved through various linguistic means such as tone of voice, use of emotion-related words, and stylistic devices such as interjections (e.g., wow!). Language plays a vital role in expressing emotions of the self and evoking emotional responses from others (Schwarz-Friesel, 2015), which helps to establish connections between individuals.

The influence of language on the perception of other people's emotions is often investigated through semantic satiation, where a prime word temporarily loses its meaning after being repeated many times. For instance, a study found that after semantic satiation, participants in the experimental group were temporarily unable to make meaning of emotion words and showed slower and 'less accurate' responses in matching images of facial expressions than those in the control group (Lindquist *et al.*, 2006). The result of this study indicates that emotion perception may be related to the accessibility of emotion words. In an exploration of the connection between language and emotion perception, researchers found that participants with semantic dementia, who are unable to access semantic meanings, could only differentiate facial expressions in terms of valence (unpleasant, neutral, and pleasant), whereas participants without the disorder managed to make far more specific emotion categories (Lindquist *et al.*, 2014). The result of this study shows that language can contribute to the perceptual categorisation of facial expressions.

Furthermore, a growing number of studies in recent years have revealed that language not only contributes to the perception of others' emotions (i.e., emotion perception) but also the interpretation of an individual's sensations (i.e., emotion experience). From a constructionist point of view, "concept knowledge represented by language also influences how individuals experience sensations interocepted from their own bodies (…) as instances of specific emotions" (Lindquist, Satpute and Gendron, 2015, p. 103). This presumption has been further elaborated in the Theory of Constructed Emotion and is supported by recent empirical evidence. For example, researchers analysed the functional magnetic resonance imaging scans of 20 participants and their self-reports of affective experiences, and they found that verbal retrieval played a key role in participants' perception of their affective experiences (Satpute *et al.*, 2013).

Emotion perception can be promoted by acquiring more emotion concepts through natural accumulation during childhood (Widen, 2013) or intentional learning and training (Fugate, Gouzoules, and Barrett, 2010). In addition to promoting emotional perception, increasing individuals' accessibility to conceptual knowledge about emotion and affect can also influence their responses to emotional stimuli. For instance, Lindquist and Barrett (2008) analysed the stories written by 108 participants under two different conditions: priming of knowledge about anger and fear. It has been found that in an unpleasant state (induced by music), participants primed with fear-related knowledge were likely to behave in a fearful manner, suggesting that the presence of emotion-related language has an influence on individuals' behaviour in an emotional state.

2.1.3 Cultural differences in emotion perception, experience, and expression

Culture plays a significant role in shaping how individuals perceive, experience, and express emotions. The norms, values, and beliefs within a cultural context shape the ways in which people interpret, respond to, and display their emotional states. Understanding these cultural differences is crucial when studying and interpreting emotional processes. This section presents an overview of differences in the perception, experience and expression of emotions between the East and the West.

(1) Cultural differences in emotional perception

In addition, cultural differences can also influence how emotions are interpreted and understood. Research on bi-/multi-lingualism and emotion suggests that emotion perception and experiences differ across languages. What is considered a negative emotion in one culture might be perceived as positive in another. For example, individualistic cultures often view pride positively. In contrast, collectivistic cultures may see guilt as desirable, associated with the need for self-improvement (An *et al.*, 2017). A study found that two groups of people from different cultures (American English and African Himba tribe) categorised facial expressions differently, while similar categorisation behaviour was observed within the same group (Lindquist and Barrett, 2012). In another study of the differences in emotion perception across cultures, Chinese and European participants were found to have different mental representations of six basic emotions (i.e., happy, surprise, fear, disgust, anger, and sad) in terms of facial expressions and eye activities (Jack *et al.*, 2012).

(2) Cultural differences in emotional experience

People's emotional experiences also differ across cultures. In one study, researchers investigated differences in emotional experience between Dutch and Chinese participants when viewing affective stimuli, using neurophysiological measurement (late positive potential, LPP) and self-reported arousal questionnaire; they found that the Chinese participants showed smaller differences in LPP amplitude between negative and positive stimuli, indicating less emotional differentiation in their neural responses, which is influenced by the cultural emphasis on maintaining harmony and emotional control in China (Vu *et al.*, 2020). For example, An *et al.* (2017) found that there are cultural differences in the perception and interpretation of emotional expressions between Americans and Japanese. Americans tend to value high-arousal positive states like excitement, whereas Japanese prefer low-arousal positive states such as calmness.

(3) Cultural differences in emotional expression

The cultural dimension of individualism-collectivism can also shed light on cross-cultural differences in emotional expression, which is defined as "how one conveys emotional experience through both verbal and nonverbal behavior" (Skinner, 2013, p. 673). Culture profoundly influences how individuals experience and express their emotions (Liddell and Williams, 2019). Existing cultural studies found that people from individualistic cultures, such as Western Europe, tend to be more comfortable expressing emotions, whereas people from collectivistic cultures, such as East Asia, are more inclined to suppress emotions (Murata, Moser and Kitayama, 2013; Hirano and Ishii, 2024). The tendency of suppression was found to be higher in people from cultures that valued social order (Matsumoto, Yoo, Nakagawa, *et al.*, 2008).

Chinese culture emphasises the importance of maintaining harmonious relationships in society and emotional control, so emotional suppression or forbearance is commonly adopted as a regulation strategy to maintain social harmony (Chiang, 2012; Su *et al.*, 2015). For example, cultural differences exist between the West and the East regarding how emotions are expressed and displayed in film. An actress said: "In American films, we say, 'We don't cry as actors—we want to make our audiences cry', whereas in China, we want to cry with our audience. It's a very big difference in terms of creative direction" (Further, 2018, p. 2). Previous researchers mapped the relationship between emotional expressivity and individualism for happiness and surprise across different countries (Matsumoto, Yoo, Fontaine, *et al.*, 2008), as shown below.

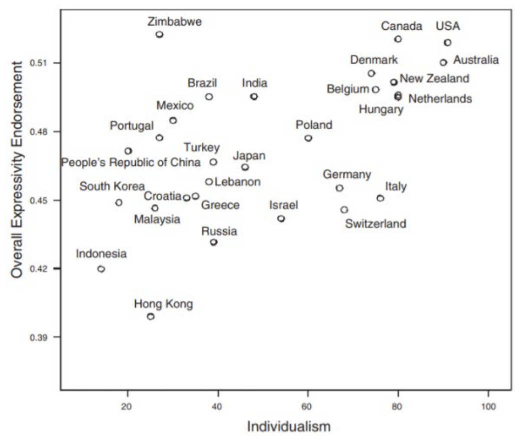

Figure 4. Relationship between overall expressivity and individualism
(Matsumoto, Yoo, Fontaine, *et al.*, 2008, p. 66)

As seen from the above figure, there are great differences in expressivity and individualism across countries. Expression norms in China and America are almost at opposite ends. These cultural differences in emotion perception, experience, and expression highlight the importance of considering cultural contexts when studying and interpreting emotions.

2.2 Emotion and Interpreting

2.2.1 Interpreters as communication facilitators

There exists an agreement that interpreters are facilitators of communication (Ingram, 1974;

Marszalenko, 2016). For effective communication, a crucial element is the emotive or expressive function of language (Jakobson, 1960; Halliday, 1975). It helps to establish connections between individuals by expressing emotions of the self and evoking emotional responses from others (Schwarz-Friesel, 2015). However, interpreters often weaken or omit emotive expressions in real-life settings (Farini, 2013; Hadziabdic *et al.*, 2014; Krystallidou *et al.*, 2018; Roter *et al.*, 2020). This missing layer of emotive communication may be related to three issues that are rooted in the profession of interpreting: the misconception of no interaction in interpreting, interpreters' lack of power in communication, and the invisible role of interpreters.

Interpreters, particularly conference interpreters, are often considered outside the communication in real life due to limited interaction with attendees. For example, when asked about interaction in conference interpreting, an interpreter affirmed: "From the questions you ask I suppose your study does not apply to conference interpreters who are in a booth and almost never interact with their clients" (Angelelli, 2004, p. 80). However, the interpreter is not isolated from the interaction between speakers but a co-participant, being called a facilitator, a mediator, or a language expert. Interaction can be verbal and non-verbal, taking place face-to-face or just voice-to-voice. As a socially situated practice, interpreting can be seen as a type of social interaction between participants in a verbal exchange, which is part of the cultural turn in interpreting (Rudvin, 2006). The interaction between the interpreter and the audience is in the form of exchange. Information is conveyed from the interpreter to the audience, and the response of the audience, whether it is a nod, a confused look, a question, or even no question, sends information back to the interpreter. Social interaction involves continuous emotional exchanges between people in the social environment (Marinetti *et al.*, 2011). In this sense, emotional interactions between the speaker, the interpreter, and the audience are crucial to the interpreting process and cannot be overlooked.

Interpreters are not outsiders and certainly not just machines that repeat others' words. As communication facilitators, interpreters have the power in communication. An experienced conference interpreter explained: "…in every aspect of interpreting, the interpreter is in charge, even in very formal meetings. He decides what word to choose, what is culturally appropriate, what needs to be explained" (Angelelli, 2004, p. 107). Indeed, the interpreter has some level of control over the degree of involvement in the communication between the speakers and the audience. Such autonomy can be reflected in the "speaker-positions" that interpreters could take in interpreting:

> 1. The interpreter could place the speaker in the speaker-position in the delivery and assume his/her first-person singular ("I") (which is the only speaker-position that the interpreter could adopt according to the "norms" in SI). 2. The interpreter could assume the speaker-position in the delivery indirectly and interpret the speaker by reporting, paraphrasing and/or inserting brief explanatory remarks about the speech on the floor.
> 3. The interpreter could assume the speaker-position implicitly and blend his/her remarks into what looked like the speaker's first-person singular ("I") in the delivery.
> 4. The interpreter could take over the speaker-position explicitly and insert his/her personal remarks or comments in the delivery.
>
> (Diriker, 2004, p. 84)

It is up to the interpreter to decide which position to take, when to make comments, and in what manner. The salience of the interpreter's autonomy can be shown especially in interpreting materials related to real-world situations: When telling jokes, interpreters frequently refer to instances where they have acted as key decision-makers and become involved in shaping the message they delivered. When recounting real-life experiences, interpreters can even go further and emphasise that interpreting entails an interpretation, a commentary, and a subjective assessment of what is said (Diriker, 2011). The significant role of interpreters means that their choices matter, and how they perceive and deliver emotions can make a difference in shaping the relationship between the speaker and the audience.

Another key issue underlying interpreters' lack of emotional involvement is related to their invisible role in communication. *Invisible* may be a word commonly heard when describing interpreters, especially in conference interpreting. Most often, interpreters are seen as "a completely neutral and transparent intermediary" and should not have any subjectivity or affective involvement (Diriker, 2011, p. 33). For a very long time, the focus of service users has been on how interpreters verbally translate the speakers' words, while it seems to have been neglected that the meaning of a word is subject to the individual's subjective interpretation. This is particularly the case in simultaneous interpreting despite the high complexity of the task itself. An experienced interpreter once described: "Some conference organizers would like to be able to hide the interpreting booths behind the scene or in a corner of the room because 'they don't look nice'" (Angelelli, 2004, p. 109). It seems that doing simultaneous interpreting in a booth for a formal conference means that the interpreter is shielded from what is going on outside the booth and is immune to emotional factors. However, even just sitting in a booth at the corner of a conference hall, the speaker's confused look or an audience's curious visit may gently raise the waves in the interpreter's wind.

Despite such a misconception of invisibility, interpreters themselves perceive the opposite in practice. They were aware of their visibility in conference, court and medical settings in varying degrees depending on the setting (Angelelli, 2004). Though conference interpreters perceived their roles as less visible compared to medical or court interpreters, the difference between conference and court interpreting was not statistically significant regarding "affect, alignment and trust" (Angelelli, 2004, p. 73). This finding implies that affect in conference interpreting is not less important in comparison to its significance in court interpreting.

In an autoethnographic study, the researcher explored the feelings of the SI interpreter in two different religious settings: In the first setting, the researcher interpreted in a booth for a church that he was familiar with and was not given many materials in advance, while the second setting, the interpreted was arranged to sit among other conference participants but was given speech materials prior to the session (Hokkanen, 2017). In both settings, the researcher interpreted alone for a long time. It has been found that the interpreter's feelings during interpreting differed greatly in the two settings, varying from being deeply emotionally involved in the first setting to feeling 'external' and detached in the second (Hokkanen, 2017, p. 16). What interests me is the difference between the two settings, which is attributed to the difference in the interpreter's emotional experience. The interpreting booth, which would normally be thought to isolate interpreters from participation, has provided some degree of security for interpreters to act 'without feeling observed' (Hokkanen, 2017, p. 14), allowing the space for emotional experience to occur.

Like interpreters in other settings, SI interpreters may also be exposed to situations where their emotional endurance is challenged. For instance, simultaneous interpreting was used at Sun Yang's hearing at the Court of Arbitration for Sport in Montreux on 15th November 2019. The quality of interpretation was publicly questioned by Mr Sun and later criticised by his lawyer, saying that the translation was "so bad" (BBC Sport, 2019). Following the criticism, more fatal errors and omissions occurred. Eventually, the SI interpreter was replaced by a consecutive interpreter. Dramatically, twenty minutes before the closure of the hearing, a person without a prior interpreter was called upon to replace the consecutive interpreter while she was still interpreting the speech. The interpreter was forced to stop. The Guardian described the judge's reaction as 'incredulous' (Associated Press, 2019). The request to replace the interpreter was rejected, and the consecutive interpreter continued to serve the hearing till the end. Regardless of the interpreting quality, both the SI and CI interpreters managed to continue interpreting, but it was hard to imagine how they managed their feelings when confronted by face-to-face negative criticism, which usually triggers negative emotions, such as anger, sense of inadequacy and "hurt feelings" (Leary, 2015, p. 473).

In another real-life example, the interpreter facilitated communication and built connections between listeners by expressing strong emotions (choking up) in his simultaneous interpretation of Ukrainian President Zelensky's speech to the European Parliament, and one listener said: "This translator was amazing (…) I was getting emotional listening to him" (Cavanagh, 2022). These examples show that interpreters' participation in simultaneous interpreting can be impactful. While the long-existing issues in interpreters' roles could pose challenges, the emotive power of language cannot be neglected.

2.2.2 The norm of neutrality in interpreting

In early times, interpreting studies largely focused on the process of information processing and paid less attention to the social factors that affect the behaviour of interpreters, such as their age, power, and status. However, it is important to study the social aspects of interpreting, given the social function of emotion. For example, Parsons' modernisation theory used emotion-related variables, i.e. neutrality and affectivity, to describe the features of society (Parsons, 1971). As actors in society, interpreters are constrained by norms and conventions in the industry. Individuals are not the only part that constitutes our society, but also "the beliefs, tendencies, and practices of the group taken collectively" (Durkheim, 1982, p. 54). These constituting parts are facts outside individuals and exert a constraint on individual behaviour. In echoing Durkheim's theory, there is a consensus among sociologists that the behaviour of individuals in society is believed to be "shaped and constrained by social structures and by how particular norms and ideas get structured into everyday ways of thinking about and doing things" (Dillon, 2020, p. 13).

Like people in other professions, interpreters are also influenced by the social context in which they work and are constrained by the norms and conventions established in the interpreting community. In interpreting training programmes, students are often taught to render the source speech faithfully, so it is no wonder that they often pay the most attention to the faithfulness of their interpretation in self-evaluating their performance (Bartłomiejczyk, 2007). As interpreting gets professionalised, interpreters are obliged to follow norms if they become members of a professional association, such as the one below

> Adherence to the standards of conduct, competence and practice set out in this Code of Professional Conduct ("the Code") are fundamental requirements of membership of the Institute. The Code sets high standards for the Institute's members.
>
> (ITI, 2016, p. 3)

The norms and conventions that may seem natural to us still carry the constraining power of society. Given the social nature of interpreting, the social attributes of a person cannot be overlooked, which includes the interpreter's emotions. Interpreters, regardless of the setting in which they work, tend to work under predetermined rules to meet the expectations of the industry, the clients, or the agencies. In the interpreting industry, institutions and associations "prescribe" the role of interpreter as "invisible" (Angelelli, 2004, p. 24), which seems to diverge from reality.

The notion of neutrality also seems to have been rooted in professional standards and the minds of interpreters who abide by those standards. In a survey about the role of interpreters with members of the International Association of Conference Interpreters (French: Association Internationale des Interprètes de Conférence, AIIC), a respondent expressed: "A conference interpreter has the duty to be completely neutral" (Angelelli, 2004, p. 78). The norm of being neutral may be influenced by Talcott Parsons' profound modernisation theory (1971), in which emotional neutrality has been regarded as a pattern variable that depicts society. According to this theory, emotional expression is subject to social situations, i.e., work and home (Parsons, 1971). Individuals at the workplace should not bring personal emotions to work, as affectivity may become a catalyst for making wrong decisions. However, is it even possible to be 'completely neutral' as the respondent said? Is language even neutral? And to say the least, being neutral does not necessarily mean interpreters cannot have feelings.

In public service interpreting, especially medical interpreting, the emotional experience of interpreters has been highlighted in many studies. Interestingly, medical practitioners expected interpreters to facilitate communication not just linguistically but also emotionally, though interpreters are still required to be neutral during interpreting. In a study, medical professionals were found to expect emotional support from interpreters to build an emotional connection with the patient in order to achieve better treatment results (Farini, 2013). The discrepancy between medical practitioners' expectations and interpreters' self-perception of the role is attributed to the dilemma interpreters encounter in practice.

Different clients and agencies have different standards and expectations. Even if a doctor may expect an interpreter to be more like a facilitator rather than purely translating the conversation to help with the procedure, this kind of involvement may not be considered appropriate for an international session at the European Commission. While interpreters themselves continue to be bound by the prescribed roles and rules, they have been found to perceive their roles differently. In contrast to the requirement of invisibility, interpreters found themselves visible in interpreting (Angelelli, 2004). Interpreters, bound by those standards, adjust how they perform to meet the ever-changing requirements. However, there are lots of uncertainties regarding how to adjust and which standard to follow.

What is promising is that recent years have seen efforts to redefine the notion of neutrality. As Ayan (2021) advocates, neutrality should be considered a form of emotional labour, as interpreters are implicitly, and sometimes explicitly, expected to manage their emotions to be neutral, even when dealing with emotionally challenging content. Such advocacy aligns with the definition of emotional labour, where the interpreters manage their emotions at work, irrespective of their true feelings (Hochschild, 1983). This is an intrinsic part of the interpreter's work and should be acknowledged as such, as many other researchers have observed in real-life interpreting situations (Lee, 2013; Hokkanen, 2017; Tekgül, 2020).

2.2.3 Emotional involvement of interpreters

Interpreters have been guided by the norm of neutrality for a long time. However, more and more evidence shows that interpreters were found to hide their emotions in various settings to maintain professional distance as per the expectations of institutions (Carstensen and Dahlberg, 2017; Tekgül, 2020). This is in line with the notion of emotional labour, which highlights the prominent social functions of emotion. This concept was coined by Arlie Hochschild in 1983, and it addresses the commercial value of emotion. According to Hochschild (1983), emotional labour is the process of managing a worker's feelings to produce an emotional state in another person in public social interaction (either face-to-face or voice-to-voice), irrespective of the true feelings of the worker. For example, a shopping assistant may be annoyed and tired, but she still appears to be very welcoming to you. You can even hear a smile in her voice, though she may not be actually happy at this point.

Similarly, interpreting also involves the emotional labour process, where an interpreter manages his or her feelings to convey the information and emotion expressed by the speaker to the audience. In a recent study, researchers found that professional SI interpreters appeared to mimic and experience emotions that were similar to those expressed in an emotional (*sad*) source speech, with statistically significant results from galvanic skin response (GSR) readings and self-reports (Korpal and Jasielska, 2019). Statistical significance was only reported for negative emotions in response to the sad speech, but no significant impact of positive emotions was observed in their experiments. Another example comes from the real-life experience of an interpreter for a plenary session of the European Parliament. She recalled her feeling in dealing with funny, rude and aggressive expressions as: "interpreters mentally install an 'anti-joke filter'" to resist 'the flood of humor'" and "the interpreter must install a kind of personal filter to keep the emotion she must reflect from actually affecting her" (Michael, 2015, p. 3). She also acknowledged the necessity of expressing the emotion expressed by the speaker to the audience, considering that some audiences do not have access to the speech otherwise. This interpreter's experience shows what was referred to as deep acting (Hochschild, 1983), during which the interpreter manages her true emotional states for the purpose of expressing another emotional state in listeners.

Regardless of the setting or mode of interpreting, interpreters are not machines that only decode and encode words. They are social human beings that have emotions, expressed or not. Should an interpreter show emotion, and to what extent? A conference interpreter once commented:

> Our work is serious, and we must be respectful no matter what. Of course, we can have feelings — we are human — but we keep them to ourselves. We are not participants; we are channeling other people's words and feelings and give our all to do so.
>
> (Angelelli, 2004, p. 78)

Interestingly, the requirement about 'feelings' has been hardly mentioned in the code of practice or practice guidelines by large associations of interpreters, such as AIIC and ITI. Then why would the respondent believe that interpreters must withhold their feelings if they were not even told to? One explanation would be that showing feelings has been perceived by the respondent as a behaviour that is against impartiality or other principles that have been stated in practical guidelines. Another possible explanation is that an impression has been constructed in the interpreting community that interpreters should not show their true feelings. Interpreters are bound by the society in which they work. The long-established view of invisibility and neutrality has shaped a common practice for interpreters not to show or even have emotions during interpreting.

It seems that the management of the interpreter's own feelings is thought to be completely separate from understanding and expressing others' feelings. But is it even possible to simply switch off the interpreter's own feelings? Even if one chooses to resist the expression of true feelings, the influence of emotional experience cannot be eliminated. Some emotions (e.g. sadness) can have hours or even days of effects on a person (Verduyn and Lavrijsen, 2014). The effects of emotions can further influence decision-making, as well as the perception, regulation, and expression of emotions (one's own or others' emotions). How to channel words and feelings without even participating in the interaction? In cross-cultural communication, the participant's ability to understand and react to others' emotions is essential. And for interpreters, it demands the ability to express the emotions, or to say the least, the information provided from the speakers' emotions. It may not even come to their attention that their emotions and the act of processing others' emotions can affect themselves.

In sum, interpreting studies have seen more studies about the emotive or affective aspects of interpreting. While many emotional encounters were observed in the profession, little evidence was found to provide an understanding of the impact of emotions on interpreters' performance, not to mention the underlying mechanism. Having said that, it is promising that the need for emotional expression in real-life interpreting settings highlights the vital role of interpreters as communication facilitators and advocates a new emotional approach to simultaneous interpreting.

2.3 Cognitive Processes in Simultaneous Interpreting

This section highlights the importance of stimuli, attention and memory in information processing and introduces key cognitive processes involved in SI, including the perceptual processing of multi-modal inputs (Subsection 2.3.1), the construction of meaning and comprehension (Subsection 2.3.1), and the roles of long-term and short-term memory (Subsection 2.3.3). The last subsection (Subsection 2.3.4) introduces Setton's model of processing for SI (Setton, 1999).

2.3.1 Multi-modal information-processing

Before jumping into the mechanism of processing of multi-modal inputs in simultaneous interpreting, it is first essential to understand the types of inputs and how they are processed in monolingual situations. In real life, information is often communicated in multiple modes, such as visual (e.g., images), aural (e.g., music), linguistic (e.g., text), gestural (e.g., body movements), and spatial (e.g., the position of an object). These modes together contribute to meaning, and the sense of these inputs is made through two key processes: bottom-up and top-down processing (Goldstein, 2019). In bottom-up processing, the brain extracts and analyses basic features of the sensory inputs, such as colour, shape, and motion (Boyce *et al.*, 2020). The interpretation of these sensory inputs is guided and shaped through top-down processing, where meaning is inferred based on one's prior knowledge, expectations, and attentional focus (Panichello, Cheung and Bar, 2012). For example, a visitor saw a tree in a park. By looking at the exterior of the tree, the visitor thinks that this tree has a white, thick trunk; it also has a red label on it (bottom-up processing). The visitor previously knew that Class I trees would have a red label, so he believes that this tree is very rare and has hundreds of years of age (top-down processing). The figure below illustrates perceptual processing, i.e., how perception is made from sensory inputs.

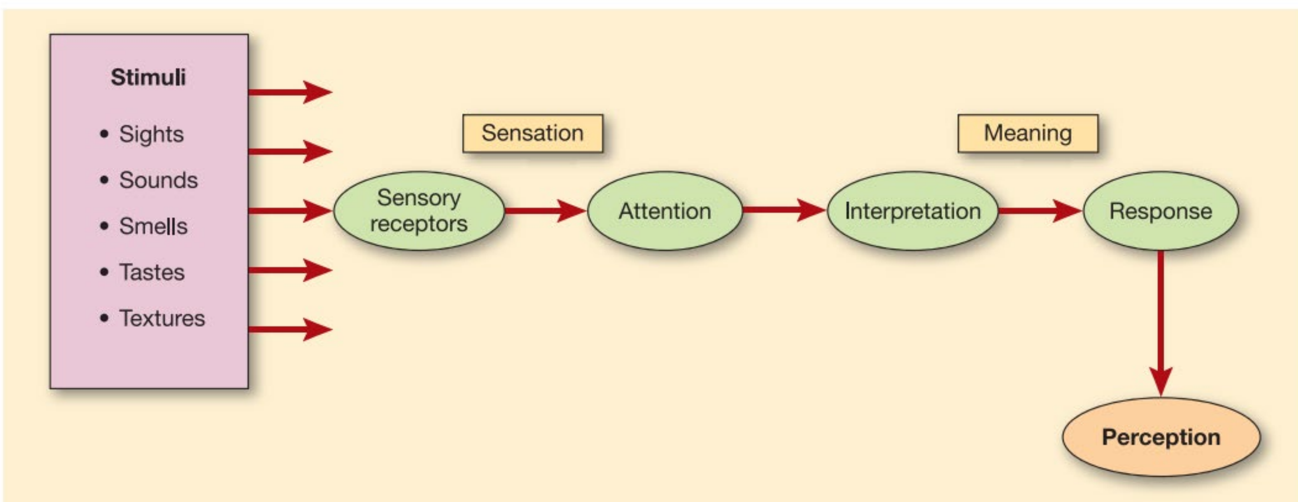

Figure 5. The perceptual process
(Solomon, 2010, p. 126)

In the figure above, five types of stimuli (including sight, sound, smell, taste and texture) are received by sensory receptors (e.g., nose and mouse) and undergo initial bottom-up processing, forming sensations. The information from sensations is selected and organised through attention, and then interpreted based on context to give meaning, forming the perception of the stimuli.

According to Solomon (2010), this process involves the continuous interplay between sensory inputs and higher-level cognitive processes, and meaning is constructed through the dynamic integration of bottom-up and top-down processes. This differs from previous theories, which argue that perception is a unidirectional process and only involves bottom-up processing (Gibson, 1966) or top-down processing (Gregory, 1974). An increasing number of evidence, however, supports the importance of both bottom-up and top-down processing in perceptual processing (Kornmeier and Bach, 2012; Intaitė *et al.*, 2013; Dobrushina *et al.*, 2021). In this dynamic process, various stimuli are analysed concurrently rather than sequentially, and selective attention can enhance or inhibit certain perceptual experiences (Solomon, 2010). In other words, multiple incoming sensory inputs would not receive equal attention, and the brain would prioritise relevant information. Sensory inputs that are attended to are more thoroughly processed, leading to heightened perceptual awareness, while unattended stimuli may be filtered out or processed more superficially (Solomon, 2010; Tallon-Baudry, 2011; Gomez-Ramirez, Hysaj and Niebur, 2016). This process is also facilitated by predictions about the environment (Panichello, Cheung and Bar, 2012).

In the context of conference interpreting, it is very common that a speaker talks while s/he points to the PowerPoint slide behind him/her, and there are often images and text on the slides. There may also be the scratching sound of pen on paper, whispering, and walking in the conference venue. In addition to the inputs from the speaker (e.g., speech and body movements) and audiovisual inputs (e.g., PowerPoint slides and sound), the target speech produced by the interpreter is an additional input (Setton, 1999). Interpreters must be able to rapidly process and integrate inputs from all these sources to accurately understand and then convey the intended message. This is even more challenging for SI as the process needs to be executed in a very short time. When multi-modal inputs are all present to the interpreter, how to allocate attention to relevant information would make a great difference in efficient understanding of the key message conveyed by the speaker.

Scholars in interpreting studies have explored interpreters' attention to visual and auditory stimuli when they were both presented to interpreters at the same time in simultaneous interpreting. In an eye-tracking study, the researchers found that freelance conference interpreters tended to prioritise visual input over auditory input when both were provided in English-to-Polish simultaneous interpreting (Chmiel, Janikowski and Lijewska, 2020). Their finding aligns with Colavita's visual dominance effect, which describes the tendency to respond more often or strongly to a visual stimulus than to an auditory stimulus presented at the same time (Colavita, 1974).

Having said that, the presence of visual stimuli does not necessarily mean that they would facilitate the interpreting process. When visual stimuli (e.g., PowerPoint slides) are presented in interpreting, this process is sometimes referred to as simultaneous interpreting with text (Seeber, 2017; Chmiel, Janikowski and Lijewska, 2020). It differs from simultaneous interpreting with only auditory inputs and involves dual processing of visual-spatial and visual-verbal information, and according to the cognitive resource footprint, this dual processing may lead to a higher cognitive demand compared to that required in situations without visual inputs (Seeber, 2017).

Not many studies investigated the effect of visual inputs on the quality of simultaneous interpreting, and mixing results were reported from those that did. In a corpus study, the authors analysed 36 speeches produced by 12 professional interpreters and measured whether the availability of the source speech manuscript would negatively impact their performance in simultaneous interpreting by leading to more interference in target speeches. Contrary to their hypothesis, there was no significant difference in their performance when comparing their target speeches with and without the manuscript (Lamberger-Felber and Schneider, 2009). Their result suggests that the presence or absence of text may not particularly attract professional interpreters' attention during simultaneous interpreting. Similarly, in a study about the impact of visual cues on simultaneous interpreting, five student interpreters completed an English-to-German interpreting task with or without visual access to inputs outside the interpreting booth (Rennert, 2008). While no significant influence (either positive or negative) was found on target speeches, they reported that interpreters were "afraid of missing something" when visual inputs (e.g., the speakers' gestures and facial expressions) were not available, and even redundant visual inputs that repeat the auditory input may still facilitate interpreters' understanding during interpreting (Rennert, 2008, p. 215).

More and more studies show that the effect of inputs on the interpreting output may be related to the congruency between the visual and auditory inputs. For example, an eye-tracking-based study investigated the impact of slides on the accuracy of numbers interpreted by student and professional interpreters in an English-to-Polish simultaneous interpreting task and found that both groups' accuracy rates were higher when the slides were presented (Stachowiak-Szymczak and Korpal, 2019). Their finding suggests that the visual input may help both student and professional interpreters, particularly for interpreting numbers. A later study demonstrated that when the written text visually presented did not match the spoken speech (e.g., inconsistent names and numbers), professional interpreters tended to have lower accuracy in simultaneous interpreting.

In addition to the potential influence of visual inputs on the interpreting output, the presence of visual inputs may impact the cognitive processing of other modalities in simultaneous interpreting. A recent study found that when many numbers and names were present in the live captioning area, student interpreters tended to constantly look at live captions, and the attention shifts between live and non-live captioning areas may increase their cognitive effort in simultaneous interpreting (Yuan and Wang, 2023). This adds support to the cognitive resource footprint for the dual processing of visual-spatial and visual-verbal information in simultaneous interpreting (Seeber, 2017). Such attention shifts mean that the interpreter needs to constantly process information from different modalities (visual, aural and linguistic), which may result in cognitive overload and then affect their interpretation. According to multiple resource theory, individuals have the ability to shift their attention across different modalities by allocating varying cognitive resources to them, but if inputs from various modalities are processed at the same time, mental overload may occur (Wickens, 2002, 2008). For simultaneous interpreting, cognitive overload can result in the occurrence of errors and omissions, hindering the overall quality of the interpretation (Gile, 1999; Gile *et al.*, 2015).

Perception is not simply a unidirectional mapping of sensory inputs to representations but rather a complex, adaptive system where different components mutually influence each other

(Panichello, Cheung and Bar, 2012). Apart from multiple sensory modalities, the processing of multi-modal inputs is a dynamic process in which the individual's goal, attention, and knowledge are all crucial to the formation of a coherent perceptual experience (Freeman *et al.*, 2012; Coté, 2015). Solomon's processing model highlights the key role of the goal or intended action of the perceiver as a key driver of processing information (Solomon, 2010). This suggests the proactive nature of perception, where the brain actively generates predictive representations to efficiently make sense of the environment (Panichello, Cheung and Bar, 2012). This means that the same sensory input could be perceived differently depending on the individual's goals, context, and prior experiences. The brain processes sensory information in parallel, with high-level cognitive processes like attention, memory, and emotion shaping the way the information is perceived (Boyce *et al.*, 2020; Wang, Hahm and Hammer, 2022). But which type of input would interpreters attend more to when they are emotional? How would that kind of attention shift affect their subsequent performance in simultaneous interpreting? To this point, little evidence has been found to answer these questions. These questions require researchers' attention because these cognitive processes are closely related and cannot be overlooked.

2.3.2 Semantic processing

The previous section has introduced the perceptual process in simultaneous interpreting, in which inputs from different modalities are received, attended to and interpreted to shape perception. But how does perception transform into a meaningful output as part of the target speech? This transformation relies on a coordinated effort involving semantic memory and the mental model.

An incoming utterance is first segmented into linguistic units (e.g., words and phrases) based on their morphological features. The brain does not process language word by word but in chunks, and the limit of processing information is usually four chunks (Cowan, 2001). The interpreter listens to the speech and processes the information by units (of meaning or sense) instead of a single word (Lederer, 1978). These units are mapped onto entries in the interpreter's mental lexicon (Forseth *et al.*, 2018; Murphy *et al.*, 2023). A lexicon is part of the semantic memory and is like a mental dictionary which contains words and their associated semantic, syntactic, and morphological properties (Boldyrev Boldyrev and Dubrovskaya, 2016). When individuals hear or see utterances, they activate this lexical knowledge to extract the meanings of the words and construct a mental representation of the message (Wang *et al.*, 2023). Bilinguals, like interpreters, have the command of both the source and target languages. Research found that bilinguals possess at least one bilingual lexicon, allowing them to rapidly access the appropriate target language equivalents (Gosselin, 2022). The lexica for the two languages are not isolated but interconnected (Setton, 1999), enabling interpreters to draw parallels between similar lexical items and facilitate the efficient transfer of meaning, ultimately enhancing language comprehension in multilingual contexts. The brain engages various regions that map word forms to their meanings while also assembling these meanings into coherent phrases and sentences (Wang *et al.*, 2023). This mapping is not simply an extraction of the literal meaning of individual words from the mental lexicon; it also involves the activation of associated concepts and relationships stored in semantic memory for a deeper understanding of the context and implications of the utterance (Jamali *et al.*, 2024).

Semantic memory is a type of long-term memory that stores general knowledge about the world, including concepts, facts, and relationships between them (Grossman, 2008). It is not tied to specific experiences but rather consists of factual knowledge (Lucas, 2002). According to frame semantics, knowledge is organised in particular ways or conceptual structures, called frames, which are mental structures or schemas stored in semantic memory that represent a particular type of situation or context (Fillmore, 1982). In other words, these frames organise knowledge in a way that reflects how we understand experiences and concepts. Words or phrases evoke these frames in the mind of the speaker or listener (ibid.). For instance, when you hear the word “shop”, your brain accesses the relevant frame about “shop” in your semantic memory to interpret its meaning, which includes knowledge about products, paying, and interacting with shop assistants. Semantic memory activation is vital for understanding and conveying the intended meaning of the source text (Langacker, 1993). It is particularly important when interpreters encounter non-literal expressions that cannot be rendered word-for-word, such as cultural idioms (Al-Aadili, 2023). However, the activation of semantic memory can be influenced by factors like emotion, cultural background, and individual differences (Sedoc *et al.*, 2019). For instance, Nguyen (2020) found that some interpreters may have stronger semantic associations with certain concepts due to personal experiences or cultural contexts, leading to variations in how information is processed and interpreted, ultimately affecting the fidelity and communicative effectiveness of the interpretation.

Interpreting is far more than literal translation of words from one language to another. It requires the interpreter to quickly grasp the sense of the source speech and produce the source speech that is contextually appropriate. The delivery of sense or semantic intent is supported by the interpreter's linguistic and extra-linguistic knowledge (Cokely, 2001). This process is guided by a higher level of framework: the mental model. It was originally proposed by Craik (1967) and then further extended by Johnson-Laird (1983) in the field of cognitive psychology. In the field of interpreting studies, several models have incorporated the concept of mental models to explain the cognitive processes involved in interpreting. For example, the processing model of simultaneous interpreting incorporated the mental model for discourse comprehension and defined it as "a structural analogue of a real or imaginary state of affairs which is constructed in working memory from propositional representations of discourse and other tokens and concepts" (Setton, 1999, p. 15). It is an internal representation constructed by the interpreter based on their interpretation of the linguistic input. This process is similar to the deverbalisation process in the Paris School's interpretive theory (Lederer, 1978; Seleskovitch, 1998), in which the sense of the discourse is extracted from its linguistic form. The mental model serves as a dynamic cognitive framework that guides interpreters to construct target speeches that are contextually appropriate, with inferences from their pre-existing knowledge and an adaptive approach to interpretation (Binder and Desai, 2011; Forseth *et al.*, 2018). Crucially, this mental model is subjective, abstract, and dynamic (Greca and Moreira, 2000; Rapp, 2005). It is constantly updated as new information is processed. In simultaneous interpreting, the new information may include the next incoming utterance (which may confirm or contradict the interpreter's understanding about the previous utterance), and the own speech output just produced by the interpreter. The mental model serves a key role in central representation and discourse comprehension, facilitating the comprehension and production of speeches. It remains unclear the number of mental models available or involved in this process. Gile suggests that rather than a mental model that plays a key role in handling the source speech, as suggested in the processing model of simultaneous interpreting (Setton, 1999), there might be multiple mental models for processing speech segments in different length and complexity (Gile *et al.*, 2001). In a recent study of lag time in SI, the idea of multiple mental models seems to be accepted as the author quotes "When we engage in any language activity, it is an artistically creative act of community and we draw unconsciously on vast cognitive resources and mappings (mental models) call up innumerable models and frames, set up multiple connections, coordinate large arrays of information, and engage in creative mappings, transfers and elaborations" (Eftekhari, 2019, p. 146). While there is little empirical evidence in literature to suggest whether multiple mental models are actually involved in information processing in interpreting, the importance of the mental model in speech comprehension and production has been widely acknowledged.

In sum, semantic processing is a complex process that involves the retrieval of mental lexicon and frames in semantic memory and dynamic facilitation of the mental model.

2.3.3 Executive function and working memory

Simultaneous interpreting is a cognitively demanding task that requires the interpreter to listen to the source language, comprehend the meaning, and then rapidly produce a translation in the target language, all while continuously monitoring their output. This complex process relies heavily on executive function, which enable the interpreter to manage the competing cognitive demands of speech comprehension and production.

Executive function plays a crucial role in cognitive and affective functioning (Ganesan and Steinbeis, 2022). It refers to the set of higher-level cognitive processes involved in the planning, monitoring, and execution of behaviours for goals (Diamond, 2013; Berryman *et al.*, 2014). Core processes include inhibition, updating, and shifting (Karbach and Kray, 2016; Rodríguez-Nieto *et al.*, 2022). Inhibition refers to the suppression of irrelevant information or distractions (Kipp, 2005). It can help the interpreter stay focused on the core content in an interpreting task without being distracted by noise from the venue, movements of the audience, and other irrelevant information. Updating means actively refreshing, revising or updating the contents of working memory (Frischkorn *et al.*, 2022). For example, the interpreter needs to constantly check and change their understanding of the previous utterance against the new utterance that the speaker produced. Shifting refers to the ability to switch between different tasks or processes (Uddin, 2021), such as disengage from articulation and engage in looking at the new information on a PowerPoint slide. These processes are essential for the success of simultaneous interpreting, allowing the interpreter to selectively attend to the relevant sensory inputs, inhibit distractions, and flexibly shift between multiple tasks.

The functioning of executive control processes relies on working memory. Working memory was first proposed in early twentieth century (Baddeley and Hitch, 1974). It refers to a system that temporarily stores and manipulates information for cognitive processing (Baddeley, 2010; Ripp *et al.*, 2022). It is similar to the concept of "buffer" (Gerver, 1971, p. 89), which is used to store information transmitted from the speaker. In the process of simultaneous interpreting, it holds a central role in supporting the updating of the mental model while being regulated by executive control to manage the high demands of various tasks. It temporarily stores incoming information from the source speech, usually in units of chunks. The SL information is then connected with existing knowledge from semantic memory, making meaning of the SL information. As new SL information comes in and the evolving context, the previous interpretation of contents in working memory is maintained or revised based on the new SL information.

It has been generally believed that working memory is not unlimited (Setton, 1999; de Jong, Wilhelm and Akyürek, 2024). "The functional capability of one's working memory system is known as working memory capacity and is often indexed in terms of the number of units of information an individual can hold in primary memory at a given time (often referred to as span) while under cognitive load" (Draheim *et al.*, 2022, p. 1144). Miller argues that the capacity of processing information is limited to around seven chucks (Miller, 1956), but Cowan reviewed findings from various fields (e.g., visual perception, working memory, and attention) and suggested that the limited capacity of human information processing for young adults is around 4 chunks of information on average (Cowan, 2001). In simultaneous interpreting, the interpreter needs to handle multiple tasks, and each task makes demands on the capacity of processing information (Gerver, 1971, p. 5). The effort model of simultaneous interpreting suggests that SI comprises four efforts, namely "listening and analysis effort" (for comprehension), the “production” effort (for output), the “memory” effort (for short-term memory operations), and the coordination effort (for coordinating the other efforts); if the interpreter requires capacity that exceeds his or her own maximum processing capacity, problems will occur (Gile, 2009, p. 168). Some research argues that working memory may not be as crucial as assumed in literature, especially when considering age and cognitive ability (Timarová, Čeňková and Meylaerts, 2015). However, a recent meta-analysis study of working memory and interpreters’ performance in simultaneous interpreting suggests that working memory generally has a positively correlation with the quality of simultaneous interpreting (Mellinger and Hanson, 2019). Another study also found that the performance of nine professional interpreters declined significantly when four chunks of processing capacity was reached in an English-to-Chinese simultaneous interpreting task (Shao and Chai, 2020).

When the capacity of working memory is exceeded by additional demands, cognitive overload would occur (Marousis, 2023). People would experience mental exhaustion and develop detachment form the task on hand (Christopher, 2022). Research found that individuals were more likely to develop anxiety and avoidance behaviour as the overload increased (Cezar and Maçada, 2023). This could greatly affect executive function and lead to the occurrence of mistakes in simultaneous interpreting. For example, a study found that when the interpreters worked near their maximum cognitive capacity in simultaneous interpreting, even small additional cognitive loads or attention mismanagement can result in omissions, grammatical errors, incorrect rendering of factual information, and other types of mistakes (Gile, 1999). The significant impact of cognitive overload on interpreting quality was also supported by more recent studies in simultaneous interpreting, where increased cognitive demands was believed to be one of the major causes for the occurrence of errors (Wehrmeyer, 2022; Zlobina, 2022).

Emotion can affect working memory performance and other executive processes. The findings about the impact of positive and negative emotions are however mixed. A recent systematic review found no significant effects of positive emotions on working memory, cognitive flexibility and inhibition, suggesting that they do not necessarily improve individuals’ cognitive performance (Lautenbach, 2024). In contrast, other researchers demonstrated that positive emotions enhanced working memory capacity and executive control, benefiting undergraduate students' performance in both verbal and spatial tasks (Storbeck and Maswood, 2016). Regarding negative emotions, findings are also not consistent in literature. A few studies suggest that negative emotions (e.g., sadness or stress) impair cognitive inhibition, where people are less able to inhibit or suppress responses to stimuli that are irrelevant to the current task (Ding et al., 2020; Shields, 2023). Some research suggests that negative emotions impair working memory performance rather than enhance it (Yang, 2023). However, a recent study demonstrated that while the quantity of information stored in the working memory was reduced under the influence of negative emotion, it could lead to enhanced short-term memory performance (Guo *et al.*, 2022). In another study about the impact of negative emotion on verbal and spatial working memory, researchers found that negative emotion did not hinder maintenance process (i.e., storing information in the memory) but the manipulation process (e.g., updating) in working memory (Hou *et al.*, 2023). There is also evidence suggesting that negative emotion can benefit enhance executive control (especially performance in an inhibition task) by promoting analytic thinking without increasing cognitive load (Gabel and McAuley, 2022).

While there are competing voices over the influences of positive and negative emotions, a common belief is that the emotional influences on working memory and other cognitive processes may be modulated by emotion regulation (Sudikoff et al., 2014; Koay and Van Meter, 2023; Yang, 2023). Effective emotion regulation could facilitate processes such as inhibition and updating, and this effect is not subject to the specific content of function tasks (Mohammed, Kosonogov and Lyusin, 2022). A neuroimaging study also found that individuals with strong emotion regulation skills experienced less disruption in their working memory performance compared to those with weaker emotion regulation abilities (Kodak and Yıldırım, 2022). A study about student interpreters' performance in interpreting also found that their performance had a positive correlation with their ability to control meta-mood (Kang, 2016a). This may also indicate the potential modulating effect of emotion regulation on task performance.

Executive control and working memory play a central role in the process of simultaneous interpreting (Setton, 1999). This subsection gives a brief overview of the key executive function processes (inhibition, shifting and updating), the capacity of working memory, the impact of cognitive overload on task performance, the influences of positive and negative emotions on executive function, and the effect of emotion regulation on cognitive processes. These key processes and areas of impact provide context for understanding the process of simultaneous interpreting in the next subsection.

2.3.4 Models of simultaneous interpreting

Over the years, models proposed with different approaches have provided various points of emphasis and diverse guiding significance. From a cognitive perspective, Moser (1978) described the process of SI using a detailed flow chart and gave great significance to the interpreter's long-term memory which was related with different tasks in SI. There are also models that focus on the interpreter's capacity for processing information in SI, such as Gerver (1971)'s flow-chart model of SI and the Effort Models (Gile, 1985). In addition, Paradis's a model of SI (2000) adds neurolinguistic evidence to support Gerver (1971)'s notion of information processing capacity and multi-tasking, and provides great insights into the overlapping operations in SI with consideration of short-term memory and bilingual language processing.

While the models discussed previously offer valuable insights, this paper concentrates on the simultaneous interpreting model introduced by Setton (Setton, 1999), which lends a cognitive-pragmatic lens to the study of emotion and cognition. The model is based on the following basic assumptions: All types of accessible inputs are utilised in SI. Central representation is essential for discourse processing. The sensory input system is fundamentally different from the central cognitive processes. Working memory is adaptive but not unlimited. Bilingual lexicons exist to allow inferences between the source and target languages. Below is the diagram of the model for SI.

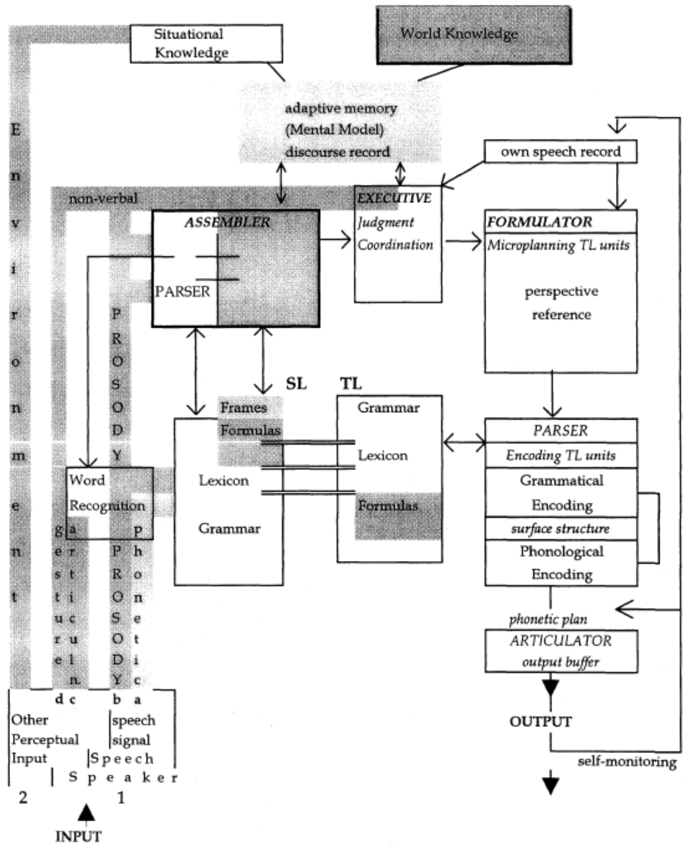

Figure 6. Diagram of SI processing model

(Setton, 1999, p. 65)

According to Setton (1999, p. 67), SI involves five key processes: (1) Word Recognition, (2) the Assembler, (3) the Executive, (4) Formulation, and (5) Articulation. In **Word Recognition**, two types of inputs are utilised in interpreting, including those related to the speaker (marked as '1') and those related to the environment (marked as '2'). The first type is further subdivided into four groups, labelled as 'a', 'b', 'c', and 'd'. These inputs are connected with other components by grey channels, which are used to imply the representation process. Speaker-related inputs all go into the '**Word Recognition**' box for lexical retrieval, and the retrieval process is explained with the cohort model (Marslen-Wilson, 1987). According to the cohort model, word recognition is an autonomic process and utilises both top-down information (context) and bottom-up information (sensory inputs). In the **Assembler,** words recognised in SL are related to words in TL based on bilingual lexicons, gramma and context. The context or relevance between words in two languages is determined based on discourse interpretation, which mainly involves the mental model. When it comes to contextualisation, the mental model utilises cues from inputs (particularly non-verbal cues and inputs from the environment) and relevant knowledge (situational and world knowledge) to establish relations and referents, which inform the generation of propositions in the Assembler and the production of TL in the parser. The right side of the diagram shadows Levelt (1989)'s speech production model, i.e., a blueprint for the speaker. In Setton's model, the **Executive** is similar to the Conceptualiser in the speech production model and refers to "whole apparatus of comprehension (input, contextualisation, and assembly) plus that of willed action, judgment and coordination" (Setton, 1999, p. 94). This process is closely related to the purposes of interpreting. Actions are controlled by the Executive to achieve four purposes: (1) secondary pragmatic assembly, (2) addressee orientation, (3) compensation, (4) production control. For secondary pragmatic assembly, the interpreter evaluates whether the interpreted utterance reflects the intended meaning of the source utterance, and the evaluation is subject to the interpreter's judgement about the relevance or importance of information. The second type, i.e., addressee orientation, is closely related to the interpreter's self-monitoring of the target speech. Based on what has been interpreted in the previous utterance, and what could be assumed, the interpreter may adopt strategies such as omission, generalisation, addition to reduce redundancy or increase richness of the target speech. Anticipation also has an influence on the action for this type. Compensation is the third type of action in which meaning that has not been clearly expressed by the interpreter could be compensated later (e.g., through emphasis). The last type is production control, where the interpreter adjusts the delivery based on speech rates, sound volume and other parameters. The **Formulator** is responsible for microplanning and encoding to provide language-specific rules, perspective and references for parsing, based on the interpreter's own speech record. An internal speech is formulated ahead of **Articulation**, and formulation and articulation are parallel and subject to the interpreter's self-monitoring (ibid).

The significance of this model is that it combines the relevance theory, cognitive semantics, the mental model, and the speech-act theory. Relevance theory (Sperber and Wilson, 1986) gives an account of communication and informs how an utterance is interpreted by an individual through decoding and inference. Based on the relevance theory, the model specifies two levels of communication in interpreting, i.e., primary and secondary communication (Setton, 1999).

Primary communication involves the speaker (of the source language) and the audience; secondary communication refers to the translation process in which the interpreter is both the sender and the receiver of speech (ibid). The model gives prominence to the mental model theory for discourse comprehension (Johnson-Laird, 1980). A mental model is defined as "a structural analogue of a real or imaginary state of affairs which is constructed in working memory from propositional representations of discourse and other tokens and concepts" (Setton, 1999, p. 15). It is similar to the deverbalisation process in the Paris School's interpretive theory, in which the sense of the discourse is extracted from its linguistic form (Lederer, 1978; Seleskovitch, 1998). This theory helps understand the comprehension of a speech in one language. Gile *et al.* (2001) argue that rather than a mental model that plays a key role in handling the source speech, there might be multiple mental models for processing speech segments in different length and complexity. This idea of multiple mental models seems to be supported by a recent study of lag time in SI (Eftekhari, 2019). However, there is still little empirical evidence in literature to suggest whether multiple mental models are involved in information processing in interpreting. Cognitive semantics, specifically the theory of frame semantics (Fillmore, 1982), provides understanding of how words are made meaning of based on experience, outlining the role of knowledge in the process of interpreting. In addition, the Speech-act theory (Searle, 1983) provides explanation to how the speaker's communicative intent is expressed through various speech acts, which are not limited to linguistic expressions.

The key processes outlined in this model offer potential links with existing findings in psychology and linguistics. For example, the model assumes that "an interpreter makes use of the relatively elastic and distributed scope over the text of the conative and affective (or attitudinal, illocutionary) dimensions of Speaker meaning, as compared to that of (logical) semantic operators, which is usually limited to the sentence" (Setton, 1999, p. 236). If all types of accessible inputs are utilised in SI, how would the interpreter allocate attention to these various inputs? Would emotive inputs be treated in the same way as non-emotive inputs? These may require further exploration and may draw insights from the impact of emotions on attention and models of perceptual processing. Furthermore, the model suggests that discourse interpretation relies on situational knowledge and knowledge of the world. This is consistent with the psychological constructivist view of the role of prior knowledge in conceptualization, which is a key to emotion generation and regulation. The Theory of Constructed Emotion sees emotion as a conceptual framing of the situation in the present, and prior knowledge is essential for situated conceptualisation (Barrett, Wilson-Mendenhall and Barsalou, 2014). In this sense, Setton's model may be further extended with the insights from theories of emotion to help understand the influence of emotion on information processing in SI.

Interdisciplinary studies are challenging, and studies that integrate theories and models from different areas are even more difficult. As Pöchhacker (2009) puts: "no single model, however complex and elaborate, could hope to be validated as an account for the phenomenon as a whole". Setton's SI model has certainly shed light on the application of pragmatics in interpreting studies. It lends a different perspective to the inquiry of information processing in SI. Even today, it is still considered to be an excellent example of interdisciplinary integration among various SI processing models (Chen and Chai, 2018). Given the above, this research project intends to adopt Setton's model for SI and attempts to add further details to the model by providing empirical evidence about interpreters' performance in SI under the influence of emotion.

2.4 Emotion and Performance in Simultaneous Interpreting

2.4.1 Challenges in simultaneous interpreting

Simultaneous interpreting in a complex and highly demanding activity. The features of the source speech, the interpreter's capabilities and the working environment may all affect the interpreter's performance. In literature, most of the investigations focused on the relation between the features of the source speech and the interpreting output. Many factors related to the source speech have been found to have an influence on the performance of interpreters in simultaneous interpreting, including the delivery speed of the speech (Gerver, 2002; Korpal, 2012), the speaker's accent (Cheung, 2013; Lin, Chang and Kuo, 2013), directionality (Gile, 2005), lexical density of the source speech (Napier, 2004), syntactic complexity of the source text (such as the types of subordinates and clauses; Hild, 2011), and audio quality.

The rate of delivery of the source speech is one of the most prominent factors that have an impact on simultaneous interpreting. In the profession, a speech rate of 130 words per minute (WPM) appears to be the threshold for simultaneous interpreters to work at a comfortable pace, and a speed higher than that is generally considered fast and could pose strain to interpreters (Chernov, 2004; Barghout, Rosendo and García, 2015; Ruiz Rosendo and Galván, 2019). In one study, the researcher compared the number of omissions (repetitions, redundancies, cultural allusions, empty fillers/discourse markers, and speaker's subjective assessment) made by trainee and professional interpreters in English-to-Polish simultaneous interpreting when the speaker spoke at varying speech rates; at around 180 words per minutes (WPM), trainee interpreters made significantly more omissions compared to when it was delivered at a slow rate (130 WPM), while professional interpreters did not show significant differences in performance at two speech rates (Korpal, 2012). In another study of speech rate, researchers compared the interpreted speeches produced by professional interpreters at three different speeds (120, 160 and 200 WPM) and found that professional interpreters generally omitted more synonyms and redundant conjunctions as the delivery rate increased (Barghout, Rosendo and García, 2015). In addition, interpreters omitted more redundant conjunctions at 160 wpm than at 200 wpm. Arum (2022) analysed linguistic errors (segment omission, word/phrase-level omission, additions, deviation of meaning) and paralinguistic errors (unfinished sentence, filled pause and long pause) made by three professional interpreters during simultaneous interpreting of two English speeches at different rates of delivery (124 WPM and 184 WPM); results show that except additions, all other types of errors showed a significant increase when the source speech was delivered at the fast rate compared to the normal rate; segment omission was most affected by the fast speech rate, followed by deviation of meaning, filled pause, word/phrase-level omission, and unfinished sentence (ibid.). The above study suggest that interpreters may struggle to keep up with the speaker if the speaker talks fast and could potentially omit large chunks of the source speech as opposed to individual words or phrases.

In addition to fast speech rate, the lexical density of the source speech is also considered an important factor that increases cognitive load, which then in turn impairs the performance of the interpreting (Plevoets and Defrancq, 2018). One study investigated the types and number of omissions in signed language interpreting by interviewing 10 Australian interpreters after they completed the interpreting of a 20-minute recorded academic lecture (Napier, 2004). In his study, omissions were categorised into 5 types, depending on the interpreter's consciousness of the omission and the intention of the act of omitting information. The five types are *unconscious* (made consciously by an interpreter), *conscious strategic* (deliberate omissions to improve interpreting effectiveness), *conscious intentional* (deliberate omission due to lack of understanding or equivalent TL), *conscious unintentional* (omissions that contribute to a loss of meaningful information due to limited time and understanding), and *conscious receptive* (omissions that contribute to a loss of meaningful information due to due to poor reception, such as sound quality). Research results reveal that the occurrence of strategic omissions was high when the lexical density of the source text (57%) was around higher than the average lexical density of the typical spoken lecture, which is 39.6%. In addition, interpreters that are less familiar with the discourse environment and the topic tend to make more receptive and unconscious omissions. However, educational background and topic familiarity do not seem to affect strategic, intentional, and unintentional omissions (ibid.). In another study, Maqsoud (2019) analysed pauses, omissions, and errors in Arabic to English simultaneous interpreting and found that high speed of delivery and information density put higher cognitive demands on interpreters, which led to a higher incidence of omissions and errors.

Interpreters are also affected by the speaker's accent. Based on Barik (1994)'s typology of omissions, a study analysed five types of omissions (skipping, comprehension, delay, compounding and contextual omissions) in English into Turkish simultaneous interpreting and found that students interpreters made considerably more omissions (especially comprehension omissions) when interpreting speech delivered with a strong non-native accent compared to a native accent (Kincal, 2020). In another study about the impact of non-native accents on interpreting performance, it was found that intonation, stress and rhythm (all parts of prosody) could have varying degrees of effects on the accuracy of renditions in English-to-Chinese simultaneous interpreting (Lin, Chang and Kuo, 2013).

Apart from difficulties of the source text, differences between the source language (SL) and the target language add burden to the interpreter's cognitive load. Past studies mainly drew attention to differences between language in syntactic features, such as 'word order', 'concision', and whether SL and TL are 'cognate languages. For instance, Chinese and English are not from the same ancestral language and follow different branching systems. English is mostly right-branching/head-initial, where the core information is in the front of the sentence; on the contrary, Chinese is mostly left-branching/head-final, where the core information is at the end of the sentence. In a SI experiment from Chinese to English, interpreters re-arranged the order of 75% Chinese sentence structures when interpreting them into English (Guo, 2011). Larger language differences are associated with a higher likelihood of making omissions and errors during interpretation. Mohammed (2017) analysed incorrect utterances (i.e., errors) made by 96 trainee interpreters in Arabic (L1) to English (L2) simultaneous interpreting; results show that 79% interpreters made syntactic-related errors (particularly incorrect use of pronouns and verbs) and 72% made pronunciation-related errors (especially hesitation and mispronunciation of words), which are likely to be caused by large differences between the source and target languages and students' low level of English proficiency.

The availability of ready lexical correspondents and the presence of lexical gaps can also influence the output of interpreting. Previous research suggests that the retrieval of standard lexical correspondents from long-term memory may be easier than retrieving non-standard lexical terms or non-cognates, so a lack of ready lexical correspondents and shared cognates between the source and target languages may lead to cognitive saturation and result in errors or the decision to omit certain information in interpreting (Swabey *et al.*, 2016). Poor sound quality of the source text can also affect the interpreters' ability to accurately perceive and interpret information from the source speech, resulting in unconscious omissions in their interpretation (Napier, 2004).

In addition, language differences in word order can also contribute to omissions and errors in simultaneous interpreting. A study analysed five interpreters' interpretation in an English-to-Chinese simultaneous interpreting task and found that omissions occurred more frequently when the word order in the source language differed from that of the target language (Cheung, 2012). In another research on the effect of word order on interpreters' performance, the researcher analysed the performance of five professional conference interpreters in English-Arabic simultaneous interpreting and found that word order differences between English and Arabic, particularly the English Subject-Verb-Object structure versus the Arabic Verb-Subject-Object or Verb-Object-Subject, significantly affected the performance of simultaneous interpreters (Al-Rubai'i, 2004). To wait for crucial information (e.g. verbs and subjects) to appear in the English sentences, interpreters often omitted key elements or made errors (substitutions). These challenges are augmented when processing complex English phrases or structures that require reordering to fit the Arabic syntax in real-time interpretation (ibid.).

In addition to the intrinsic difficulties in the source speech, interpreters are also vulnerable to cognitive overload due to high demands placed on their processing capacity. Gile (1999) analysed the target speeches made by ten AIIC interpreters in an English-to-French simultaneous interpreting task and found the interpreters worked near their maximum cognitive capacity, and even small additional cognitive loads or attention mismanagement can result in the occurrence of various types of errors (linguistic: grammatical, syntactic, lexical, and semantic; factual: incorrect rendering of numbers, names, dates) and omissions (partial and total). In a later study, researchers suggested that the occurrence of omissions and errors in simultaneous interpreting was more related to the saturation of processing capacity of interpreters, rather than the difficulties of the source speech (Gile *et al.*, 2015). This strong negative impact of cognitive saturation on interpreting has been supported by later studies. Based on the model of speech production (Levelt, 1989), Wehrmeyer (2022) analysed psycholinguistic slips (i.e., errors) in signed language simultaneous interpreting from English to South African at various levels of cognitive processing, including comprehension, conceptualisation, and production (lemma selection, lexeme selection and morphological encoding, and articulation) and found that 88% errors were production-related, predominantly caused by cognitive overload, followed by production errors (related to lemma selection), formulation errors, and comprehension errors.

The impact of high cognitive demands on interpretation seems to be amplified by other factors. Previous research found that the occurrence of miscues (wrong interpretation of the original content) and semantic deviations from the source speech in simultaneous interpreting is not only the result of cognitive overload but may also be caused by lack of familiarity with the subject matter, and insufficient linguistic and cultural knowledge of the source and target languages (Eftekhari, 2019); The study found that insufficient background knowledge and high cognitive demands can lead to increased errors, interpretation phobia (fear of falling behind the speaker), and a passive approach to interpreting tasks (ibid.). By analysing existing literature, Zlobina (2022) suggests that the occurrence of mistakes (errors) and unintentional exclusions (omissions) in simultaneous interpreting are mainly caused by three phenomena: improper management of attention resources, increased cognitive demands, and short informational signals with little redundancy. However, research shows that redundancy in information can have a facilitating effect (Tal and Arnon, 2022). In this sense, redundancy can help interpreters infer the missed content if some parts of the message are missed or misunderstood.

These omissions and errors occurred in simultaneous interpreting may be made by interpreters intentionally or unintentionally. For example, in a study that analysed the omissions made by ten Australian Sign Language (Auslan)/English interpreters, it was found that each participant made around 34 omissions on average, and unconscious omissions were one of the most frequent types of omissions made by interpreters in the study, followed by conscious strategic, conscious intentional, conscious receptive, and conscious unintentional omissions (Napier, 2004). In another study, Zhang, Zhao and Che (2015) analysed the performance of six student interpreters in English-to-Chinese and Chinese-to-English consecutive interpreting using discussion and retrospective interview; they found that in English-to-Chinese interpreting, the most significant types of omissions were omissions due to comprehension failure and unconscious omissions, which contrasted with the Chinese-to-English interpreting, where omissions due to time constraint and production failure were more prevalent; they suggested that language proficiency of the second language (i.e., English) may be the main reason for the occurrence of omissions related to speech comprehension and production (ibid.).

The above studies show that interpreters tend to make ‘mistakes’ (e.g., omissions and errors) unintentionally due to difficulties arising from the interpreting. However, it has also been found that interpreters would deliberately omit information as a strategy in simultaneous interpreting, particularly for pragmatic considerations. In simultaneous interpreting, interpreters are actively engaging in importance screening to maintain the quality of their output by focusing on preserving the most meaningful information and omitting less relevant or less essential details (Barghout, Rosendo and García, 2015).

Interpreters may choose to omit information based on their judgment of what is necessary in the context, in order to improve the communicative effect of the target speech. In post-experiment interviews, four out of eight student interpreters deliberately omitted information that they deemed less relevant or redundant in the context for pragmatic reasons, rather than reducing cognitive load (Kincal, 2020). In a study, participants reported in questionnaires that they felt the need to organize the speeches and omit information in simultaneous interpreting in order to make them more communicative, especially in the case of a fast speaker (Korpal, 2012). Pym (2009) re-analysed experimental data in Gile (1998) and found that interpreters made choices about what to omit based on an analysis of the communicative risks associated with each potential omission, and they strive for non-omission primarily in cases that have high communicative risk. Low-risk omissions are consistently made by interpreters across different interpreting sessions or renditions. They do not consistently occur at the same points in the text, which may be influenced by factors such as the interpreter's momentary cognitive load, their understanding of the text, or shifting attentional focus during the performance (ibid.).

2.4.2 Impact of emotions on language processing

Emotions have a great impact on several processes of language processing, particularly comprehension. “Emotion can in principle pervade every step of the language-comprehension process, and that mood and other aspects of one’s affective state can in principle impact on all components of the comprehension process” (Van Berkum, 2019, p. 756). The impact of emotion or affective states on language processing has been supported by evidence from many linguistic and neurolinguistic studies. This section highlights key common areas of impact of emotions in general and compares how positive and negative emotions differ in their influence on language processing.

Emotions can influence how quickly and accurately language is understood. People respond quicker to language that matches their present emotional state. In an experiment about emotion simulation and language comprehension, 96 participants were asked to evaluate the level of pleasantness of sentences on a rating scale when holding a pen in their mouth either in teeth (the *smiling* condition) or in lips (the *frowning* condition), and their results show that participants rated pleasant sentences faster when they were smiling than when frowning, while unpleasant sentences were rated slower when smiling than when frowning (Havas, Glenberg and Rinck, 2007). This implies that individuals may understand and process language that matches their emotions more quickly and easily. However, in another experiment with 42 participants, researchers noticed that when rating the difficulty of text, participants tended to compromise the rating speed for accuracy where they might initially spend time on establishing a way to reliably judge sentence difficulty (ibid). This means that there is a trade-off consideration between processing speed and accuracy.

Emotional responses to language can be influenced by the context of communication. Emotional nuances are accentuated when words are within a context or from a sender perceived as more relevant to the recipient. The effects of mood on language processing are not fixed but are context-dependent; they vary with task demands and other situational factors. "It is only within its communicative embedding that the full emotional potency of a word or a phrase will come to the fore" (Kissler, 2020, p. 854). Therefore, understanding the impact of emotion on language comprehension requires considering the context in which the language is being processed or produced.

Positive and negative moods are associated with different styles of processing. It is generally agreed that positive emotions are associated with narrower scope of attention and heuristic-based processing style, while negative moods with broad scope of attention and detail-oriented processing style (Fredrickson, 1998, 2001; Miron, Naftalovich and Kalanthroff, 2020; Naranowicz, 2022; Salsano *et al.*, 2024). Positive emotions were found to promote top-down processing, particularly through its influence on attention (Li *et al.*, 2014; Unkelbach, Alves and Koch, 2020). Negative emotions, particularly those of high intensity, enhance bottom-up processing of sensory inputs (Tyng *et al.*, 2017; Salsano *et al.*, 2024), but they may disrupt top-down control by competing resources for attention (Nikolla *et al.*, 2018).

Positive and negative emotions have different modulating effects on semantic processing. Positive emotions can better facilitate semantic processing in language comprehension, while negative emotions may not be conductive to semantic processing. For example, one study measured participants' brain activities when reading sentences after exposed to happy/sad film clips and found that the N400 cloze effect, which reflects semantic processing, strongly reduced in the sad mood condition compared to the happy mood condition, suggesting facilitation of positive emotion in semantic processing (Chwilla, Virgillito and Vissers, 2011). In another study, researchers analysed the brain responses of 30 female participants in reading sentences containing semantic reversal anomalies , which are syntactically correct but semantically implausible; they found that participants in a positive mood demonstrated a significant P600 [1] effect when processing semantically implausible verbs, suggesting the use of heuristic processing, but participants in a sad mood showed no P600 effect but instead exhibited increased anterior negativity, indicating more detail-oriented processing and potentially greater working memory load without the reliance on heuristic strategies (Vissers *et al.*, 2013). The varying emotional influences may be related the impact of emotions on the activation of semantic memory. Research shows that a positive mood improves semantic processing by promoting the activation spread to remotely associated concepts and increasing the breadth of attentional selection, potentially facilitating global processing but impairing activities requiring narrow attentional focus; a negative mood may inhibit the activation spread in semantic memory, potentially affecting tasks involving verbal working memory and imposing higher cognitive demands, with no impact observed on attention in perceptual tasks (Naranowicz, 2022).

[1] The P600 is an event-related potential that is referred to in the context of language comprehension and is generally associated with the processing of grammatical anomalies and syntactic complexity.

In addition to semantic-level influence, emotions have also been found to have an impact at syntactic-level processing during language comprehension. Using intentional emotion induction through film and electroencephalogram (EEG), researchers analysed the brain activities of 32 participants while they read sentences containing syntactic violations, such as subject-verb agreement errors (Verhees *et al.*, 2015). They observed a reduction in P600 amplitudes in a negative mood, indicating less allocation of cognitive resources to processing syntactic information. On the other hand, an increase in P600 amplitude was observed in participants in a positive mood condition, suggesting increased reliance on heuristic processing (which is based on the expectation that sentences will be syntactically correct). Additionally, they discovered that the effect of emotions on syntactic processing is also modulated by attention: greater attention to syntactic details enhanced the P600 amplitude, and the effect was stronger in a positive mood than in a negative mood (ibid). Findings from another neuroscience study also demonstrated the modulating effect of emotional states on semantic processing, further highlighting the critical role of emotion a in language comprehension (Chwilla and Tromp, 2013). The above studies suggest that individuals in positive emotions may be more engaged in finding meaning even when faced with semantic and syntactic anomalies, whereas those in negative emotions might be less willing to invest cognitive resources in exploring such inconsistencies deeply.

Moreover, emotion can affect how individuals evaluate their self-monitoring processes in language processing. In one study, researchers analysed the relationship between text comprehension and achievement emotions (i.e., emotions that are related to the outcome of the study) of 358 high school students and found that students used their emotions as cues for predictions and postdictions about their text comprehension; positive emotions often led to overconfidence about their understanding of text and negative emotions to underconfidence (Prinz-Weiß *et al.*, 2023). This suggests that emotions can affect individuals' ability to accurately assess their own language comprehension and may lead to biases in their self-monitoring processes.

Such an influence may also be related to the impact of emotions on memory accuracy. Memory accuracy here is more of what is defined as 'truth'— the correspondence between the memory representation and the past event (Bernecker, 2010). The phenomenon when people remember "an event in a different way to how it was experienced" is referred to as false memory (Robin and De Bont, 2022, p. 31934). For instance, an interpreter remembers that she interpreted word A as A, when in fact, she said B. Her memory of the interpretation is not true in this case. Research has shown that the occurrence of false memories is caused by detailed semantic and visual encoding (Lentoor, 2023). Interpreters, when simultaneously processing multi-modal inputs in great detail, may be prone to false memories. It is also widely acknowledged in the field of psychology that emotion can affect memory accuracy. In general, high emotional arousal can lead to a more robust encoding of the memory, which can contribute to greater recall accuracy for certain details; negative information tends to be remembered with more detail compared to positive information (Kensinger, 2009). However, there are differing views on which dimension of emotion has the most impact on memory accuracy. Ayyıldız (2022) investigated the impact of induced positive emotions on false memory using the Deese-Roediger-McDermott paradigm. The Autobiographical Emotional Memory Task was used to elicit happiness before participants took an information recognition test. The results showed that individuals in the happy group made fewer errors in the recognition test compared to those in the neutral group, indicating that the occurrence of false memories may be more linked to emotional arousal rather than valence. However, other studies have found that valence may also influence memory accuracy. In one study, researchers tested participants' memory accuracy using mood induction through images and voice narrations (Moore, Urban-Wojcik and Martin, 2021). They assessed the recognition of neutral images that were encoded in different emotional contexts. The results revealed that neutral images encoded within a positive context had lower accuracy in memory recall compared to those encoded with no emotional context, whereas neutral images encoded within a negative context showed similar memory accuracy as those in non-emotional contexts (ibid). These findings suggest that the impact of emotion on memory extends beyond emotional arousal to include valence, which may influence memory accuracy differently. In another study, researchers investigated the effect of emotions on false memories by analysing EEG signals of participants who were induced with positive or negative emotions and exposed to mixed-emotion word lists, and their results indicated that the positive emotion group had a higher false memory rate and more active brain regions compared to the negative emotion group, showing that participants' emotional states and semantic understanding are key factors influencing the occurrence of false memories (Li *et al.*, 2021). The impact of positive and negative emotions on memory accuracy is a complex phenomenon. It may be influenced by factors such as emotional arousal, valence, and the specific context in which the emotions are induced. However, positive emotions may generally increase the risk of false memories, while negative emotions may have less of an effect on memory accuracy.

Another key process of language processing that is influenced by emotions is speech production. Research has found that emotions exert an influence on how people formulate utterances. Kempe, Rookes and Swarbrigg (2013) conducted two experiments to investigate how the emotions of the speaker (happiness, neutral and sadness) affect language ambiguity using mood induction with recall (experiment 1) and images (experiment 2); they found that happy speakers produced more ambiguous utterances due to less tendency to modify the object and the second homophone (or nouns with bare homophones which are ambiguous), indicating the impact of positive emotions on increasing language ambiguity. Contrary to the above finding, a recent study about the effect of the affective states of the speaker on the production of referring expressions[2] (using mood induction with film excerpts) shows that speakers in opposing affective states (happiness vs sadness; disgust vs anger) did not differ at a statistically significant level regarding their use of modifiers and specification levels of utterances, which was likely due to the short duration of elicited effect (Vonk, Goudbeek and Krahmer, 2022). They suggested not relying on valence alone for testing and reducing the number of stimuli to induce stronger affective states (ibid.). The above studies suggest that the influence of emotions may be more global than local; such an effect may also occur in a short time. The effectiveness of eliciting emotions is very important.

2.4.3 Impact of emotion on interpreting performance

Emotions have a great impact on information processing, and how interpreters perceive and deal with emotions affects their performance in interpreting. Research has shown that interpreters'

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[2] A referring expression is an expression used to provide information about a specific object, such as 'That bottle of milk is the expired one.'

performance is affected by their meta-emotion (Kang, 2016b, 2016a). The concept of meta-emotion was defined as "emotion about emotion" or "feelings about feelings" (Gottman et al., 2013:6), which refers to how people feel about their own emotions. Existing research has found that meta-emotion is positively correlated with the performance of student interpreters and that it has a synergistic effect on students' interpreting output (Kang, 2016b). In another study, researchers investigated student interpreters' emotional intelligence and found a positive correlation between interpreters' performance and their ability to control meta-mood (Kang, 2016a). They suggested that student interpreters should make "dynamic regulation of their meta-emotions during the decoding of the source language, language transferring, and information output of the target language" (Kang, 2016a, p. 20). While the above studies did not elaborate on how meta-emotion affected performance, their studies show that interpreters' awareness of their emotions during interpreting and their feelings would affect their performance.

Negative emotions, in particular, seem to have an influence on interpreters' coping strategies to emotional situations and attention allocation in interpreting, which further affect their performance. With a descriptive approach, Çoban and Telci (2016) highlighted the significance of emotional intelligence in translation and interpreting activities. Their research mainly revolves around the Big Five personality factors that have an impact on the performance of translators and interpreters, which are "neuroticism, extraversion, openness, compatibility and self-discipline" (Çoban and Telci, 2016, p. 120). It has been claimed that negative emotions caused by disappointment or criticism can have a negative influence on an interpreter that he or she "can not" adopt strategies to manage such situations well, thus hindering cognitive information processing and further concentration (Çoban and Telci, 2016, p. 121). This may also be related to interpreters' perception of their ability in interpreting. Drawn insights from personality psychology and second language learning, Bontempo and Napier (2011) examined the self-perceived competence of over 100 accredited signed language interpreters in Australia from three aspects, namely self-efficacy, goal orientation and negative affectivity. Interpreters' emotional stability was described by negative affectivity, which is defined as "an enduring tendency to experience negative mood and emotion" (Bontempo and Napier, 2011, p. 87) and measured using the Positive and Negative Affect Schedule (Watson, Clark and Tellegen, 1988). Research results showed a negative correlation between negative affectivity and the perceived interpreting competence of professional interpreters. In other words, interpreters who are more prone to be affected by negative emotions perceive that they are less competent in interpreting. Having said the above, it is worth noting that their study focused on signed language interpreting, which relies primarily on the interpreter's body language and facial expressions, as opposed to other modes of interpreting. In this sense, the findings may not be applicable to other modes, but it has pointed out the potential connection between negative emotions and interpreters' performance.

Furthermore, interpreters' attention to emotions has a great impact on the quality of interpreting output, particularly accuracy. Bao (2019) investigated the relationship between performance and meta-emotions under noise intervention based on the Trait Meta-Mood Scale (Salovey *et al.*, 1995) and the cognitive effort model of simultaneous interpreting (Gile, 2009). In general, noise (+5 dB) was found to enhance the overall performance of interpreters. The vast majority of participants agreed that their mood was affected under noise, and some of them developed negative feelings. Participants who gave lots of attention to their emotional states were found to have poorer performance than those who did not (Bao, 2019). Specifically, noise put special strains on all four sub-indices of fluency: *speech rate*, *mean length of run*, *average length of pauses*, and *repair per 100 characters*. Speech rate was increased greatly under noise intervention, while a significant decline was observed in the mean length of run and average length of pauses. More repairs were made after the noise intervention. Scores for completeness of interpretation only dropped a lot after background noise was introduced, and there was a sharp decline in the accuracy of interpreting after noise intervention (ibid). The results indicate that fluency is more likely to be affected during noise intervention, while completeness and accuracy tend to be affected more after the intervention. The changes in completeness and accuracy may be caused by the changes in emotional states after noise intervention. Krystallidou *et al.* (2018) compared the differences in content and level of empathy between the original utterances by the patient and the doctor and the translated utterances by the interpreter when communicating bad news in a simulated clinical scenario. In more than 1/3 of the "empathic opportunities", the level of empathy in the original utterance was "reduced, increased or omitted" in the interpretation (Krystallidou *et al.*, 2018, p. 38). According to the authors' analysis, reduced and omitted emotions were mainly caused by omissions in interpreting, while in some cases, the interpreter added what the patient did not say at all or repeated previously said information, resulting in differences in emotional content (Krystallidou *et al.*, 2018). Based on the above studies, it may be inferred that there may be a decline in the completeness and accuracy of interpretation if interpreters are exposed to negative emotional stimuli. Yang (2000) investigated the relationship between meta-mood and student interpreters' performance in English-Chinese consecutive interpreting of a technical speech recording, with accent as the intervening variable. The meta-mood levels of 18 participants were measured using the Trait Meta-Mood Scale (Salovey *et al.*, 1995), with a focus on three dimensions of emotional intelligence: attention (to emotional states), clarity (i.e., the ability to differentiate feelings), and repair (i.e., the adaptability to negative emotions). Participants' performance in consecutive interpreting was evaluated with an adapted version of the interpreting rating scale (Yang, 2005), which comprises four aspects of interpreting: fidelity, delivery, language and time control. It was not properly justified why this rating scale was selected and why these four aspects were studied. According to their research results, the higher the total score of the trait meta-mood, the better their performance. The performance was also positively correlated with clarity and repair and negatively correlated with attention. In other words, student interpreters performed better when they could better differentiate between feelings and deal with negative emotions, but their performance declined if they paid too much attention to their own emotions.

The impact of emotions on interpreting performance also differs between student and professional interpreters. Compared to professionals, student interpreters are more likely to be affected by emotions during interpreting. In one study, researchers compared the level of tolerance for ambiguity among students and professional translators and interpreters using questionnaires. According to their results, the tolerance of ambiguity was positively correlated with emotional stability and negatively associated with neuroticism (Rosiers and Eyckmans, 2017). Additionally, student interpreters' overall level of tolerance for ambiguity was significantly lower than that of professional interpreters. Their findings suggest that student interpreters may be more vulnerable to emotional events than professionals. Another interesting finding from their research was that there was no significant difference between student translators and interpreters in terms of their tolerance for ambiguity, suggesting that there may not be variations in emotional stability between the groups.

2.5 Methods for Studying Emotions and Interpreting Performance

2.5.1 Methods for measuring emotions

In psychology, sociology and neurobiology, many methods have been proposed for emotion measurement, ranging from self-reporting to brain imaging techniques. There is no consensus on which method is the most effective for the measurement of all components. Nevertheless, self-reporting and monitoring of bodily reactions with sensors appear to be the most common approaches to emotion measurement in literature. This section will introduce key constructs and instruments used for measuring emotional states.

(1) Self-reports

Self-reporting has been widely used and is probably one of the most classic methods for understanding an individual's emotional state. This approach generally collects the participant's subjective feelings using retrospective interviews and rating scales. Retrospective interviews are commonly used to understand the reasons behind omissions (e.g., Zhang, Zhao and Che, 2015; Kincal, 2020). This method allows the participant to share his/her thoughts freely and gives the researcher an opportunity to obtain a deeper understanding of a specific question. Therefore, it has been widely used in qualitative studies.

On the other hand, rating scales are often used to collect quantitative data about immediate emotional responses to stimuli. The Self-Assessment Manikin (SAM) scale is a non-verbal rating scale that was originally developed by Lang (1980). It can quickly measure an individual's subjective experience of emotions from 3 dimensions (valence, arousal, and dominance), as shown in the figures below. Valence describes the extent to which an emotion is positive or negative; arousal indicates the intensity of emotion; dominance is associated with the degree of feeling of being controlled or in control (Bradley and Lang, 1994).

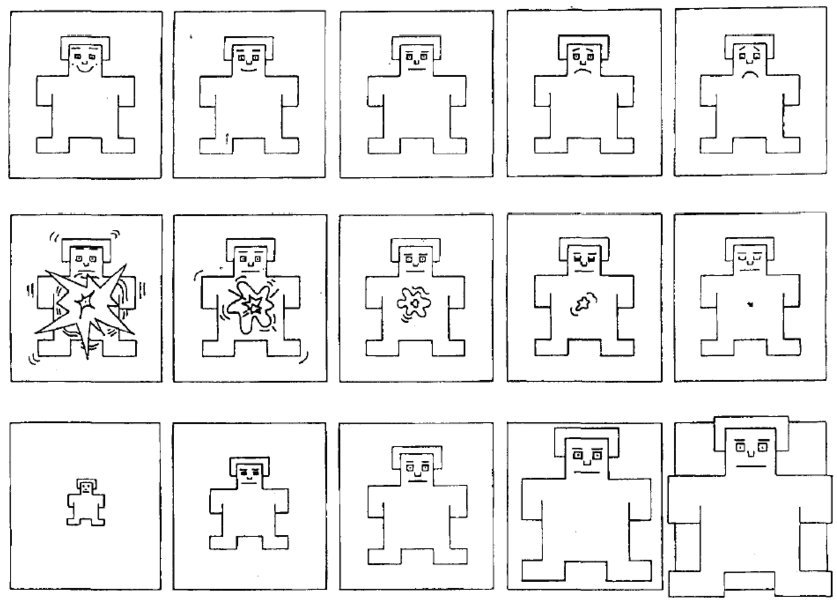


Figure 7. The 5-point SAM
(Bradley and Lang, 1994, p. 51)
Note: The top, middle, and bottom rows are for valence, arousal, and dominance, respectively.

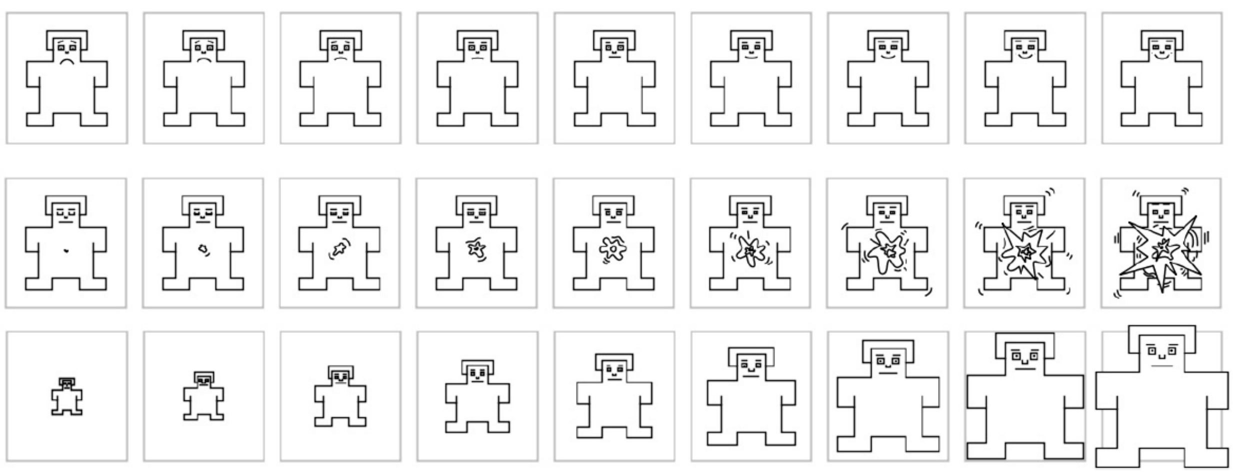


Figure 8. The 9-point SAM
(Daşdemir, Yildirim and Yildirim, 2017, p. 4)
Note: The top, middle, and bottom rows are for valence, arousal, and dominance, respectively.

In addition to the original 5-point version, the SAM scale is available in 7-, 9-, 20- or 25 points. Researchers recommend using a version with at least 9 points for higher accuracy of results (Tsonos and Kouroupetroglou, 2008). A 9-point version is shown in Figure 8. The SAM scale (both 5-point and 9-point versions) has been tested effective in measuring emotional responses to a variety of stimuli, such as images and sounds. Because it is based on graphic abstract characters, it is also suitable for participants from various cultures, including non-English speaking participants (Bradley and Lang, 1994; Morris, 1995).

Emotions are directly reported by subjects, so it reduces the probability of errors in data interpretation to some extent. Rojo López (2020) suggests that self-reports alone do not necessarily match actual behaviours. Since emotions are reported by subjects, the accuracy of self-reports largely depends on the ability of subjects to make judgements about emotions. If the subject reported the experienced emotion as delighted but could not distinguish delighted from satisfied, then the accuracy of such results is at stake as the two experiences differ greatly in arousal. Moreover, self-report results are retrospective, making it very difficult to evaluate the object's emotional state at a specific moment. Therefore, it is very common to complement it with measurements of bodily reactions, such as skin conductance and facial expressions.

(2) Skin conductance

One common method for measuring bodily reactions to emotional stimuli is through the measurement of skin conductance. Skin conductance, also known as galvanic skin response (GSR), is a physiological measurement that assesses changes in the conductivity of the skin in response to an emotional stimulus (Jindrová, Kocourek and Telenský, 2020). The basis of this measurement is that sweat glands become more active when an individual experiences emotion, leading to an increase in skin conductance (Christopoulos, Uy and Yap, 2019). Skin conductance is measured by passing a small electrical current between electrodes on the palm or the fingertips of the index and middle fingers of the non-dominant hand of the subject. The electrical current causes a slight change in the electrical resistance of the skin, which can be detected and measured (Ogorevc *et al.*, 2013). This change in skin conductance is considered to be an indicator of sympathetic nervous system activity, which is associated with emotional arousal.

Several studies have explored the use of skin conductance to measure emotional responses. For example, Jindrová, Kocourek and Telenský (2020) investigated the amplitudes, latencies and rise times of skin conductance of 100 young adults in response to emotive pictures from Nencki Affective Picture System (Marchewka *et al.*, 2014) and International Affective Picture Systems (Lang, Bradley and Cuthbert, 1999). In their study, skin conductance was recorded using the

Neuron-Spectrum 4/P acquisition system, with a threshold of skin conductance amplitude of 0.01 μS for analysis. The results found an increase in SCR amplitudes for negative, high-arousal stimuli but not for positive stimuli. Another study explored the numbers of peaks and amplitudes of skin conductance of 11 adults during initial and secondary viewings of seven emotive video stimuli, i.e., joy, sadness, anger, surprise, disgust, disgust, contempt, and fear (Mancini and Jasra, 2019). Skin conductance was measured using the Shimmer3 Kit Biosensor around the index and middle fingers and analysed in the iMotions 6.3 system. They found that around half of the participants had a higher number of GSR peaks during the initial exposure to the stimuli, while the other half had more peaks during the second exposure. Moreover, joy and sadness did not seem to differ greatly either in the number of peaks or the average amplitudes (ibid.). Their results indicate individual differences in emotional experiences and the influence of times of exposure to stimuli on the level of emotional arousal. In a study using music, researchers investigated the emotional responses of 24 participants to pictures and three pieces of music: 1) fear: 'Mars' from *The Planets* (Op. 32) by Gustav Holst; 2) sadness: *Adagio for Strings* by Samuel Barber; 3) happiness: the 3rd movement of the *Symphony No.6* by Beethoven (Baumgartner, Esslen and Jäncke, 2006). A 5-point rating scale and psychophysiological reactions were used for measuring emotional experiences, including EEG, skin conductance response, heart rate, respiration, and skin temperature. Significant stronger skin conductance responses were observed in negative conditions than in positive conditions. Their findings suggest that using a combination of music and images or music alone elicited stronger responses (ratings, SCR, heart rate, respiration) than pictures (ibid.). To date, music has not been used as an emotional stimulus in interpreting studies for intentional emotion manipulation.

In interpreting studies, previous researchers investigated the impact of the speaker's emotions on simultaneous interpreters by using the SUPIN-S30 questionnaire for self-reporting emotions and by measuring their galvanic skin responses with a PsychLab SC amplifier (0.02 μS threshold), Psych-Lab Data Acquisition software (acquisition: 1000 Hz; idle: 500 H) and Psych-Lab Analysis software (Korpal and Jasielska, 2019). They observed greater galvanic skin responses when participants were interpreting a sad speech compared to a neutral speech, indicating that the interpreters were emotionally affected by the speaker's emotions.

(3) Other markers

In addition to skin conductance, other indicators, such as heart rate, facial expressions, breath, EEG, body temperature, and muscle movements, have also been used to measure emotions in literature. Facial behaviours (Darwin, 1890; Ekman and Friesen, 1976; Russell, 1994) and body movements (Tracy and Robins, 2004) can also be used to detect emotions, but results drawn from movements are not accurate and reliable given the inconsistency of facial and body movements relating to the same emotion (Barrett, 2017).

For specific emotional states, there is no consistent correspondence between these indicators and emotional states. In general, high-arousal emotions are generally associated with faster heart rates, higher skin conductance responses (Laine *et al.*, 2009), deeper breathing, a rise in body temperature and increased muscle contractions. These measurements typically require different data collection modules and the placement of sensors on various parts of the participant's body. Emotions may also be measured using neuroimaging methods (Panksepp, 2010) or the autonomic nervous system (James, 1884; Lang, 1994) with indices such as heart rate (HR), but they tend to reflect more on approaches rather than valence and arousal (Mauss and Robinson, 2009), making them less feasible to be incorporated in this project.

The measurement of skin conductance offers a feasible approach to measuring emotions in an interpreting booth, minimising interferences to existing facilities in the interpreting booth and direct contact with the participant’s body while still providing a physiological measurement of bodily responses to stimuli in real time.

2.5.2 Methods for evaluating performance in SI

(1) Performance

Performance has been a central topic in translation and interpreting studies for decades. Both quality and performance can be used to describe “how well or badly” an interpreting assignment is done (*Oxford Learners’ Dictionaries*, no date), though the latter has a broader connotation. In addition to the quality of the output (i.e., the target speech), an interpreter's performance also takes into account the interpreting process and the interpreter's interaction in the assignment (Pöchhacker, 2015). Due to limited time, performance in this project is limited to the quality of the target speech produced by the interpreter.

In the existing literature, interpreter-centred and user-centred topics about quality in interpreting have been investigated in great depth. Interpreter-centred research on quality in interpreting has evolved over the years. In the late 20th century, key topics focusing on the factors influencing the interpreting product, such as stress (Keiser, 1978; Agosti, 1997), mental efforts (Kurz, 1994), speech rate (Gerver, 1976), and the availability of visual information (Anderson, 1979; Bühler, 1985; Balzani, 1990). Following the advances in cognitive science, studies in the 21st century pay more attention to the influence of cognitive (e.g. working memory capacity) and paralinguistic factors (e.g. intonation) on interpreting quality.

Research on user perception of interpreting quality started to draw attention in the 1980s and continues to flourish nowadays. In conference interpreting, the users of the interpreting service may differ in terms of their roles (e.g. conference organisers, attendees, booth mates, etc.), language proficiency in the target language, and other personal characteristics. Considering the diversity in user profiles, interpreting quality evaluated by the users is often associated with subjectivity and thus commonly excluded from research specifically on interpreting quality. The subjectivity is attributed to many factors, such as the users' specialisation (Kopczynski, 1994), users' subjective judgment of interpreters' performance based on native language and gender (Ng, 1992), nationality (Gile, 1990), or individual differences (Meak, 1990).

When it comes to the style of evaluation, users usually take an impressionistic and holistic approach to assessing the quality of interpretation in SI (Cheung, 2013). García Becerra (2015) invited 24 participants to rate the quality of four simultaneous interpretations of a European Parliament plenary session and found that they were particularly subjective when evaluating form-related aspects of interpreting despite the presentation order of the interpretations. However, it has not been specified what those form-related aspects refer to. In an investigation of the influence of feelings on quality evaluation, greater differences in the assessors' ratings of style and functionality were noticed, which were both classified as content-related parameters in the study (Behr, 2015). Having said the above, it has to be noted that human-mediated evaluation methods that exclude the perception of the users are not immune to subjectivity. Raters, as the users, are all human beings that have different characteristics. It is, therefore, impossible to completely eliminate the subjective nature of human-mediated evaluation, which is probably a rational explanation for the emergence of computer-assisted methods for performance evaluation.

Rating methods for quality assessment can be broadly categorised into two groups: computer-assisted methods and human-mediated methods. Each type has its advantages and disadvantages with regard to test reliability, suitability, and practicality. Zhang (2016) evaluated the quality of SI (from English to Chinese) by using a semi-automatic scoring system, which showed a strong correlation with human-mediated scoring and was claimed to be superior to the automatic evaluation system of machine translation based on bilingual evaluation understudy proposed by (Papineni *et al.*, 2002). The system borrows the concept of semantic role labelling (SRL) in a scoring metric called the monolingual semantic evaluation metric (Lo and Wu, 2011), which benefits from automatic SRL annotation of translation, as well as the FrameNet project that offers datasets for SRL annotation. In the study conducted by Zhang (2016), the source and target speeches were transcribed, annotated and scored; the quality of the target speech was measured with the proportion of matched 'frames' and 'frame elements' in the transcriptions of the source and target speeches, while frame matches and frame element matches correspond to the 'minimum expectation' and 'maximum expectation' respectively. The major concern about this scoring metric is its theoretical basis - 'Translating means translating meaning', which was drawn from the theory of functional equivalence (Waard and Nida, 1986). The theory addresses bible translation, so it is not meant to be applied to interpreting assessment in the first place. Moreover, the author states that "The only thing what interpreters are focusing on is transferring the meaning of speaker's speech to the audience" (Zhang, 2016, p. 10), which clearly overlooks the social nature of interpreting. Another recent study also adopted an algorithm-based approach to look at the performance of interpreters in SI, where Quest++ was used for the estimation of interpreters' performance and METEOR for the automatic evaluation of the interpreting output (Stewart *et al.*, 2018). Quest++ is a piece of software designed for machine translation based on machine learning (Specia, Paetzold and Scarton, 2015), and METEOR is a scoring metric for machine translation (Denkowski and Lavie, 2015). A combined use of METEOR and Quest++ was found to have a high correlation with human judgements (Scarton, 2016). Since both Quest++ and METEOR were originally developed for machine translation, the researchers adapted the features in Quest++ to reflect the differences between machine translation and SI, which differs their evaluation system from the previous one (Stewart *et al.*, 2018). Features included were mostly related to interpreting accuracy, completeness and fluency, i.e., 'pauses, hesitations, incomplete and non-specific words, quasi-cognates, and the number of words' (Stewart *et al.*, 2018, p. 2). Compared with the previous semi-automatic system (Zhang, 2016), this metric offers an even more objective approach to evaluating interpreting quality. Furthermore, their evaluation metric is accessible online, making it possible to test its reliability in research. While computer-assisted scoring is great for rating consistency and efficiency, it is methodologically difficult to train a rating system that can accurately recognise the interpreting output. More importantly, when physiological measurement is used, it is very challenging to synchronise data across different platforms, making it difficult to use in this project.

With respect to the evaluation of interpreting, human-mediated scoring has been traditionally adopted for the evaluation of both the overall performance of interpreters and the analysis of specific aspects of interpreting. Scoring methods can be generally categorised into impressionistic, holistic, analytic and psychometric scoring. Impressionistic and holistic scoring methods are often used to evaluate the overall quality of the interpreting product or the overall performance of interpreters (Lee, 2018). Analytic and psychometric scoring methods tend to judge the interpreting quality based on units of the interpretation. Rating rubrics or scales have been particularly welcomed in recent years (Shafiei, 2024), but only a very small number of studies have provided indicators and detailed descriptions of experimental procedures. The vast majority of the studies about interpreting quality adopted a point-based rating scale.

In SI, evaluation criteria can be broadly categorised into content-, form-, and delivery-related criteria, as well as those in connection to character traits. Content-related criteria mainly focus on the semantic features of the target speech, such as its completeness and sense consistency with the source speech. Form-related criteria evaluate how the source speech is rendered in terms of style, terminology, grammar, and diction. Delivery-related criteria aim to look at the presentation of the target speech from various perspectives, such as fluency of the target speech, the interpreter's voice, accent, and intonation. Criteria related to the character traits include the interpreter's ability to concentrate, endure, and remain calm during interpreting. Based on the previous review (see Section 2.4.3), different degrees of omissions and changes in the intensity of emotive expression were reported in emotive situations (Butow *et al.*, 2011, 2013; Rosenberg *et al.*, 2011). Speech rate and number of repairs also increased with noise intervention, while a significant decline was observed in the mean length of run and average length of pauses (Bao, 2019). This indicates that emotion may have an influence on the accuracy and fluency of interpretation. Due to limited time, this study focuses on omissions, errors and incompletion. These were chosen as they are key markers of interpreting performance. Additionally, previous studies found that interpreters tend to weaken and omit emotive expressions in public service interpreting. It makes one wonder if such behaviours would be observed in conference interpreting as well.

(2) Omission

In interpreting studies, omissions are often considered to be deviations from the source speech. The definition and classification of omissions vary greatly depending on the perspective of a study. According to Collins English Dictionary (*Collins English Dictionary*, 2005), "an omission is something that has not been included or has not been done, either deliberately or accidentally." In the context of interpreting, (Barik, 1975) defined omissions as

> Omissions, referring to items present in the original version, which are left out of the translation by the T[ranslator/interpreter] (exclusive of contextually irrelevant repetitions, false starts, fillers such as "you know," etc., and also excluding material not to be found in the translation due to its involvement in a substitution or error of translation, which necessarily consists of the "omission" of one item and the "addition" of another in its place).
>
> (Barik, 1975, p. 275)

Based on the above definition, omissions in this study refer to items that are originally present in the original speech but have not been included deliberately or accidentally in the target speech, exclusive of repetitions, false starts, and fillers (lexicalised and unlexicalised). Repetitions refer to consecutive repeated words/phrases/sentences (see Example 1).

Example 1

This is really, really important.

Example 2

And you, there are ways to do that, but it's physiological training.

Example 3

Green and the-the purple people were people who had learned by grammar and formal study.

Both lexicalised and unlexicalised fillers (e.g., 'ah') are not considered omissions.

Table 2. Fillers in the source speech

Type	Filler	Occurrences	Note
Unlexicalised	Err	1	
Unlexicalised	Uh	1	
Lexicalised	Well…	3	
Lexicalised	Ok…	1	
Lexicalised	So…	7	Not for transition
Lexicalised	But…	1	No causality
Lexicalised	Now…	7	Not about time
Lexicalised	Actually	3	
Lexicalised	And…	25	Introducing new information, not for connecting
Lexicalised	And then	1	
Lexicalised	You know	1	

In an inquiry into the linguistic and communicative aspects of conference interpreting, Kopczyński (1980) approached omissions from a linguistic perspective. Omissions were subdivided into different groups depending on the type of elements in phrase structure that were affected by omissions. Specifically, elements that are essential to understanding the meaning of the phrase are the core elements, such as the subject and the verb; modifiers (e.g., an adjective) are optional elements. According to Kopczyński's analysis, conference interpreters tended to omit modifiers in order to retain the gist of the source speech. This approach was later adopted and promoted in a comparative study of omissions made by student interpreters in consecutive and simultaneous interpreting (Cox and Salaets, 2019). As a supplementary to Kopczyński's research, they draw reflection on the functionality of omission and defined omissions as

> "[…] all omissions that provoke a loss of significant information, and thus a decrease in accuracy, are considered non-functional. All omissions that boost the interpretation quality are considered functional."
>
> (Cox and Salaets, 2019, p. 5)

Their study examined non-functional omissions, which were then classified into eight categories: "noun phrase, verb phrase, prepositional phrase, conjunctive phrase, adjective phrase, adverbial phrase, other omission, and the omission of complete sentences" (ibid, p. 9). Methodologically, they first analysed the core elements and modifiers in the source text. Next, the omission percentage of all essential information per category, and the number of omissions per phrase type (core/modifier) in the TT were calculated, but the calculation methods for the two percentages were not explicitly provided. Finally, the overall mean omission percentage for each mode of interpreting was calculated as the sum of omission percentages of students divided by the number of students. The researchers elaborated their research design in detail, making replication possible for future studies. However, a great concern is how to determine the functionality of an omission, i.e., whether it promotes or impairs accuracy or quality.

Based on the interpreter's consciousness in decision making, Napier (2004, p. 125) categorised omissions into five types, depending on whether the interpreter is conscious of the omission and whether it contributes to a loss of "meaningful information": "conscious strategic omissions, conscious intentional omissions, conscious unintentional omissions, conscious receptive omissions, unconscious omissions." This classification is probably the most detailed one to date that looks at the interpreter's consciousness and the act of omitting. However, it should be noted that Napier's research focus on Australian Sign Language, so it may not apply to simultaneous interpreting. Moreover, it may be methodologically challenging in determining whether the interpreter is conscious of every single omission s/he has made.

To avoid subjectivity in the classification of omissions, Lu (2018) advocates an information-based system for analysing different types of information loss in simultaneous interpreting, including omissions, errors, and incompletion. The assessment system takes the view of information structure in linguistics and analyses the source/target speech with an *assertion* as the unit of measurement, which is defined as "the proposition expressed by a sentence which the hearer is expected to know or take for granted as a result or hearing the sentence uttered" (ibid, p. 794). In the above figure, T/R/S assertions refer to thematic/redundant/situational assertions, respectively. Thematic assertions are defined as "those related to the theme of the talk"; redundant assertions are "neighbouring assertions meaning the same"; situational assertions are "non-thematic, situational discourses often related to event procedures or emergencies" (ibid, p. 796). The transcriptions of the source speech and the target speech were annotated based on the three types of assertions and the types of propositional information loss in each assertion, i.e., omission, incompletion, error. This method was tested by the researcher and another inter-rater. We found great inconsistency in the length of assertations. This is related to the language style of the speaker in the source speech. Many predicative clauses were very long (e.g., 3 lines) and many were very short (e.g., 5 words). Their method categorised a predicative clause as one assertation, regardless of its length. However, this would result in great differences in results when the target text is compared against data about emotions. Therefore, it is not suitable for this project.

In sum, omissions in this study refer to items that are originally present in the original speech but have not been included deliberately or accidentally in the target speech, exclusive of repetitions, false starts, and fillers (lexicalised and unlexicalised).

(3) Error

In interpreting studies, there are a variety of definitions for errors and no single unified definition that applies to all research. These definitions often carry different connotations and have been derived from diverse perspectives. Some studies referred to errors in a similar way as omissions. For example, one study regarded omissions as errors or strategies in simultaneous interpretation of presidential debates (Ahmed, 2018). However, errors in interpreting studies are generally considered deviations from the original speech or the norms of the source language. These errors typically include omissions, additions, and substitutions (Liu, 2011; Baker and Diriker, 2019). In addition to these three types, paraphrases are often classified as errors in interpreting (Schachter, 1974; Wang, 2019; Shao and Chai, 2020). A few studies also included concepts that are more related to language accuracy such as mistranslations, semantic changes or inaccuracies, in addition to omissions, additions and substitutions (Barik, 1975; Wang, 2014, 2015; Tiselius, 2018; Bozok and Kıncal, 2022).

There are also a few studies that placed emphasis on the accuracy of the target speech and approached errors from a more linguistic perspective. This can involve syntactic or semantic inaccuracies. For instance, a study analysed syntactic errors (incorrect grammar structure, verb-subject agreement) and pronunciation errors (incorrect word pronunciation, stuttering) in the target speeches made by trainee interpreters during simultaneous interpreting (Mohammed, 2017). In another study, the researcher investigated language errors (grammatical correctness), meaning errors (semantic correctness) and phonological errors (pronunciation correctness), in addition to omissions (Gile, 2011). Some research did not investigate language accuracy but focused on features related to speech fluency such as pauses and hesitations (Tissi, 2000; Stewart *et al.*, 2018).

It is also noted that the definition of errors and inaccuracies in interpreting studies can vary depending on the specific research project and context. A few studies defined errors in the context of their specific projects. For example, in a research project focusing on simultaneous interpreting of numbers, errors were defined as inaccuracies in numbers in the target speeches (Cheung, 2008). Similarly, incorrect interpretation of figures occurred during simultaneous interpreting were regarded as errors in a study (Hamid, 2019). In another study about repairs in simultaneous interpreting, errors were defined as added mistakes, including pauses, false starts, self-corrections, and slips of the tongue (Dailidėnaitė, 2017).

In this study, the definition of errors borrows concepts from Gile (2011), which includes language errors (grammatical correctness), meaning errors (semantic correctness) and phonological errors (pronunciation correctness). These errors do not conform to the norms of the target language and result in wrong renditions of the source speech. The following examples demonstrate the typical error of each type.

- Language error

  ST: …my brain is exploding.

  TT: …我的大脑正在蓬勃发展。

  BT: …my brain is developing vigorously.

  (Participant 23)

  The speaker used "exploding [brain]" to vividly express the surprise or shock he got. However, here the interpreter interpreted "exploding" as "蓬勃发展", which is commonly used to describe the fast and prosperous development of an incorrect industry, resulting in a wrong lexical collocation between "brain" and "developing vigorously".

- Meaning errors

  ST: You can fly like a squirrel.

  TT: 就可以像蝙蝠一样飞行了。

  BT: can fly like bat.

  (Participant 5)

  In this example, "squirrel" was interpreted as "蝙蝠" (bat), which is an incorrect rendition of the source text. In other cases, interpreters may add information that was not in the original speech, such as the example below.

  ST: …Chinese living in America, Britain, Australia, Canada…

  TT: …他们在美国、澳大利亚、新西兰…

  BT: …they are in America, Australia, New Zealand…

  (Participant 30)

In this case, the interpreter said "New Zealand", but the speaker did not mention "New Zealand" at all in his speech. Therefore, "New Zealand" was incorrectly added by the interpreter, resulting in a meaning error.

- Phonological errors:

  ST: …like a flying squirrel.

  TT: …就像松（shōng）鼠（shǔ）一样。

BT: …like squirrel.

This pronunciation of ‘松鼠’ (English: squirrel) is sōngshǔ, but here the first character ‘松’ (sōng) is pronounced as ‘shōng’. The consonant ‘s’ was pronounced as ‘sh’, resulting in a phonological error.

(4) Incompletion

Incompletion has been considered a type of difficulties in simultaneous interpreting that affects the accuracy of interpretation (Gile, 2001). Sometimes, the concept of incompletion may overlap with omissions, which are considered incomplete renditions of the speech (Korpal, 2012; Khemlani *et al.*, 2020). Incomplete sentences are commonly used in linguistics and cognitive science as an indicator of high cognitive load or a weaker language system (Banovic, Zunic and Sinanovic, 2018; Nasiri *et al.*, 2022). Research has found that interpreters tend to have more incomplete segments at the beginning of sentences in simultaneous interpreting than in consecutive interpreting (Gile, 2001). The sudden occurrence of incomplete sentences may reflect heavy cognitive burden on the interpreter.

To provide more insights into the influence of emotions on the cognitive process of simultaneous interpreting, this project also considers speech difficulties at sentence level (i.e., incomplete sentences). Specifically, incompletion refers to the instance that occurred when a participant failed to complete an utterance and did not attempt to compensate. A self-correction by the interpreter is not regarded as an instance of incompletion.

Example:

ST: …these interc-interconnect in very very important ways, **especially** <u>when you're talking about learning.</u>

TT: …我们要注意到他们之间的互相连接，**尤其是**。

BT: …We need to note the interconnections between them, **especially**.

(Participant 11)

In the above example, the interpreter suddenly stopped interpreting the current sentence after ‘especially’ (in bold), without any attempt to compensate. As a result, the underlined part of the original sentence was completed omitted. This may indicate suddenly high cognitive load to the interpreter.

2.6 Theoretical Framework

This section provides an overview of key theoretical works that together lay the foundation for this research project, including the processing model of simultaneous interpreting (Setton, 1999), the theory of communication (Jakobson, 1960), the theory of constructed emotion (Barrett, 2014) and the model of perceptual processing (Solomon, 2010). A diagram was drawn to show the connections between these works, as shown below.

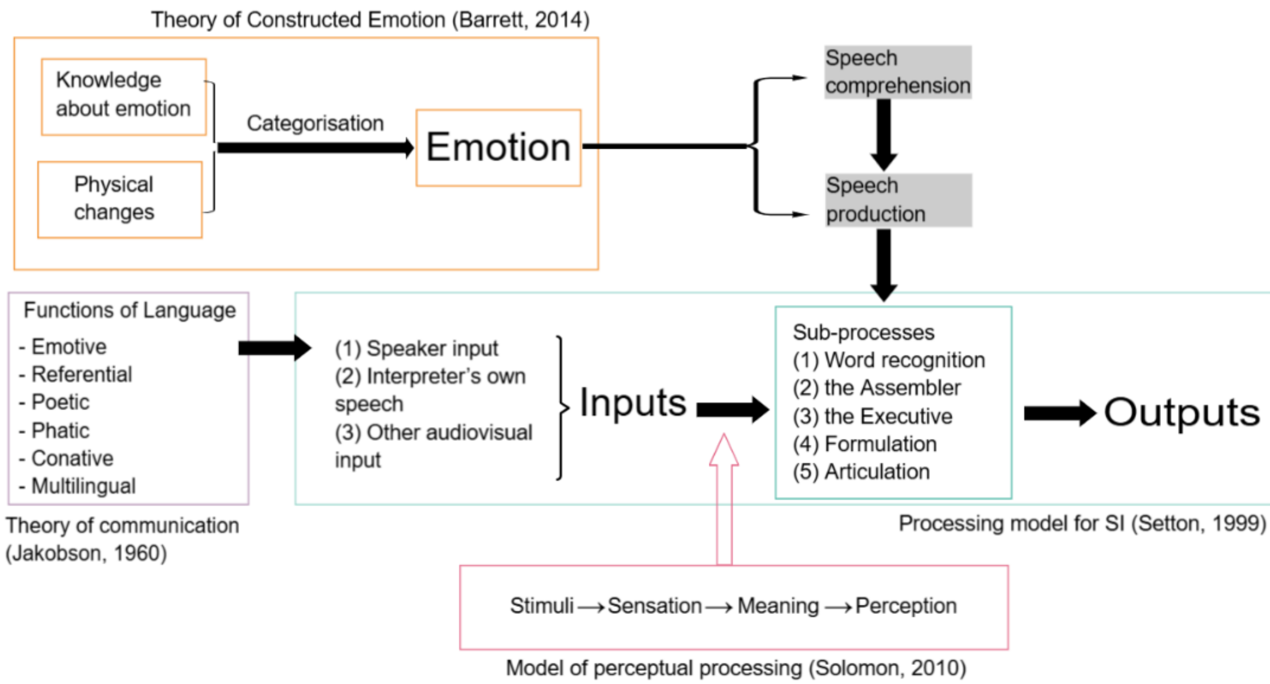


Figure 9. Diagram of the theoretical framework

The processing model of simultaneous interpreting (Setton, 1999) sets the basis for the understanding about the process of simultaneous interpreting. Specifically, it points out how the target speech (outputs) is produced from three main types of inputs (the speaker's input, interpreter's own speech and other audiovisual inputs) through five key subprocesses: (1) Word recognition, (2) the Assembler, (3) the Executive, (4) Formulation, and (5) Articulation. Given the linguistic and cognitive basis of this processing model, these inputs and key subprocesses can then be connected to models of communication and emotion. They also provide a reference for the design and analysis of materials for the experiment.

Solomon's 2010 model of perceptual processing is centred around understanding how humans perceive and process sensory information. It is built upon foundational theories in the field of cognitive psychology and neuroscience, integrating concepts such as bottom-up and top-down processing, parallel processing, feature integration, and Gestalt principles (Freeman *et al.*, 2012; Panichello, Cheung and Bar, 2012; Wang, Hahm and Hammer, 2022). This model offers insights into how different sensory inputs are processed, which is often not explained in detail in interpreting models. It also highlights the role of attention in the shaping of perception, which gives a potential link to emotion.

The theory of communication (Jakobson, 1960), particularly the model of functions of language, offers a way for the researcher to understand (1) the role of language in verbal communication (which is a key in interpreting); (2) six functions of language for different purpose and addressee (including Butow, referential, poetic, phatic, conative and multilingual); (3) how emotion is conveyed through language at the textual level. This provides insight into the analysis of the source and target speeches from simultaneous interpreting.

The theory of constructed emotion (Barrett, 2014) lays the foundation for the core understanding of emotion, i.e., how the emotion is made. This is important because of the great inconsistency in the definitions of emotion and their theoretical basis. This theory takes a psychological constructionist approach and link emotions with the functions of the brain and addresses the impact of social influences on emotional experiences. This is very important for interpreters, considering the social nature of the interpreting task and them as providers of emotional labour. With the theoretical basis of the construction of emotion, this study then draws insights from existing literature about the impact of emotion on speech processing, particularly comprehension and production. These two key processes are then considered within in the context of simultaneous interpreting to explore the influence of emotion on the processes during simultaneous interpreting, which then leads to the influence of emotion on interpreters' performance in general.

2.7 Summary

This chapter has provided an overview of past research on emotion-related concepts in interpreting studies, such as empathy, affect and meta-emotion. Relevant theories, models and studies have also been introduced in this chapter to facilitate understanding about the foundation of this research project. The 'affective' role of interpreters in communication during simultaneous interpreting is still very invisible. Despite efforts in previous studies, there is a lack of empirical evidence about the influence of emotion on student interpreters' performance in simultaneous interpreting, showing the necessity of research in this area.

Chapter 3. Methodology

This research project adopted a mix-method approach to investigate the impact of positive and negative emotions on the performance of student interpreters in simultaneous interpreting. Both qualitative and quantitative data were collected and analysed. A combination of physiological measurement, self-assessment, and in-depth interviews were adopted for the measurement of interpreters' emotional states. Interpreters' target speeches were recorded and analysed with complementary data from interviews. Given the complexity of interdisciplinary research, the design of this study was developed in five phases to ensure its validity, reliability, and feasibility.

This chapter will first explain the five phases to provide context for understanding the study design in general (Section 3.1), and the following sections will present the characteristics of participants (Section 3.2), instruments used in the experiments (Section 3.3), the procedure of experiments (Section 3.4), types of data and ways of collection (Section 3.5), cleaning of data for preparation of analysis (Section 3.6), methods for analysing different types of data (Section 3.7).

3.1 Phases of study

This research involves six phases of study. This section will describe the research design by first providing an overview of the phases, followed by a more detailed description of the design of formal experiments. Study phases are presented in the figure below:

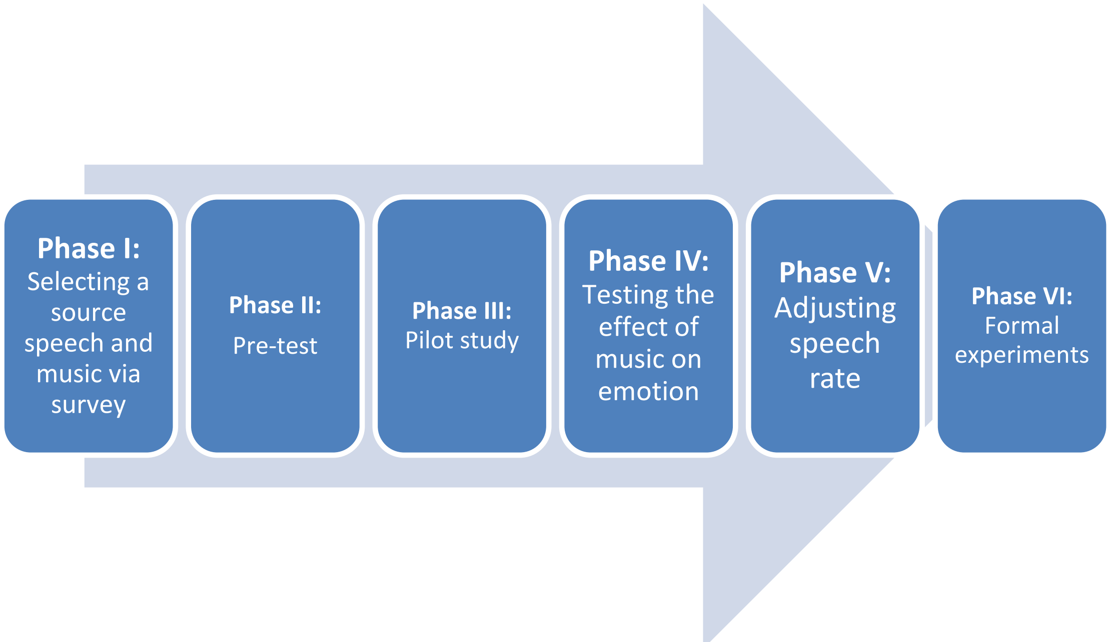


Figure 10. Flowchart of study phases

During **Phase I**, key materials, including the source speech and the music for emotion induction, were rated via an online survey by 13 respondents who shared similar profiles as participants in the pilot study and formal experiments. Based on rating results, the most neutral and the most emotive music (positive and negative) were determined for the next phase.

Phase II aimed to test instruments and estimate the duration of each task designed in the procedure so that the researcher could set the duration for each task (called 'module' in the eSense app). One participant was invited for testing the procedure. All equipment and software for the experiment were tested functional. Time used for each task was recorded, which was used as a reference for setting module time in the eSense app. Based on the participant's feedback, other necessary adjustments were made, including revising the wording of instructions on the eSense app and changing the originally designed PowerPoint slides for testing emotional granularity to a simple rating form.

A pilot study was conducted during **Phase III** to test the whole experimental procedure. A total of six participants took part in the pilot study, including 3 current and 3 past Stage 2 students on the postgraduate Translating and Interpreting programme at Newcastle University. Results of the pilot study show that participants with prior SI experience tended to experience more fluctuations in skin conductance responses, though the effect was only observed during SI preparation. The selected music pieces from Phase I did not seem to have exerted strong simulating effects on participants in the pilot study, which could be related to the use of an online questionnaire when the music was played. While most of the participants believed that they were not emotionally affected by the questionnaire, their attention might not be fully given to music due to the distraction from the questionnaire. Therefore, the questionnaire was removed from the procedure to minimise distraction. Moreover, it was also observed that 2 minutes was not long enough for the majority of participants to return to their baseline, and 4 minutes seemed to be a more reasonable duration.

To test the duration of baseline and ascertain the effect of music, a separate experiment was conducted in **Phase IV** to measure participants' emotional responses to the selected music pieces via self-reporting and GSR monitoring. 45 participants were recruited, among which 2 withdrew from the experiment. According to experiment results, the vast majority of participants returned to their baseline status in 4 minutes, and the music pieces were effective in inducing negative and positive emotions when they were played twice (6 minutes in total). Considering these results, the duration of tasks was adjusted accordingly in the eSense app.

Phase V was aimed at adjusting the source speech. The result of the pilot study showed that half of the participants considered the speech fast. To reduce the potential impact of speech rate on interpreters' performance, the original speech was slowed to varying rates, and most natural version was selected through a survey.

Formal experiments were performed during **Phase VI**, and details of the design of experiment are presented in the following subsections.

3.2 Participants

To address the research questions, the experiment in this study was designed to investigate the performance of student interpreters. The target population was the group of students enrolled in a translation and/or interpreting programme at a postgraduate level and have received formal training in simultaneous interpreting. Participants in this study were recruited from the same university to reduce the influence of differences in interpreting programmes across universities.

A total of 30 participants were recruited for experiments, and the data of 27 participants were included for analysis. All participants were enrolled in a translation and/or interpreting programme at a postgraduate level at Newcastle University and have received formal training in simultaneous interpreting at the time of participation. The distribution of their characteristics is presented in the table blow.

Table 3. Demographic characteristics of the participants

Variables	**Number**	**%**
Gender		
Female	22	81.5%
Male	5	18.5%
Work Experience in SI		
None	22	81.5%
Less than 1 year	4	14.8%
1-3 years	1	3.7%

In general, the sample consisted of higher numbers of females over males. Most of them do not have professional experience of simultaneous interpreting in the industry. For participants in each stage of study, they were randomly assigned to three equal groups, i.e., the positive group (P), the negative group (N), and the control group (C). Participants in the experimental groups (i.e., P and N) respectively received stimulation from positive and negative music, while participants in the control group were not exposed to emotional stimuli before the interpreting task.

3.3 Instruments

This subsection introduces different types of instruments used in the study, including music excerpts for emotion induction (Subsection 3.3.1), the source speech for simultaneous interpreting (Subsection 3.3.2), the self-assessment manikin scale for participants to rate their emotional states

(Subsection 3.3.3), devices for collecting and monitoring participants' skin conductance responses (Subsection 3.3.4), a rating scale for assessing participants' emotional granularity levels (Subsection 3.3.5), a glossary (Subsection 3.3.6) and PowerPoint slides (Subsection 3.3.7) for supporting participants' preparation for the interpreting task, and supplementary devices for monitoring the environment of the interpreting booth (Subsection 3.3.8).

3.3.1 Emotional stimuli

In this project, music was used as stimuli for inducing participants' emotional responses. It has been proven effective in emotion induction in literature (see Subsection 2.1.1). The fixation cross is also commonly used as a control (or neutral) condition in psychology and has been tested having no emotional inducing effect on participants (also see Subsection 2.1.1). Therefore, it was used as a neutral stimulus for the control group. An example of the fixation cross is shown below.

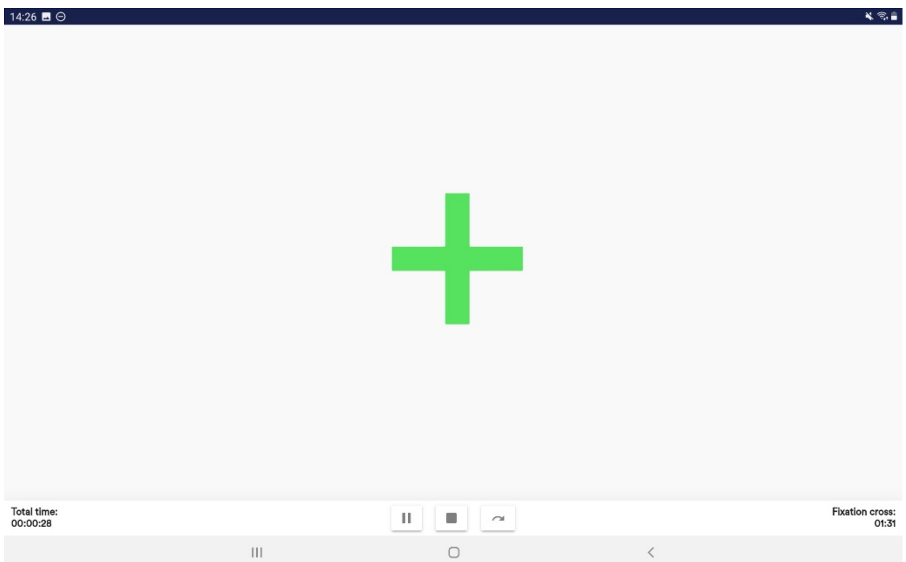


Figure 11. Screenshot of a fixation cross in eSense App

For the experimental group, this study used music as stimulus for inducing emotions. The music selection process involved three steps: First, 6 pieces of music were identified from the literature that were tested effective in eliciting emotions, including 3 for positive emotions and 3 for negative emotions. Three candidate pieces for positive emotions were: Bach's "Brandenburg concert No.2", Mozart's "Symphony in C major No.41", and Vivaldi's Violin concert E major Op.13 (No.12); three candidate pieces for negative emotions were: Albinoni's "Adagio", Edward

Elgar's "Cello Concerto in E minor, Op. 85", and Mahler's "Symphony No.5, fourth movement Adagietto".

Then, in the material preparation stage, 13 participants were invited to rate their emotional states with the SAM scale after listening to these pieces. All materials were randomised in the survey to avoid order effect and cumulative effect. Based on their ratings, the positive piece (Bach's "Brandenburg Concert No.2") was selected for inducing positive and the negative piece (Edward Elgar's "Cello Concerto in E minor, Op. 85") for inducing negative emotions, given participants' ratings of valence, arousal and familiarity with the music. Next, these two selected music pieces were used in a pilot study with 6 participants, and they were asked to report how they felt during the interview. The results showed that about half of the participants felt the music had little effect on their emotions, which was inconsistent with the literature, possibly due to the short 3-minute duration of the music excerpt.

To verify the pieces' effect on emotion induction, a separate experiment was conducted, increasing the duration of emotion induction from the initial 3 minutes to 6 minutes by playing them twice consecutively. 45 university students used the same SAM scale as the pilot study, and their skin conductance was monitored with the Mindfield eSense Skin Conductance device to assess changes in their emotions before and after listening. Results showed the two selected pieces could induce emotional changes in participants. Mean deviation (MD) and p-value were calculated. Participants in Group N reported a decline in valence ($MD = -0.9$; p-value = 0.053) and a significant increase in arousal ($MD = 2.1$; p-value = $<.001$) after listening to the negative music. In comparison, there was a significant increase in both valence ($MD = 0.86$; p-value = 0.017) and arousal ($MD = 1.09$; p-value = 0.018) for Group P after listening to the positive music, showing the effectiveness of the selected positive music in inducing strong positive emotions. Regarding mean skin conductance, the positive music generally induced very strong emotional responses at the significance level of 0.05 ($\Delta SC = .640$; p-value = $<.001$), while the negative music generally induced high changes in skin conductance but not at statistically significant level ($\Delta SC = .210$; p-value = .059). Given the above, these two pieces were effective in inducing students' emotional responses, so they were chosen as stimuli to induce positive and negative emotions in the formal experiments. Specific information about the selected pieces is listed in the table below.

Table 4. Features of the selected negative and positive pieces of music

Type of Stimulus	*Composer*	*Title*	*Pre-processing*	*Valence score*	*Arousal score*
Negative	Edward Elgar	"Cello Concerto in E minor, Op. 85"	0 min 9 s – 3 min 9 s (last 2 s 26 ms fade out)	3.83	5.50
Positive	Johann Sebastian Bach	"Brandenburg concert No.2"	0-3 min (first 1 s 20 ms fade in + last 6s 62 ms fade out)	7.50	5.33

Each excerpt is in the length of 3 minutes and was played twice consecutively, making the total duration of 6 minutes. The musical excerpt used for positive induction was the 0-3 minutes of the first movement (Allegro) of "Brandenburg Concerto No. 2" in F Major (BWV. 1047) composed by Johann Sebastian Bach and performed by The English Concert. It was processed in Audacity 3.1.3 with the first 1s 20 ms fade in and the last 6s 62 ms fade out. The music excerpt for inducing negative emotion was 0 min 9 s – 3 min 9 s of "Elgar's Cello Concerto" in E Minor (Op.85) performed by the Jacqueline du Pré and the London Symphony Orchestra. It was processed in Audacity 3.1.3 with the last 2s 26 ms fade out.

3.3.2 Source speech

The source speech was a key material in this study. It was chosen with careful considerations based on literature, surveys and testing in the lab.

The following characteristics of the source speech were considered. First, the speech should be relatively emotionally neutral to reflect real-life needs in conference interpreting. It should be noted that this study does not intend to separate interpreters' perceived emotions of the source speech and music. The focus is on the exploration of their interpreting performance when they are under the influence of emotions. Additionally, the difficulty of the speech should be lowered in several ways to facilitate the interpreter's task. The speech rate needs to be controlled, as this has a great impact on the interpreter's performance in simultaneous interpreting. A moderate and consistent pace is ideal. Additionally, a standard English accent should be chosen, as this is more accessible and familiar for the interpreter compared to regional or non-native accents. Furthermore, the source text should not contain an excessive amount of technical or specialized terminology. Providing supporting materials like a PowerPoint presentation and glossary can further help the interpreter prepare for and navigate the content. Finally, the overall topic of the speech should be general in nature and familiar to the interpreter, rather than a highly specialized or obscure subject matter. For recorded speeches, the video recording should have clear sound quality and a clear view of any visual aids like PowerPoint slides that are used.

To select the source speech that meets the above criteria most, this study first found six candidate speeches from *TED* and *TED x* Talks on YouTube. Their lexical density levels were analysed through an online text analyser 'Analyse My Writing', and their text sentiment scores were calculated with the 'Sentiment Analyzer'. 13 raters who shared a similar background as the participants of the formal experiments were recruited to evaluate the emotionality and difficulty of the speeches via an online survey, and 12 responses were returned. Speech emotionality was rated using 9-point Self-Assessment Manikin (SAM) scale (see detailed description in Subsection 3.3.3), and speech difficulty was evaluated on 1-10 Likert scale. The survey was distributed online, so the participation of the raters was not monitored in an experimental environment. To ensure the validity of rating, an accuracy question was added to each speech, and ratings for a speech were counted only if the answer to the accuracy question was correct. Based on rating results, the most neutral and easiest speech was selected, and its characteristics are presented in the table below.

Table 5. Features of the selected source speech

Category	*Description*
Title	How to learn any language in six months
Language	English
Source	TEDx Talks
Speaker	Chris Lonsdale
Speaker profile	Native English speaker from New Zealand, psychologist, linguist, and educator
Length (min:sec)	18:26
Video resolution	720p

Lexical density	47.67%
Words per minute	167
Text sentiment score	-7.0 (neutral)
Difficulty rated by participants	6.0 (1=extremely difficult; 10=extremely easy)
Valence rated by participants	6.18
Arousal rated by participants	4.18
Valence-arousal mean	5.18

The selected speech was then used in Phase II (pre-test) and tested in Phase III (pilot). Pilot study involved six participants that shared a similar profile as the formal experiments. Their ratings of the source speech's emotionality were obtained and compared with those in the material selection stage.

Table 6. Comparison of valence-arousal ratings between stages of study

Dimension	Phase I	Phase III	Rating Difference
Valence	6.18	6.5	+0.32
Arousal	4.18	5.33	+1.15

The table shows that the source speech was perceived as slightly more positive and intense in Phase III than in Phase I, possibly due to the immersive experience of SI in Phase III. Similar to the result in Phase I, participants in the SI setting also considered the speech easy, with an average score of 3.83 out of 10 (10 = extremely difficult). The vast majority (5 out of 6) found the length of the source speech moderate, which means that it was not too long to cause any cognitive overload. Regarding accent, 83.3% participants agreed that the speaker was easy to understand and would not affect their performance. However, mixed opinions were expressed when it comes to speech rate. While half of the participants rated the speech as fast, the other half rated moderate. The original delivery speed of the source speech is 167 WPM, which is considered very fast for interpreters in literature but natural to native speakers.

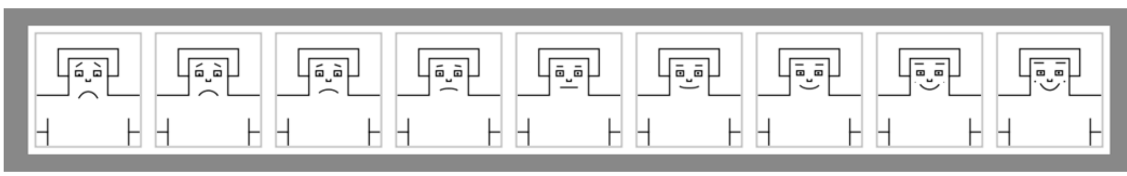
To reduce the potential impact of speech rate on interpreters' performance, the source speech was slowed to varying speech rates. The original rate of the speech was adjusted to 0.85x, 0.8x, 0.75x, and 0.7x, with the WPM being 141, 131, 125, and 115, respectively. The slowed video clips were trimmed to around 15 minutes at a complete sentence. After excluding the fastest version (0.85x) and the distorted version (0.70x), a small online survey was conducted to select the most natural version out of the rest two versions. Based on survey results, the version at the speech rate of 131 WPM was selected as the final source speech for formal experiments.

3.3.3 The Self-Assessment Manikin Scale

To understand how participants felt before and after each task, this study used the 9-point Self-Assessment Manikin (SAM) scale to collect their self-reported emotional states, as shown below.

Valence:

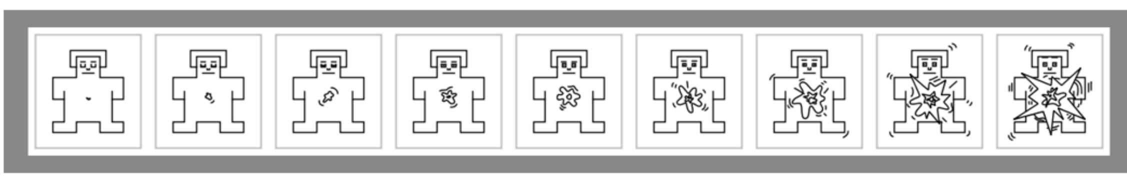
Please tick '✓' a figure that best represents how you currently feel, in terms of valence.



1 (unhappy)	2	3	4	5	6	7	8	9 (happy)

Arousal:

Please tick '✓' a figure that best represents how you currently feel, in terms of arousal.



1 (calm)	2	3	4	5	6	7	8	9 (excited)

Figure 12. The 9-point SAM scale

The scale was used at various points in the experiment to monitor changes in participants' emotional states before and after a task. This can offer a better understanding of how their emotions would change throughout the experiment when different factors (e.g., preparation, listening to music, interpreting) were present, so as to explore the impact of emotions on interpreting and potential influencing factors. First, participants in both groups rated their emotions with the scale after looking at a fixation cross at rest, establishing an initial baseline. Next, they rated emotions again after the preparation of interpreting, which tested the influence of preparation on emotions. Participants then rated their emotions a third time, with the experimental group listening to music and the control group simply viewing the fixation again. This measured the specific impact of the stimulus on the participants' emotions. Finally, all participants rated their emotions after the interpreting task to provide understanding about how their emotional states changed over the period of interpreting.

The SAM scale used in the formal experiments was the same as the one in the stage of material selection and the pilot study, which achieved a Cronbach's alpha of 0.75 based on the calculation of ratings from the pilot study, indicating adequate internal consistency. A rating guide (see Appendix 4) was provided to participants prior to the experiment to facilitate their understanding about the definition of valence and arousal, timing of rating, and descriptions of the pictures. They were also offered the opportunity to ask questions about the scale before giving consent to take part in the experiment. The definition was quoted from the study by Citron *et al.* (2014) and the descriptions from Imbir's study (2015), both of which were found easy to understand by participants in the stages of material selection and pilot.

3.3.4 Devices for skin conductance monitoring

To monitor participants' emotional responses throughout the experiment, this study measured their skin conductance using the Mindfield eSense Skin Response device (sensor). The device had been tested during preliminary studies, and equipment specifications are listed below.

Table 7. GSR equipment specifications

Category	**Description**
Input device	Tablet
Tablet model	Samsung Galaxy Tab A 10.1-Inch 32 GB Wi-Fi - Black (UK Version)
Headphone jack	3.5 mm
Operating system	Android
Type of electrodes	Clip-on finger electrodes
Connection of electrodes	Wire through the press button connectors
Positions of electrodes	Index and middle fingers of non-dominant hand

Format of exports	.csv or .pdf

For each participant, two clips were put on the fingertips of the index and middle fingers of the participant's non-dominant hand, which were connected to the eSense Skin Conductance device to measure the activity of sweat glands, as shown below.

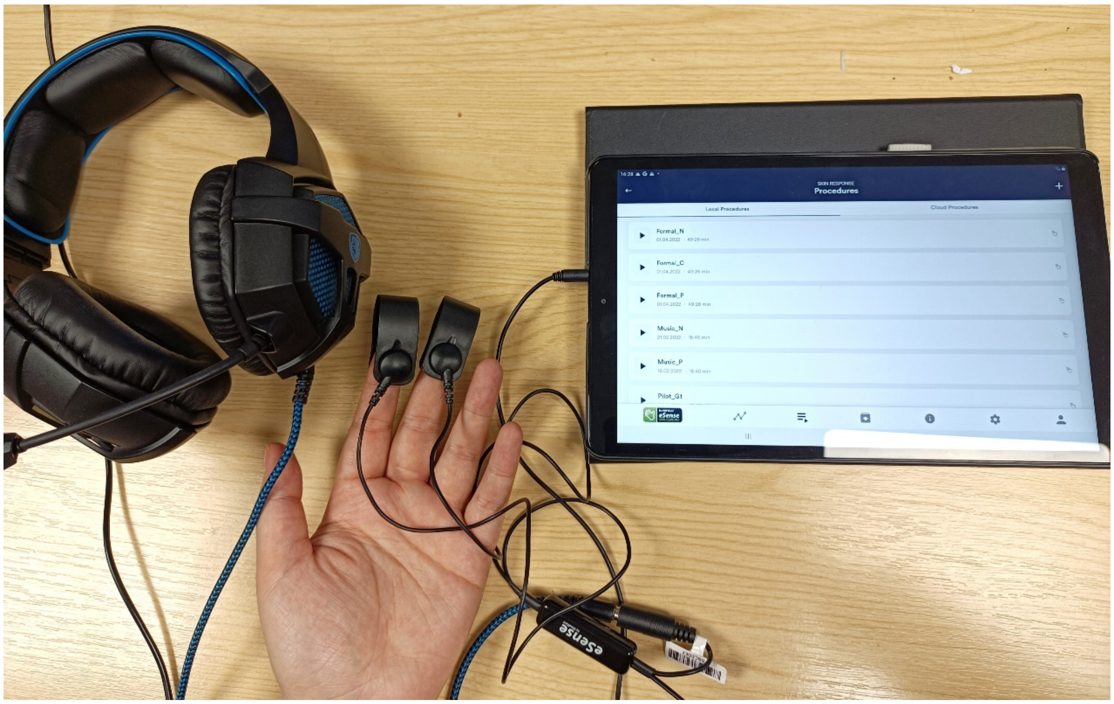
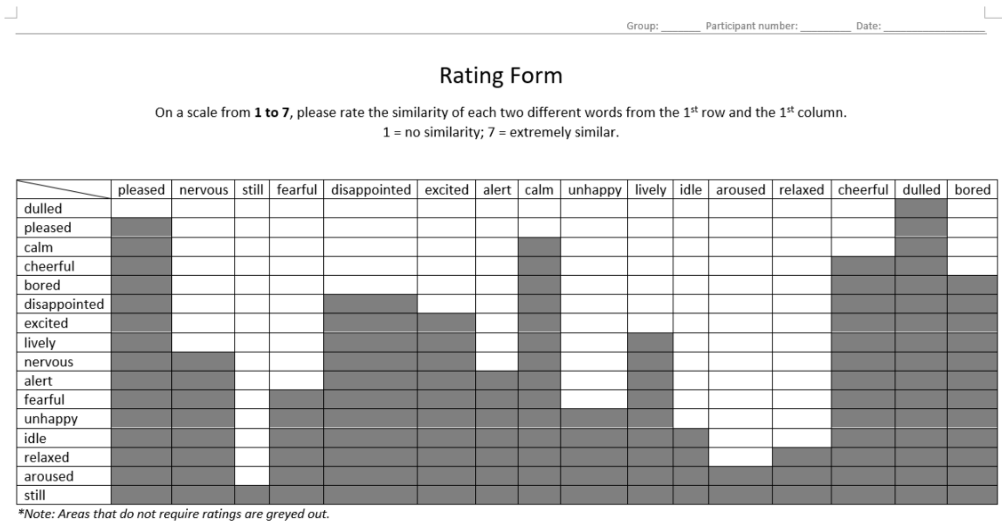


Figure 13. Application of clip-on sensors

The other end of the eSense device was connected to a digital tablet via the microphone input of the tablet. The Mindfield eSense App was installed onto the tablet to set up the procedure of the experiment and receive data collected from the device. The eSense Web App was used for the researcher to monitor the measurement of skin conductance in real team, to ensure the correct setup and timely response to any sudden signal loss.

3.3.5 Emotional granularity test

Participants' ability to differentiate emotional states (i.e., emotional granularity) can affect their perception and experiences of emotion (see Subsection 2.1.1). Taking into this influencing factor, the study also measured their emotional granularity. It was measured by using the following rating form, which collects the rating scores for the similarity between each two different words from the set of 16 words on a scale of 1 to 7 where 1 refers to no similarity, and 7 means extremely similar. The 16 words were taken from the circumplex model of affect (Barrett, 2004, p. 266) and include *excited*, *lively*, *cheerful*, *pleased*, *calm*, *relaxed*, *idle*, *still*, *dulled*, *bored*, *unhappy*, *disappointed*, *nervous*, *fearful*, *alert*, and *aroused*.



Group: ______ Participant number: ________ Date: _______________

Rating Form

On a scale from **1 to 7**, please rate the similarity of each two different words from the 1st row and the 1st column.
1 = no similarity; 7 = extremely similar.

	pleased	nervous	still	fearful	disappointed	excited	alert	calm	unhappy	lively	idle	aroused	relaxed	cheerful	dulled	bored
dulled																
pleased																
calm																
cheerful																
bored																
disappointed																
excited																
lively																
nervous																
alert																
fearful																
unhappy																
idle																
relaxed																
aroused																
still																

**Note: Areas that do not require ratings are greyed out.*

Figure 14. Emotional granularity rating form

Ratings will be collected for analysis which will be explained in more detail in Subsection 3.5.2.

3.3.6 Glossary

A glossary was created to facilitate interpreters' preparation and lower the difficulty of the interpreting task. The types of terms in the glossary were selected based on an AIIC survey of glossary practice of conference interpreters (Jiang, 2013) and the Practical Guide for Professional Conference Interpreters (AIIC, 1999). Four top types were selected according to their relevance with the source speech, including (a) names and titles of people; (b) names of organizations; (c) technical terms; (d) words and phrases. Questions about the usefulness of the glossary were added to the list of interview questions. During the pilot study, all participants agreed that the glossary list provided for preparation was useful, with 50% 'somewhat useful', 33.3% 'very useful', and 16.7 % 'extremely useful'. Some participants suggested that the glossary could be further improved by grouping terms of a similar category together (e.g., names), so the glossary was further improved to reflect such a change. The final glossary used in the formal experiments is presented in Appendix 3.

3.3.7 Slides of the source speech

The slides shown in the original speech video were obtained as screenshots, which were then converted into a PowerPoint to facilitate interpreters before and during interpreting. All but one slides were obtained. The one was not obtained because it was an animation about mouth positions for pronunciation in a speech video, but it was not required to be interpreted anyway. All participants during the pilot study agreed that the PowerPoint presentation (PPT) slides provided for preparation was useful, with 16.7% 'somewhat useful', 16.7 % 'very useful', and 66.7 % 'extremely useful'. The slides were originally printed one-sided, with one slide per A4 paper. Participants thought they were too thick and made them worried during the preparation of the interpreting task. To address this comment, four slides were printed on one page to reduce the number of pages and retain the clarity of words in each slide.

3.3.8 Device for booth environment control

Temperature and humidity data were collected by using Govee high-precision thermo-hygrometer. The default comfortable level was set to a comfortable temperature range of 20–25.5 °C and a comfortable humidity range of 30-60%. For each experiment, the thermo-hygrometer was placed in the booth at least 20 minutes before the time of experiment. Data were stored in cloud and were exported as .csv files. According to Govee data, the average temperature and moisture were all in the comfortable range. During the pilot study, all participants also agreed that the working environment in the booth was comfortable to work in.

3.3.9 Interview protocol

Retrospective interviews were conducted immediately after the simultaneous interpreting task to explore participants' emotional states, perceived task difficulty, and their interpretations of omissions, errors, or incomplete renditions. The interviews followed a semi-structured format, combining a standard set of open-ended questions with researcher-led follow-up prompts.

The key questions (see Appendix 7) addressed participants' physiological and emotional reactions to the experimental stimuli, their experience during the interpreting task, perceived performance, and possible influencing factors (e.g., speech familiarity, difficulty, and delivery). These standardised items ensured consistency across participants while allowing space for individual variation in responses. In addition to the prepared questions, the researcher took real-time notes during the interpreting task and used these to guide follow-up questions on specific instances of omissions, errors, or incompletions observed in participants' output. These prompts were designed to elicit interpreters' reasoning behind particular performance issues and to identify whether such instances were intentional, strategic, or potentially emotionally influenced. Participants were not shown the transcript or any annotations in advance, and questions were phrased in an open, non-leading manner to preserve response neutrality. The interview protocol was developed through pre-tests and piloting, and the researcher had prior training and experience in interpreter performance assessment.

3.4 Procedure

The experimental procedure evolved through different stages, from the initial design to the pilot design, which was further adjusted for the formal experiments. A comparison of experimental designs is illustrated in the figure below.

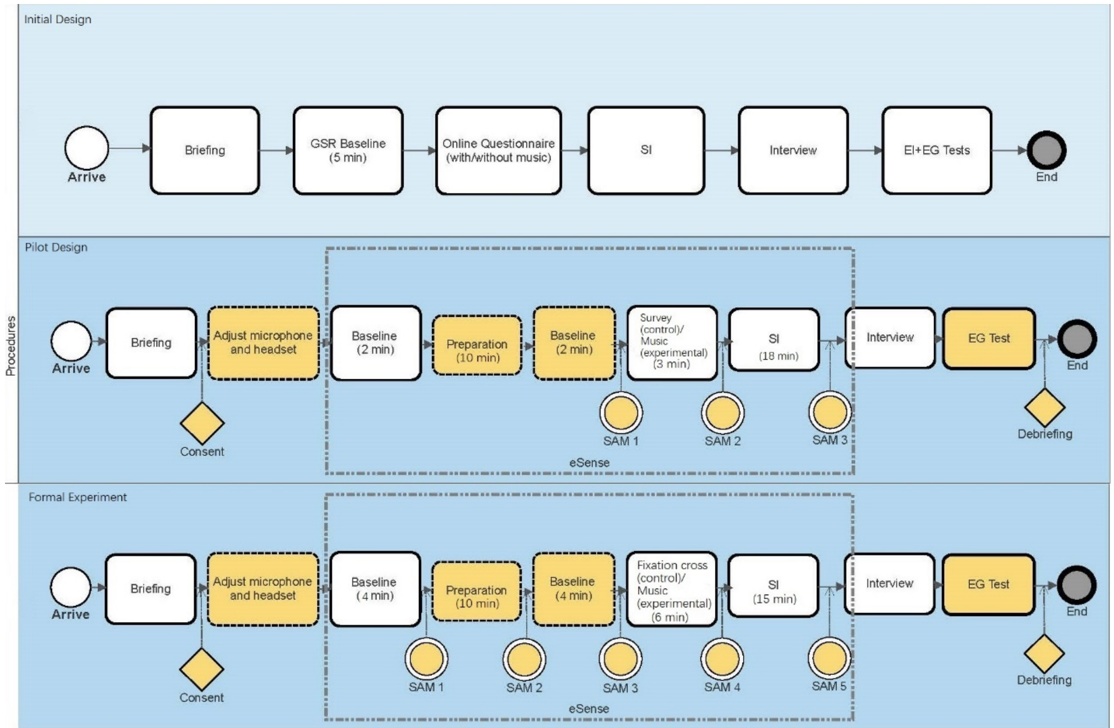


Figure 15. Comparison of different versions of experimental procedure

The procedure of the final formal experiment is as follows. Each experiment session only involved one participant and lasted around 2 hours. Upon arrival, the participant was briefed on the procedure of the experiment and given the opportunity to read the information sheet (see Appendix 1), the consent form (see Appendix 2), rating guidelines for the SAM scale (see Appendix 4) and ask questions before taking apart. If the participant decided to participate, two identical copies of the consent form were signed by both the researcher and the participant. One signed copy was given to the participant and the other copy retained.

After giving consent, the participant was asked to enter an interpreting booth. The booth was equipped with a computer monitor, a keyboard, a mouse, a switchboard for simultaneous interpreting, a headset, a tablet, the eSense device, a glossary, a form for emotional granularity test, a stack of A4 plain paper, and a pen. The participant was then asked to adjust the interpreting equipment (e.g., microphone and headset) to a comfortable setting. Next, two clips were put on the fingertips of the index and middle fingers of the participant’s non-dominant hand. The researcher would then start recording (Zoom and other recorders) and leave the booth. The participant was guided via Zoom to complete a structured sequence of tasks using the eSense App on a tablet. The participant first viewed a fixation cross for 4 minutes while sensor data were recorded. The participant then filled in the 1st SAM scale. This was followed by a 10-minute preparation task, during which participants were allowed to review the provided glossary and PowerPoint slides. After the preparation, the participant then completed the 2nd SAM scale. A second 4-minute baseline measurement was conducted (still viewing fixation cross), followed by the 3rd SAM rating. Next, the participant either listened to music (experimental groups) or viewed only the fixation cross (control group) for 6 minutes, then completed the 4th SAM scale. After that, the participant completed a 15-minute SI task. The 5th SAM scale was completed immediately after SI. All tasks were timed, and step-by-step instructions were built into the eSense App to ensure standardisation. An example of the experimental group's specific timing and task sequence is presented in Appendix [X].

After completing all tasks on the tablet, the researcher would be informed by the participant and then enter the booth to remove the finger clips. The participant would remain in the booth and be interviewed via Zoom. After the interview, the participant was asked to complete the emotional granularity rating form (Appendix 5). The experiment finished with a debriefing session during which the researcher would answer the participant's questions and provide feedback about the participant's performance. The participant would then leave the room.

3.5 Data Collection

This project has collected rich data from experiments. Different types of data were collected to investigate participants' emotions and their performance in simultaneous interpreting. This section first presents an overview of datasets collected from the main experiments and then gives a more detailed description about the data collected for evaluating participants' emotions and performance.

3.5.1 Overview

For each participant, five sets of data were collected in the main study, including 5 pages of ratings using the SAM scales, physiological data (eSense), 1 page of ratings of emotion words, one video recording (zoom), and three copies of audio recordings (zoom, voice recorder, and Sonus). The audio file generated from the zoom meeting contains the same verbal information as the video recording, just without visual information. The audio recordings from Zoom were used primarily for analysis. Several back-up recordings were generated using different devices to avoid data loss from technical issues. If any Zoom recording failed, other recording(s) would be used. Each recording is around 2-2.5 hours long, and approximately 70 hours of recording were collected in total.

3.5.2 Collection of emotion-related data

This project intends to understand participants' emotions from various dimensions, including their bodily responses to emotional stimuli, perception of emotion, and their ability in differentiating different emotions. For this purpose, various types of data were collected, which are introduced in the following subsections.

(1) Bodily responses

Participants' physiological data were collected using the Mindfield eSense Skin Response sensor to continuously monitor changes in the electrical conductance of the skin, which shows the level of arousal of emotions.
The sensor collected the tonic skin conductance level and the phasic skin conductance response (SCR) of the participant. The unit for skin conductance is microSiemens (μS). The sampling rate of the sensor is 5 Hz, with a minimum threshold of 0.01 uS. Three files were generated for each participant: a .csv file, an online report, and a .pdf file. The .csv file contains all raw data, such as date and time of recording, timestamps, minimum μS, maximum μS, number of SCRs per minute, markers for tasks, etc. The .csv file was pre-processed and used for creating diagrams and signal animation. The online report presents the above key data graphically, including an automatically generated diagram that shows the participant's response level against tasks. This report and the .pdf file were for reference only and will not be processed further for analysis.

(2) Self-reported emotions

The 9-point SAM scale was used to collect participants' self-evaluation of perceived emotion in two dimensions, valence, and arousal. Each SAM form produces two numerical values, one for valence and one for arousal. For each participant, 12 scores (6 valence and 6 arousal) were collected from the experiment at 6 time points: 1) after watching the 1st fixation cross; 2) after reading speech-related materials; 3) after watching the 2nd fixation cross; 4) after listening to music (experimental groups) or watching the 3rd fixation cross (control group); 5) immediately after interpreting; 6) after interpreting and during interview. 10 scores (at time points 1-5) were related to their own emotional states, and 2 scores (at time point 6) were related to their perception of the emotionality of the source speech. These scores were transferred from paper to Excel and then to IBM SPSS Statistics 28.0 for analysis.

(3) Emotional granularity

To evaluate participants' levels of emotional granularity, data were collected using the EG rating form (as mentioned previously) to assess their ability in differentiating emotion words. Each participant was asked to rate the similarity of each two different words from a "set of 16 emotion-related adjectives" (Barrett, 2004, p. 266) from 1 to 7, where 1 = no similarity, and 7 = extremely similar. The adjectives include *excited, lively, cheerful, pleased, calm, relaxed, idle, still, dulled, bored, unhappy, disappointed, nervous, fearful, alert, and aroused*. For each participant, 120 scores were generated from the rating. A total of 3600 scores were manually transferred from paper to Excel and then to IBM SPSS Statistics 28.0 for analysis. The analysis of these scores is introduced in Subsection 3.7.1.

3.5.3 Collection of target speeches in SI

The target speeches produced by participants were recorded in audio by using a recorder device (not connected to any other equipment) and the recorder on the computer (Sonus); Zoom was also used for collecting the videos of the whole experiment, which included the target speeches. The reason for using multiple recording platforms and devices was to avoid data loss and facilitate data analysis. Depending on the volume of the participant, one device may capture the participant's voice than the other. This would help the researcher to choose the one with the best sound quality and cross-validate speech records if one source was not recognisable during transcribing.

3.5.4 Ethics

Informed consent was obtained from participants for all experiments in this study. Participation in experiments was truly voluntary, and participants can withdraw from the study at any time without penalty or harm of any type. The research does not intend to cause any psychological distress or physical harm to the subjects. While the subjects may experience changes in emotions, such an effect is believed to last no longer than 2 minutes (Ribeiro *et al.*, 2019). There are no other foreseeable risks. Anonymity, privacy, and dignity of participants will be ensured. Research data have been kept confidential and meet the requirements of Data Protection Act 1998. Ethical approval was obtained from the Research Ethics Committee of Newcastle University.

3.6 Data Cleaning

To ensure data quality, raw experimental data were first checked to identify any missing values, outliers and extreme values. Three participants (i.e., P17, P18, and P21) were excluded from further data analysis due to extreme values or missing values. For Participant 17 (P17), extreme skin conductance values were identified, with the maximum of 16973.8 μS and the minimum of 0.09 μS, which do not fall in the normal human range of SCR (i.e., 1-5 μS), so P17 was excluded. Data markers were missing in Participant 18 (P18)'s data, meaning that the participant did not follow the procedure, so P18 was excluded. The data from Participant 21 (P21) was marked invalid because the participant only completed 1 out of 5 SAM scales, and the data of 4 scales were missing.

3.7 Data Analysis

In this project, rich data were collected from several tasks in the experiments to understand participants' emotions at various stages, their performance during simultaneous interpreting, and how emotion may influence their performance. Given the complexity of the project design, data were not analysed in a single way. This section explains the approaches to analysing various types of data. The arrangement of subsections are as follows: Subsection 3.7.1 will introduce methods for analysing data about emotion, and Subsection 3.7.2 will focus on the analysis of interpreters' target speeches in SI.

3.7.1 Analysis of emotion-related data

This project intends to understand participants' emotions from various dimensions, including their bodily responses to emotional stimuli, perception of emotion, and their ability in differentiating different emotions.

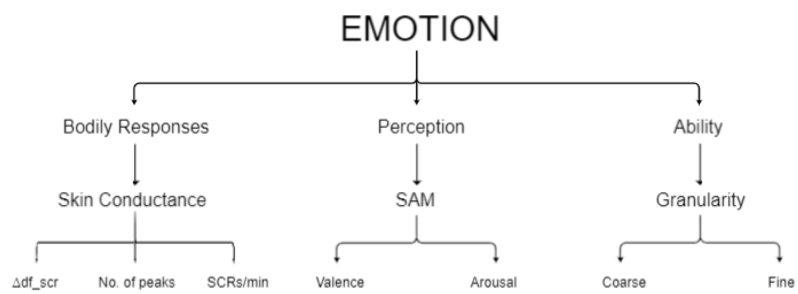


Figure 16. Structure of analysis of emotion

(1) Bodily responses

To understand a participant's emotional states during SI, the study calculated the difference in SCRs during SI and at resting conditions, number of skin conductance peaks, and the average number of SCRs per minute.

(1) Δ*df_scr*

The difference between the baseline value of SCR at resting conditions and the average value of SCR during SI (denoted as Δ*df_scr*) reflects the overall change in the participant's emotion. The larger the difference, the greater the change in SCR, and the stronger the emotional responses in general. Each participant had a different baseline SCR value, and this value was subtracted out from the participant's average SCR value during SI to obtain the difference in SCRs, i.e., Δ*df_scr*. The mean value of SCR during the whole experiment was also calculated to understand the potential lasting effect of induced emotion.

(2) Number of SCR peaks

A peak is defined as the local maxima in skin conductance data. In other words, if the SC value at time t is greater than the values at t-0.2 and t+0.2, it will be recorded as a peak value. For each participant, the number of peaks occurred during SI was counted, and the average value was calculated.

(3) SCRs/min

The number of skin conductance responses per minute (SCRs/min) reflects the participant's level of arousal. In general, a higher SCRs/min value indicates a higher level of arousal. According to existing literature and the eSense manual, 0-5 SCRs/min indicates a ‘relaxed’ state, 6-9 SCRs/min means that the participant is aroused, while values over 9 SCRs/min suggest a high level of arousal.

To ensure procedure consistency and data accuracy, SCRs/min values were collected using the eSense app. The app detects a start of an SCR event if any of the following two conditions is met: (1) the signal is constantly rising for 2 seconds; or (2) the difference between the current signal and the pretended base value (i.e., the first value in the current rising signal) is above 0.5 micro siemens. The app calculates SCR events within a one-minute time, thereby producing SCRs/min values. The values for each participant were processed in Excel for analysis. Specifically, participants' average SCRs/min values were calculated, to obtain an overview of their levels of arousal. Considering that participants finished their interpreting in different lengths (usually a few seconds after the 15-minute source speech stopped), only data for the first 903.8 seconds (15 minutes 3.8 seconds) were used for calculating mean values, which is the shortest finishing time of all participants. The mean values were then used to plot graphs.

(2) Self-reported emotions

In this study participants were asked to rate their emotional states using the 9-point Self-Assessment Manikin (SAM) scale at six time points, generating 6 sets of scores about their emotional states. The table below summarises the use of SAM ratings in this project.

Table 8. Scales used for various groups

SAM Scale	Experimental group	Control group	Purpose
1	after watching the cross (the 1st time)		Baseline at rest
2	after reading speech-related materials		Influence of preparation on emotion = SAM 2 - SAM 1
3	after watching the cross (the 2nd time)		Deviation from baseline after fixation = SAM 3 - SAM 1
4	after listening to music	after watching the cross (the 3rd time)	Change in emotion = SAM 4 - SAM 1 Influence of stimuli + recall/cross on emotion = SAM 4 - SAM 3
5	Immediately after interpreting		Influence of SI on emotion = SAM 5 - SAM 4
6	After interpreting and during interview		Perceived emotionality of the source speech

The first five SAM ratings were related their emotional states, while the last SAM rating was related their perceived emotion of the source speech. For each participant, changes in their emotions before and after a task was calculated by subtracting the score of the previous SAM scale from the score of the SAM scale after the task. For instance, to test where the participant's emotion was affected by listening to music, the scores from SAM 3 (before listening to music) was subtracted from SAM 4 (after listening to music), obtaining Score 3 (SAM 4 - SAM 3). The mean values of emotional changes in different stages of the experiment were calculated to compare group differences from two dimensions of emotion, i.e., valence and arousal.

(3) Emotional granularity

For each participant, a total of 120 scores were generated from the rating. These scores were processed following procedures in literature (Barrett, 2004). Scores were manually input into SPSS to generate a circumplex model of emotion, which shows emotion from two dimensions, i.e., valence and arousal. The circumplex model was obtained by generating a distance matrix of the adjectives through multidimensional scaling (ALSCAL) in SPSS. For ALSCAL, the interval for measurement was Euclidean distance, and values were transformed with Z-scores. A sample plot is illustrated below:

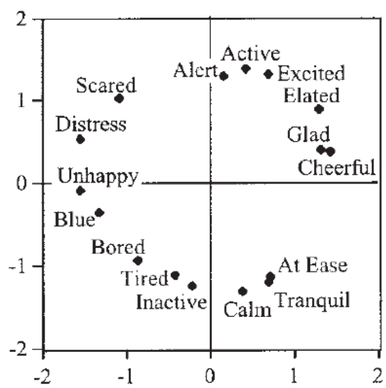


Figure 17. A sample plot of similarities between emotion-related adjectives
Extracted from (Barrett, 2004, p. 271)

In the above plot, the horizontal axis and vertical axis represent the valence dimension and the arousal dimension of emotion. The complexity of the circumplex plot can indicate each participant's level of emotional granularity. The higher complexity of the circumplex, the higher level of emotional granularity. The flatter the model, the lower emotional granularity. The plot above suggests a high level of emotional granularity. Depending on the shape of the circumplex model, participants' levels of granularity were classified as coarse (low) or fine (high). Participants with different levels of emotional granularity were then compared regarding their speech outputs, as well as perception of speech emotionality and speech difficulty. Statistical analysis was performed in IBM SPSS Statistics 28. Normality test was first run to determine the distribution characteristics of data. If the data conform to a normal distribution, then the independent sample t-test would be performed to test the differences in performance and perception between participants with different levels of emotional granularity. If non-normality, then the non-parametric Mann-Whitney U test would be conducted.

3.7.2 Analysis of target speeches in SI

The study adopts both deductive and inductive approaches to data analysis. Deductive analysis of interpretation transcripts provides a more objective view about the number and types of omissions from a linguistic perspective. Differential emphasis on the functions of language reflects the influence of emotion on communication. On the other hand, inductive analysis is based on retrospective interview, which presents a more subjective but deeper understanding about the causes of the occurrence of omissions/errors and the process(es) of simultaneous interpreting that may be affected by emotion. Since the participants only commented on their performance after the interpreting task, there are instances when participants failed to recall memories or give explicit explanations about a specific omission/error. Some omissions/errors were also not asked specifically during the interview.

To facilitate understanding, a diagram was produced to visualise the connections between different sets of data (see below).

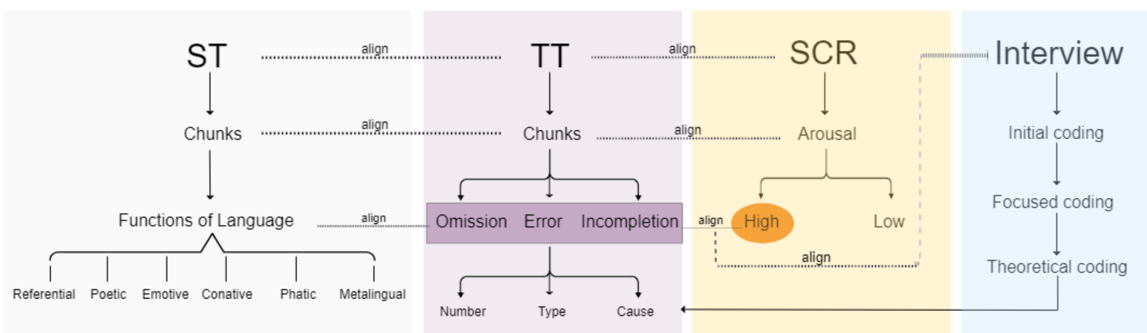


Figure 18. Diagram of analysis of performance in SI

This diagram shows how data sets were processed in general and connected with each other. The following subsections describe the details of different processes.

(1) Transcriptions

The recording of the source speech was transcribed by two YouTube transcribers. Before the pilot study, their transcription was checked by the researcher and an external checker who is a native English speaker on a doctoral degree programme. The audio recordings (Zoom) of the participants were transcribed at ifyrec.com and then double-checked by the researcher.

(2) Chunking of ST and TT

In the first attempt, the source text was segmented based on the information-based system (Lu, 2018). The system takes the view of information structure in linguistics and analyses the source/target speech with an *assertion* as the unit of measurement, which is defined as "the proposition expressed by a sentence which the hearer is expected to know or take for granted as a result or hearing the sentence uttered" (Lu, 2018, p. 794). The assertations were then categorised into thematic, redundant and situational assertions based on their relevant to the theme of the speech. The segmentation was completed by two raters, one with a background in linguistics, on with a background in interpreting studies. However, after segmentation, we noticed the system was not reasonable when it came to the segmentation of subordinate clauses, which could be very long but were still classified into one assertation. Therefore, in the second attempt, the transcriptions were analysis in the unit of chunks.

A chunk is defined as "a collection of elements having strong associations with one another, but weak associations with elements within other chunks" (Gobet *et al.*, 2001, p. 236). Chunking was performed by two raters (including the researcher), both had postgraduate degrees in interpreting studies and professional experience in conference interpreting. To increase chunking consistency, a guiding document was produced for the chunking task which lists the types of lexical chunks and their corresponding examples (see the table below). The types of chunks are based on (Lewis, 1993)'s classification of chunks.

Table 9. Types of lexical chunks

Types of lexical chunks	**Examples**
Polywords	as soon as, on the one hand, talk about, after all, and so on
Conjunctions	for example, as a result,
verb+noun	play the basketball, shake hands, catch a cold
adjective+noun	splendid future, strong possibility

noun+noun	portrait painting
verb+ adjective+noun	embrace the latest technology
verb+noun+noun	raise your blood pressure
verb+adverb	fail miserably
number+noun	three people
Fixed order	knife and fork, bread and butter
Catch phrases	Look! Up in the sky! It's a bird! It's a plane! It's Superman! (Adventures of Superman, 1952)
Institutionalized utterances	accepting: I would be happy to…
	offering: can I help you…
	supposing: If I were you…
Frames and heads	It is suggested that…; The fact is…; My point is that…;
Composition frames	firstly, secondly…, finally…
Lexical fillers	you know

The raters also had a meeting to make sure that they shared common understanding about chunking. Two raters then chunked the transcription of the source speech independently. Below is an example of a chunked sentence.

Example:

Original ST: People at the back, can you hear me clearly?

Chunked ST: People at the back, /can you hear me clearly?/

After chunking independently, their chunking results were compared in Microsoft Excel line by line to identify agreement and disagreement. If a sentence was not chunked in the same way by both raters, the raters would give their own reasons and reach a final agreed version after discussion. After resolving all inconsistencies, we obtained the chunked source text. The transcriptions of the target speeches of all participants were then chunked based on the chunked source text.

(3) Alignment of ST and TT

Transcriptions of participants' interpretation were aligned with the source text sentence-by-sentence in SDL Trados Studio 2019. Aligned files were exported as a bilingual document, with source text on the top and target text on the bottom. For each participant, a bilingual document was produced. These bilingual documents were then imported into NVivo for analysis.

Segment ID	Source segment
Segment status	Target segment
1	People at the back,1/ can you hear me clearly?2/
Translated (100%)	37:49 后面的人，朋友[1]/可以听到我的声音吗？[2]//

Figure 19. Example of an aligned bilingual document

(4) Alignment of physiological data and interpretation

Speech recordings were aligned with physiological data by time. After synchronising speech data and physiological data, bilingual documents were coded in NVivo against the physiological data based on the levels of SCRs/min: 0-5 SCRs/min, 6 SCRs/min, 7 SCRs/min, 8 SCRs/min, 9 SCRs/min, 10 SCRs/min. In general, 0-5 SCRs/min indicates 'relaxed' state, 6-9 SCRs/min means that the participant is aroused, while values over 9 SCRs/min suggests a high level of arousal. Levels above 10 SCRs/min were not identified in any participants' physiological data, therefore the highest level of SCRs/min is 10 SCRs/min.

(5) TT analysis

Participants' performance in simultaneous interpreting was evaluated by analysing three aspects of the target speech: omission, error and incompletion. As previous defined in Section 2.5.2, omissions in this project are defined based on Barik (1971)'s definition of omission, and refer to items that are originally present in the original speech but have not been included deliberately or accidentally in the target speech, exclusive of repetitions, false starts, as well as lexical fillers (e.g., you know, well, and, so) and unlexicalised fillers (e.g., uh, um). The definition of errors borrows concepts from Gile (2011), which includes language errors (grammatical correctness), meaning errors (semantic correctness) and phonological errors (pronunciation correctness). Incompletion refers to the instance occurred when a participant failed to complete an utterance, and a self-correction by the interpreter was not counted as an instance of incompletion.

Based on the definitions, any instances of error, omission, and incompletion were coded in NVivo. The numbers of chunks were then compared across groups to obtain an overview of participants' performance in simultaneous interpreting. To find out the influence of emotion on their interpreting output, all instances of omission, error, and incompletion were checked against participants' SCR levels to identify instances of omission, error, and incompletion that occurred when participants reached the arousal state (i.e., above 5 SCRs/ min). These were first categorised based on the level of SCRs/min and were compared across groups.

When it comes to the types of omission, error, and incompletion, all instances of omission, error, and incompletion at arousal states were categorised based on Jakobson's linguistic framework of functions of language. Specifically, the transcriptions of the target speech and the source speech were compared to identify the parts (chunks) of the source speech that were omitted, incorrectly rendered or not interpreted fully. Relevant parts of the source speech were then coded based on their functions: referential, emotive, conative, phatic, metalinguistic, and poetic. Different types of omission/error/incompletions were then compared across groups to find out similarities and differences.

(6) Interview transcription

During the interview, participants were asked about their performance to find out the causes of the occurrence of omission/error/incompletion. Their descriptions were analysed in a qualitative manner, inspired by (Charmaz, 2006). Three phrases of coding were involved: initial coding, focused coding, and theoretical coding.

Initial coding

Each instance of omission/error/incompletion was linked to the participant's description about the interpretation in the interview transcription. Annotations were produced to note down the key reasons the participants mentioned for the occurrence of omission/error/incompletion. Similar accounts were grouped into a code. Codes were constantly revised based on their similarities and differences. After initial coding, frequent initial codes were discovered, such as 'didn't hear it', 'didn't know how to express in the target language', 'it was not key information' and 'I thought I interpreted'.

Table 10. List of initial codes

Codes
Did not understand
Wrong understanding
Believed SP had been interpreted
Wrong self-correction
Redundant information - compared with previous utterance
Redundant information - compared with later utterance
Believed not necessary to interpret
To catch up with SP
Thinking about previous utterance
Thinking about later utterance
Interpreting previous utterance
Interpreting later utterance
Did not know how to express in TP
To avoid emotional expressions in TP
Not fast enough to speak out TP
Correct understanding but spoke out wrong TP

Heard partial SP

Heard incorrect SP

Did not hear SP clearly

Did not hear SP at all

Distracted by glossary

Distracted by PPT

Wrong anticipation

Fatigue

Unknown

Note: In the list above, SP and TP stand for the source and target speeches, respectively.

Focused coding

Focused coding involved a closer exploration of the codes generated from the initial coding phase to further extract more abstract categories from them and find out their relations. To find the connections between emotion and performance, interview transcriptions (specifically about participants' emotional experiences) were analysed line by line in NVivo to identify the key areas where they believed their emotions impacted their interpreting performance. Several areas were identified, including confidence, sensory processing, reaction speed, speech formulation, and concentration. These areas informed the categorisation of initial codes into focused codes. It should be noted that focused codes were generated not purely based on the above areas identified from the interview, but also through constant comparison between codes, so that data could be categorised more incisively. After focused coding, the following categories are generated:

Table 11. List of focused codes

Parent Code	*Child Code*
Comprehension of SP	Lack of knowledge of TL
	Issue of listening SP
	Wrong anticipation
Processing of SP	previous utterance
	later utterance
	Fatigue

False memory	Believed SP had been interpreted
Time constraints	To catch up with SP
SI strategy	simplifying
Formulation of TP	retrieval of TL
	Wrong self-correction
	emotional avoidance
Articulation of TP	Fail to speak out TL
	Spoke out unintended TL

Theoretical coding

During the phase of theoretical coding, this study drew insights from the model of simultaneous interpreting (Setton, 1999). As introduced in Section 2.3.1, SI involves five key processes: (1) Word Recognition, (2) the Assembler, (3) the Executive, (4) Formulation, and (5) Articulation. The codes in the stage of focused coding were re-examined and categorised based these five processes. The codebook is presented below.

Table 12. Revised codes based on Setton (1999)

Process	***Sub-category***
Word recognition	
	Complete
	Partial
Assembler	
	SL
	TL
Executive	
	Secondary pragmatic assembly
	Addressee orientation
	Compensation
	Production control
Articulation	
Unknown	

In the table above, key components of the processes are also listed. For Word Recognition, there are ‘Complete’ and ‘Partial’, which refer to the instances when the interpreter failed to hear the complete whole (‘Complete’) or only part (‘Partial’) of an utterance. The four subcategories (i.e., Secondary pragmatic assembly, Addressee orientation, Compensation, and Production control) under the ‘Executive’ correspond to the four actions taken by the interpreter that are processed in the ‘Executive’ (see Section 2.3.4 for more details about each action). For the Assembler, there are two sub-categories: SL and TL. If the interpreter fails to comprehend the source language, then this instance is categorised as Assembler-SL; similarly, if the interpreter fails to encode the target language, the instance is categorised as Assembler-TL. All instances when the interpreter understands the SL but fails to articulate the TL are coded to ‘Articulation’. Those without specified reasons are coded as ‘Unknown’.

After theoretical coding, the instances of omissions/errors/incompletions related to the above processes were compared in three ways. First, the instances were compared between groups to identify any differences between the experimental and control groups. Groups were compared first based on the mean number and then at a statistical level of 0.05. Depending on the normality of data, independent samples t-test was used for normally distributed data, while Mann-Whitney U test was used for data with non-normal distribution. Second, the occurrence of omissions/errors/incompletions in these processes was queried against the functions of the source speech to explore if the occurrence in a process is related to the feature of the source speech in general. The associated was tested using the Chi Square test. Next, groups were compared against the functions of the source speech and the occurrence of omissions/errors/incompletions in these processes to explore if emotion has a specific influence on interpreting utterances of the source language with a specific function. The effect was tested using either One-way (analysis of variance) ANOVA or the non-parametric Kruskal-Wallis test depending on the normality of data.

Chapter 4. Results and Findings

To explore the potential influence of student interpreters' emotions on their performance in simultaneous interpreting, this project has conducted in-person experiments and collected both qualitative and quantitative data for analysis. This chapter presents the major results of the analysis and intends to answer research questions. It first looks at participants' emotional responses during the experiment and then analyses their interpreting performance. Results about their self-evaluation of performance and perception of emotion are also included to provide more insights into the influence of emotion on student interpreters. It then closes with a summary of key results and findings of this study corresponding to each research question.

4.1 Emotional Responses During Experiment

This section presents the analysis of two types of data related to participants' emotional states: the first type of data is their continuous electrodermal activity during the experiment, which is objective data measured using a sensor; the second type of data is the ratings of emotional states self-reported by participants at five time points of the experiment, before and after each small task in the experiment. While the sensor data provides great evidence for participants' emotional responses in the process of a task, electrodermal activity is only one of the physiological indicators for emotion, so it cannot be used alone for determining the effect of emotional stimuli (e.g., music) on participants' emotions. On the other hand, self-reports of emotional states offer direct evidence of

participants' emotional changes, but these perceived emotions may be influenced by participants' ability to understand their emotions. That's why two data types were analysed to provide a clearer picture of participants' changes in emotions during the experiment.

4.1.1 Self-reports of emotion experience

In this study, participants were asked to rate their emotional states using the 9-point Self-Assessment Manikin (SAM) scale at five time points: 1) after watching the 1st fixation cross (SAM 1), 2) after reading speech-related materials (SAM 2 and SAM 3) after watching the 2nd fixation cross (SAM 3 and SAM 4) after listening to music or watching the 3rd fixation cross (SAM 4 and SAM 5) after interpreting (SAM 5).

For each participant, changes in their emotions before and after a task was calculated by subtracting the score of the previous SAM scale from the score of the SAM scale after the task. For instance, to test where the participant's emotion was affected by listening to music, the scores from SAM 3 (before listening to music) were subtracted from SAM 4 (after listening to music), obtaining Score 3 (SAM 4 - SAM 3). The mean values of emotional changes in different experiment stages were calculated to compare group differences from two dimensions of emotion, i.e., valence and arousal. The results are summarised in the above below.

Table 13. Comparison of SAM scale ratings

Score No.	***Description***	***Dimension***	***Mean***		
			Group C	Group P	Group N
1	Effect of SI preparation on emotion (SAM 2 – SAM 1)	Valence	0.43	0.22	0.36
		Arousal	1.14	1.67	1.91
2	Return to baseline after preparation (SAM 3 - SAM 1)	Valence	0.14	0.11	0.00
		Arousal	0.29	0.44	1.09
3	Effect of music/fixation cross on emotion (SAM 4 - SAM 3)	Valence	-0.14	0.56	-1.36
		Arousal	-0.14	1.00	1.00
4	Overall change in emotion (SAM 4 - SAM 1)	Valence	0.00	0.67	-1.36
		Arousal	0.14	1.44	2.09
5	Change of emotion before and after SI (SAM 5 - SAM 4)	Valence	0.57	-0.11	2.09
		Arousal	1.71	1.22	1.09

According to the table above, all three groups were emotionally affected when preparing for the interpreting task to a similar extent (see Score 1), and they generally returned to the baseline level after watching the fixation cross (see Score 2). When it comes to the effect of music, participants exposed to the positive music reported an increase in the valence of emotion, and the valence of emotion of participants in Group N decreased, meaning that participants' emotions generally changed towards the emotionality of music (see Score 3). Group N showed the biggest changes in emotion compared to the other two groups at various stages, suggesting a stronger and more long-lasting effect of negative music.

(1) Pre- and post-condition comparison of ratings

Participants' ratings of their emotional states before and after listening to music/watching fixation cross, and before and after the interpreting task were compared in SPSS. The normality of data was first analysed to identify the suitable test for comparing pre- and post-condition group differences. The result of the normality test is shown below.

Table 14. Normality test result of SAM ratings

Scale		Group	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
			Statistic	df	Sig.	Statistic	df	Sig.
VA-3	rating of valence before music/fixation cross	C	0.241	7	.200*	0.937	7	0.609
		N	0.351	11	0.000	0.780	11	**0.005**
		P	0.223	9	.200*	0.838	9	0.055
AR-3	rating of arousal before music/fixation cross	C	0.311	7	0.039	0.720	7	**0.006**
		N	0.215	11	0.166	0.912	11	0.259
		P	0.223	9	.200*	0.838	9	0.055
VA-4	rating of valence after /fixation cross and before SI	C	0.296	7	0.063	0.840	7	0.099
		N	0.162	11	.200*	0.878	11	0.099
		P	0.280	9	0.040	0.844	9	0.065
AR-4	rating of arousal after /fixation cross and before SI	C	0.338	7	0.015	0.769	7	**0.020**
		N	0.233	11	0.098	0.903	11	0.203
		P	0.274	9	0.050	0.827	9	**0.041**
VA-5	rating of valence after SI	C	0.267	7	0.140	0.894	7	0.294
		N	0.282	11	0.015	0.832	11	**0.025**
		P	0.156	9	.200*	0.924	9	0.430
AR-5	rating of arousal after SI	C	0.296	7	0.063	0.840	7	0.099
		N	0.160	11	.200*	0.940	11	0.517
		P	0.246	9	0.123	0.925	9	0.434

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Note: C, N, P represent the control, negative and positive groups.

In the table above, VA-3, VA-4, and VA-5 represent the ratings of valence in SAM Scales 3, 4 and 5. Similarly, AR-3, AR-4, and AR-5 represent the ratings of arousal in SAM Scales 3, 4 and 5. According to the test result, non-normality was observed in some data (see bold numbers).

Therefore, the non-parametric Wilcoxon Signed Ranks Test was used for comparing differences before and after a condition. Comparison results are shown below.

Table 15. Result of the Wilcoxon Signed Ranks Test

Test Statistics					
Group		After *vs* before music[a]		After *vs* before SI	
		Valence	Arousal	Valence	Arousal
C	Z	-.378[b]	-1.000[b]	-.604[c]	-2.232[c]
	Asymp. Sig. (2-tailed)	0.705	0.317	0.546	**0.026***
N	Z	-2.714[b]	-1.450[c]	-2.512[c]	-1.996[c]
	Asymp. Sig. (2-tailed)	**0.007***	0.147	**0.012***	**0.046***
P	Z	-1.098[c]	-2.264[c]	-.264[b]	-2.232[c]
	Asymp. Sig. (2-tailed)	0.272	**0.024***	0.792	**0.026***
a. Fixation cross for the Control group and music for experimental group					
b. Based on positive ranks.					
c. Based on negative ranks.					
* Significance at the level of 0.05					

Note: C, N, P represent the control, negative and positive groups.

The above table shows the within-group comparison of ratings of emotional states after and before listening to music/watching fixation cross, and before and after the interpreting task. According to the table, the Control group was not emotionally affected by the fixation cross, with a p-value of 0.705 for valence and a p-value of 0.317 for arousal. This means that the fixation cross is a neutral stimulus and does not cause significant changes in participants' emotions. In comparison, the selected negative and positive stimuli had significantly affected participants' emotions in different dimensions. Participants in the Negative group were strongly affected by the negative music, which was manifested as a significant decline in valence after listening to the negative music (*p*-value = 0.007). On the other hand, the emotional influence of the positive music is only reflected in the change in arousal of participants in the Positive group, which increased significantly after participants were exposed to the positive music (*p*-value = 0.024). The comparison of participants' emotional states before and after the exposure to fixation cross or music show that both negative and positive music pieces are effective in stimulating participants' emotional responses.

In addition, the study also analysed changes in all participants' emotional states before and after the interpreting task. As can be seen from Table 15, participants in all three groups were affected by the interpreting task. The Control group reported a significant increase in arousal (*p*-value = 0.026), while there was no significant change in valence (*p*-value =0.546). This result suggests that while the selected speech was evaluated as emotionally neutral, it may still have some influence on interpreters' emotions but is not strong enough to change participants' emotions in the valence dimension. In the Negative group, significant changes were reported in both valence (p-value = 0.012) and arousal (p-value = 0.046). Since the significance was only manifested in valence after listening to the negative music, this result shows that the negative emotions developed from listening to the negative music may have been intensified during the interpreting task. As for the Positive group, only arousal was significantly changed after interpreting, with a p-value of 0.026. Since participants in this group already reported a significant increase in their emotional arousal after listening to the positive music, this suggests that the influence of the positive stimulus on arousal is long-lasting during interpreting.

(2) Between-group comparison of ratings

Statistically, the effect of condition (i.e., music) was tested in IBM SPSS to identify any significant differences between groups. The results of the normality test and the Q-Q Plot did not show evidence of non-normality (W=0.958, p-value=0.329). However, the sample size is not adequate enough (at least 30 per group) for one-way ANOVA, so a non-parametric test (i.e., Kruskal-Wallis test) was performed. The result of the Kruskal-Wallis 1-way ANOVA (k-samples) shows that there was a significant difference at the confidence level of 0.05 between the control group and the negative group (*p*-value=0.036), while no significant difference was observed between the control and positive groups, nor between the two experimental groups.

The result of self-reported ratings of emotion shows that negative music has a significant effect on participants' perceived emotion, which is characterised by great decline in both valence and arousal. While self-reports reflect participants' subjective feelings, they may not be able to assess themselves accurately. Therefore, their electrodermal activities during the experiment was also measured to provide more objective information about their emotional states.

(3) Group comparison of self-reports in interviews

During the interviews, participants were asked what they were thinking about while they were listening to music, their perceived bodily responses throughout the experiment (particularly before and after listening to music and before and after interpreting), as well as if they thought there were any potential influence of emotions on them. Their descriptions were categorised thematically in NVivo 13, and results are reported in this section.

Regarding the events participants recalled while they were listening to music, several key types of events were identified from their descriptions and summarised in the table below. Participants in the Control group were looking at the neutral stimuli (i.e., fixation cross) while others in the experimental group were listening to music, so what they were thinking while looking at the cross was not presented in the table below.

Table 16. Types of content recalled while listening to music

Category	Sub-category	Group N (n=11)	Group P (n=9)
Not personal	Historical events	1	0
	Films or musicals	2	0
	Religious scenes	1	0
	Subtotal	4	0
Personal	Health	2	1
	Relationship (peers, family)	4	3
	Career	2	2
	Recreation	0	7
	Other	1	0
	Subtotal	9	13

Total	13	13

The table above compares the types of events recalled by participants from the Negative and Positive groups. The number of events is larger than the number of participants because some participants thought about more than one event while they were listening to music. In general, participants both groups recalled personal events, such as health-related topics (e.g., Covid-19, illness), relationship-related events (e.g., activities with peers or family members), career (e.g., future pathways), recreation (e.g., leisure activities). The greatest difference in the types of events recalled between the Negative and Positive groups is only the Negative group recalled non-personal events. These non-personal events include historical events, films or musicals, or religious scenes. 'Other' in the table above means that the participant did not give a clear description and described as 'random stuff'. 4 out of 11 participants in the Negative group recalled events that were distant from their personal life, such as "war, disaster…the Spanish flu" (Participant 1), "Les Misérables" (Participant 22), "The Shawshank Redemption" (Participant 9), and "crucifixion of Jesus" (Participant 12). This differs from participants in the Positive group who all recalled events related to their personal life. Because of the diversity of events participants recalled while they were listening to music, this indicates that the construction of their emotional experiences may be affected by their past experiences. The extent of stimulation from music seemed to be related to the level of specificity of the events recalled by the participants. Individuals who only thought about images of war did not report significant mood swings after listening to the music (2/11), while those who recalled specific events reported varying degrees of negative or positive emotions. In addition, the emotion evoked by the event was linked to its relevance to the participant. Those who recalled specific personal experiences all reported experiences of negative emotions (e.g., sadness) to varying degrees (7/11), whereas two out of eleven participants who recalled events that were not relevant to their personal life reported experiences of positive emotions (e.g., happiness).

To further understand their emotional responses to the emotional stimuli, participants were asked about their bodily sensations, such as heart rate, muscle movements, body temperature and breath. Changes in these conditions may indicate the increased or decreased levels of emotions. Their descriptions were transcribed and coded in NVivo 13 thematically. Results are presented in the table below.

Table 17. Comparison of bodily changes to emotional stimuli

Indicator	Change	Group N (n=11)	Group P (n=9)
Breath	Rapid	4	1
	Slow	6	1
	No change	1	7
	Subtotal	11	9
Heart Rate	Increase	4	4
	Decrease	3	0
	No change	3	4
	Not specified	1	1
	Subtotal	11	9
Temperature	Increase	4	3
	Decrease	4	1
	No change	2	3
	Not specified	1	2
	Subtotal	11	9
Muscle Movement	More movements	2	3
	Goose bumps	2	0
	Intensified	2	2
	Relaxed	1	1
	Change dynamically	0	2
	No change	2	1
	Not specified	2	0
	Subtotal	11	9

All participants from the experimental group were able to recall their breathing before and after they were exposed to the emotional stimuli. For the Positive group (Group P), 7 out of 9 participants reported no changes in their breathing. And the rest of the two participants each reported more rapid and slower breathing. This result indicates that the induced positive emotions may not lead to changes in breath in these participants. For the Negative group (Group N), respiratory changes varied, with the majority of the participants breathing more slowly and steadily and a few reporting more rapid shallow breathing. Six participants breathed more slowly and with a higher degree of relaxation on the second listen than on the first. A small number of subjects (e.g., P22) took deep breaths while listening to music, deliberately to adjust her negative emotions (e.g., shock). Rapid shallow breathing was mainly related to the rise and fall of the music.

Participants reported that they experienced rapid shallow breathing when listening to the climax of the music, although the change afterwards varied from individual to individual, with some slowing down and others continuing to breath rapidly. By looking at the emotions reported by participants who had rapid shallow breathing, it seems that rapid shallow breathing occurred in the experience of high-arousal emotions. This suggests that the music may have a calming effect, and the effect may be more obvious as the duration of listening to the music increased.

In addition to changes in respiration, participants also reported changes in body temperature, with distinct patterns emerging across conditions. In the Negative group, four participants reported an increase in temperature (two reporting full-body warmth, two reporting hand sweating), while another four reported a decrease (one full-body, three in hands). Two participants reported no noticeable change, and one did not specify. Temperature increases were mostly associated with faster breathing (3 out of 4), whereas temperature decreases primarily co-occurred with slower breathing (3 out of 4). This pattern suggests the presence of two distinct physiological profiles within negative emotions: one more aroused, characterised by increased temperature and rapid breathing; and one more subdued (e.g., low arousal), marked by reduced temperature and slower respiration. In contrast, the Positive group showed a less consistent pattern. Three participants experienced an increase in temperature, three reported no change, one noted a decrease, and two did not specify. Among the three participants who experienced a temperature increase, one also reported faster breathing, one noted no change, and one did not attend to their breathing. The single participant who reported a temperature decrease also described slower breathing. These observations suggest that while positive emotional arousal may involve physiological activation (e.g., warmth and increased respiration), such responses may be less pronounced compared to those in the negative condition.

Regarding heart rate, the two experimental groups had different changes. Around half of the participants in the Positive group reported an increase in their heart rates after listening to the positive music (n=4), while an equal number of participants (n=4) reported no noticeable changes. No participants reported slower heart rates after exposure to the positive music. The increases in heart rates suggest that the selected positive music may have a strong stimulating effect on emotional arousal. In comparison, while four participants in the Negative group also reported an increase in their heart rate, three reported a decrease. Three participants did not find a noticeable change in their heart rate, and one person didn't specify. Three out of the four individuals reported accelerated heart beats when listening to the exciting parts of the music, while one person expressed that her change in heart rate may not be related to music as she had been in an excited state before listening to music. The three participants who experienced a decrease in heart rate believed that their emotions had been alleviated compared to before listening to the music. The result indicates that the participants may have synchronised to the rhythm of music, leading to the increases in heart rate. The change in heart rate seems to be somewhat related to breathing. The three individuals who experienced a decrease in heart rate reported more slow and steady breaths. No obvious patterns were observed between the increase in heart rate and other indicators (such as temperature and muscle contractions). The mixed result from the Negative group suggests that the selected negative music piece may not particularly lead to consistent changes in heart rate.

Muscle contractions and specific physical movements are often used to indicate the emotional states of individuals. In the present study, participants reported a variety of responses. Participants from Group P reported increased small body movements (n=3), muscle contractions (n=2), relaxed muscle (n=1), dynamic changes in muscles (n=2), and no noticeable change (n=1). Over half of the participants reported intensified muscle or increased body movements Body movements and muscle contraction/relaxation responses are commonly associated with positive emotions, such as joy, happiness and interest. These responses reflect the emotional engagement participants experienced while listening to the positive music. Six participants in Group N reported experiencing goosebumps, muscle contractions, and specific movements (such as picking at paper and clenching hands) while listening to the negative music, particularly at moments of big climaxes in the music. People with anxiety tend to pick at themselves or certain objects to cope with their negative feelings. Clenching fists could be a sign of suppression, as a reaction to strong negative emotion, such as anger and tense. The movements often occurred during episodes of rapid breathing, whereas participants experienced muscle contractions reported slow and steady breaths. The appearance of goosebumps was accompanied by fluctuations in heart rate, either increasing or decreasing. These results indicate a strong stimulating effect of the negative music piece, and participants' tendency to suppress negative emotions.

To understand emotional influences on interpreters, participants were asked about any influences they thought their emotions had on them during interpreting. Their descriptions were analysed thematically in NVivo 13, the key themes derived from coding are summarised in the table below.

Table 18. Areas of emotional influences on interpreting

		N	P	C
Mental state		4	1	2
	Empathy with speaker	1	0	0
	Less nervous	1	1	0
	Decrease confidence	1	0	0
	Increase self-satisfaction	0	0	1
	Improve overall mental state	1	0	0
	Improve performance	0	0	1
Information processing		3	4	2
Speed	Capacity	0	0	1
	Faster reaction	1	1	0
Perceptual processing	Failures in hearing SL	1	2	1
Semantic processing	Faster TL retrieval	0	1	0
	Changing strategy	1	0	0
	Expressions	0	0	2
Concentration		2	1	1
	Decrease	1	1	1
	Increase	1	0	0

The above table shows the areas of emotional influences on participants during interpreting. Not all participants reported influences, and one participant may have reported more than one area of influence on interpreting. From the analysis of their descriptions, emotional influences on participants were mainly on their mental states, level of concentration on the interpreting task, speed of information processing, auditory input of information, and the adoption of interpreting strategies.

Regarding changes in mental states, one participant from the Positive group said positive emotions helped her become less nervous in the interpreting task. In comparison, participants from the Negative group reported mixing results: 2 for enhancing effects of negative emotions on their overall performance and confidence and 1 for negative impact on confidence. Another one participant said s/he empathised with the speaker. Despite small number of descriptions about the changes in mental states, the result suggests that negative emotions seem to have a stronger influence on participants' perception of their own and others' emotions, and participants who were exposed to the same stimuli may have oppositive perception or experiences.

Another area of emotional influences is concentration or focus on the interpreting task. Participants from both experimental groups reported a decline in concentration (one each from the two groups). For example, one participant from the Negative group felt less able to concentrate when s/he was nervous and anxious (after changing from low-arousal emotion to high-arousal emotion), but after changing from high-arousal emotion to low-arousal emotion, participants felt more focused during SI. This suggests the impact of negative emotions on concentration can be dynamic and seems to vary with changes in emotional arousal.

Emotions, particularly positive emotions, seem to disrupt the processing of the auditory input (i.e., the source speech). One participant from the Negative group and two participants from the Positive group mentioned specifically that they did not hear the source speech when they were emotional. For example, Participant 29 from the Negative group reported that she could not hear what the speaker was saying when she was annoyed. This suggests that negative emotions (e.g., annoyance) may affect perceptual processing, which is likely to cause omissions and mistakes.

Emotions may also affect decision making during interpreting. Some participants would make self-corrections when they were calm but actively chose to ignore errors when they were in the experience of excitement. Both positive and negative emotions seem to enhance the speed of information processing, with one participant each from the two groups mentioning the positive effect on their fast reactions. One participant said that she usually experienced fear and nervousness when there were audience, but this time she was calm and felt that she could quickly come up with English expressions that corresponded to the original text.

In sum, participants recalled varying events (person or non-personal) while they were listening to the emotive music and reported mixed bodily responses (including temperature, breath, heart rate, and body movements). Emotional perception and information processing appeared to be two major areas that were affected by emotions. Given the small number of participants who explicitly mentioned emotional influences, it should be noted that the areas identified from their descriptions only inform later analysis but cannot be generalised to a wide population.

4.1.2 Measured electrodermal activity

The level of skin conductance responses (SCRs) reflects the intensity of arousal of an emotional stimulus. In this study, the emotional states of the participant throughout the experiment were monitored by measuring their SCRs using the Mindfield eSense Skin Response sensor. The sensor was connected to a tablet for receiving signals, which were automatically processed in the eSense app. The sampling rate of the sensor is 5hz, with a minimum threshold of 0.01us. Three files were generated for each participant: a .csv file, an online report and a .pdffile. The .csv file contains all raw data, such as date and time of recording, timestamps, minimum μS, maximum μS, number of SCRs per minute, markers for tasks, etc. The .csc file was processed in Excel and analysed in SPSS.

Three types of data were produced to understand participants' emotion during SI, including difference in SCRs during SI and at resting conditions, number of skin conductance peaks, and the average number of SCRs per minute. These data provide information about participants' emotional states from different dimensions, which will be explained in more detail in the following subsections.

(1) Difference in SCRs

The difference between the baseline value of SCR at resting conditions and the average value of SCR during SI (denoted as Δdf_scr) reflects the overall change in the participant's emotion. The larger the difference, the greater the change in SCR, and the stronger the emotional responses in general. Each participant had a different baseline SCR value, and this value was subtracted out from the participant's average SCR value during SI to obtain the difference in SCRs, i.e., Δdf_scr.

The mean value of SCR during the whole experiment was also calculated to understand the potential lasting effect of induced emotion. Results are summarised in the table below.

Table 19. Comparison of skin conductance across groups

Group	Baseline (µS)	SCR during music/cross (µS)	Difference between music/cross and baseline (µS)	SCR during SI (µS)	Δ*df_scr* (µS)	SCR during the whole experiment (µS)
C	2.49	3.35	0.86	3.71	1.22	3.45
N	3.20	3.91	0.70	3.86	0.65	3.88
P	2.52	3.28	0.76	3.68	1.16	3.32

*Note: The unit for skin conductance is microSiemens (µS).

Overall, the results of Groups C and P show quite similar responses. Their initial states are quite similar, both around 2.5. In contrast, Group N started with a relatively higher state (mean=3.20 µS). By combing the SAM ratings in Table 13, Group N gave high scores for the influence of SI preparation on their emotional states (see Scores 1 and 2). Therefore, it is likely that this higher emotional state of Group N is affected by their preparation for the interpreting task.

Compared to baseline states, changes in skin conductance during SI were observed in all three groups to varying degrees. Group N had the highest value (mean=3.86 µS), followed by Group P (mean=3.68 µS) and Group C (3.71 µS). While Group N had the highest value, its change from the baseline was the smallest. This suggests that the influence of negative music might not be as pronounced. As the experiment progressed, both Groups C and P experienced a decline of around 0.3 µS in skin conductance. In contrast, Group N saw an increase of 0.02 µS. This indicates that negative emotion may have less intensive but long-lasting and accumulative effect on participants. Having said that, the difference across groups was not statistically significant at the significance level of 0.05 (p-value=0.403), as shown below.

Table 20. Comparison of mean SC values across groups

Ranks

Group	N	Mean Rank
C	7	16.14
N	11	11.55
P	9	15.33
Total	27	

Test Statistics[a]

	Mean
Kruskal-Wallis H	1.817
df	2
Asymp. Sig.	.403

a. Kruskal Wallis Test

b. Grouping Variable: C0, N1, P2

(2) Number of peaks

In addition to the difference in the average SC values, the number of SCR peaks provides a more straightforward and closer view of the frequency of emotional responses. A peak is defined as the local maxima in skin conductance data. In other words, if the SC value at time t is greater than the values at t-0.2 and t+0.2, it will be recorded as a peak value. For each participant, the number of peaks occurred during SI was counted, and the average value was calculated (see Table 21). The results were compared across groups, as shown in Table 22.

Table 21. Comparison of number of peaks across groups

Group	No. of peaks in the first 3 minutes after listening to music	No. of peaks during SI
C	54	280.14
N	41	199.73
P	53	238.11

Table 22. Comparison of number of peaks across groups

Ranks

Group	N	Mean Rank
C	7	15.43
N	11	12.23
P	9	15.06
Total	27	

Test Statistics[a]

	Mean
Kruskal-Wallis H	.935
df	2
Asymp. Sig.	.627

a. Kruskal Wallis Test

b. Grouping Variable: C0, N1, P2

On the other hand, participants in Group N had the lowest number of peaks and smallest changes in SCR in the first three minutes after listening to music but highest average SCR during the whole experiment. This mean that negative music may induce less intense emotions, but the effect could be longer lasting than positive music. It should be noted that peaks may also be resulted from heavy hand movements, so the results may not be as accurate. Having said that, these peaks were not excluded from analysis to avoid bias in identifying peaks.

(3) Skin conductance response (SCR) per minute

The amount of skin conductance responses per minute (SCRs/min) reflects the level of arousal of the participant. In general, a higher SCRs/min value indicates a higher level of arousal. According to existing literature and the eSense manual, 0-5 SCRs/min indicates ‘relaxed’ state, 6-9 SCRs/min means that the participant is aroused, while values over 9 SCRs/min suggests a high level of arousal.

To ensure procedure consistency and data accuracy, SCRs/min values were collected using the eSense app. The app detects a start of an SCR event if any of the following two conditions is met: (1) the signal is constantly rising for 2 seconds; or (2) the difference between the current signal and the pretended base value (i.e., the first value in the current rising signal) is above 0.5 micro siemens. The app calculates SCR events within a one-minute time, thereby producing SCRs/min values. The values for each participant were processed in Excel for analysis. Specifically, participants' average SCRs/min values were calculated, to obtain an overview of their levels of arousal. Considering that participants finished their interpreting in different lengths (usually a few seconds after the 15-minute source speech stopped), only data for the first 903.8 seconds (15 minutes 3.8 seconds) were used for calculating mean values, which is the shortest finishing time of all participants. The mean values were then used to plot graphs (Figs. 4.1 and 4.2) to observe the trend of changes in SCRs/min with time. The graph below shows the overall level of arousal of all participants.

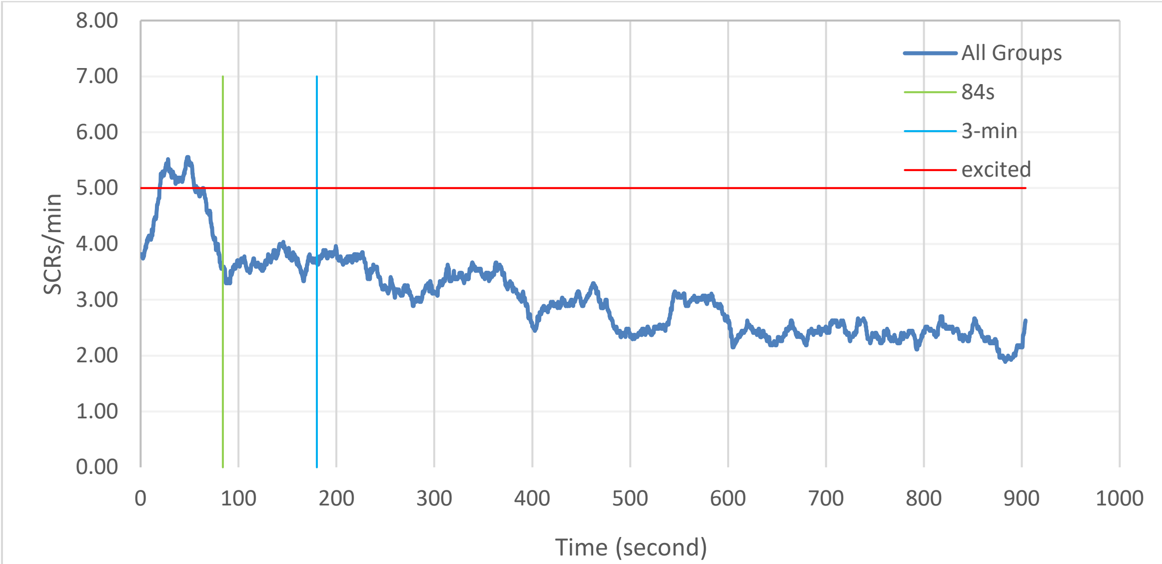


Figure 20. Changes in SCRs/min during SI (all groups)

It can be seen from the figure above that participants generally experienced a high level of arousal above 5 SCRs/min (red horizontal line) within the first 84 seconds from the start of interpreting (see green vertical line). After that, they returned to a more relaxed state between 2 and 4 SCRs/min (mean = 3.07). To better observe the differences between the three groups, their changes in SCRs/min during SI were plotted in EXCEL, as shown in the figure below. In the graph, below, yellow, purple and grey lines represent the positive, negative and control groups, respectively. The red horizontal line represents the benchmark of arousal, which is 5 SCRs/min. Two vertical lines mark the time points for discussion, which will be referred to later.

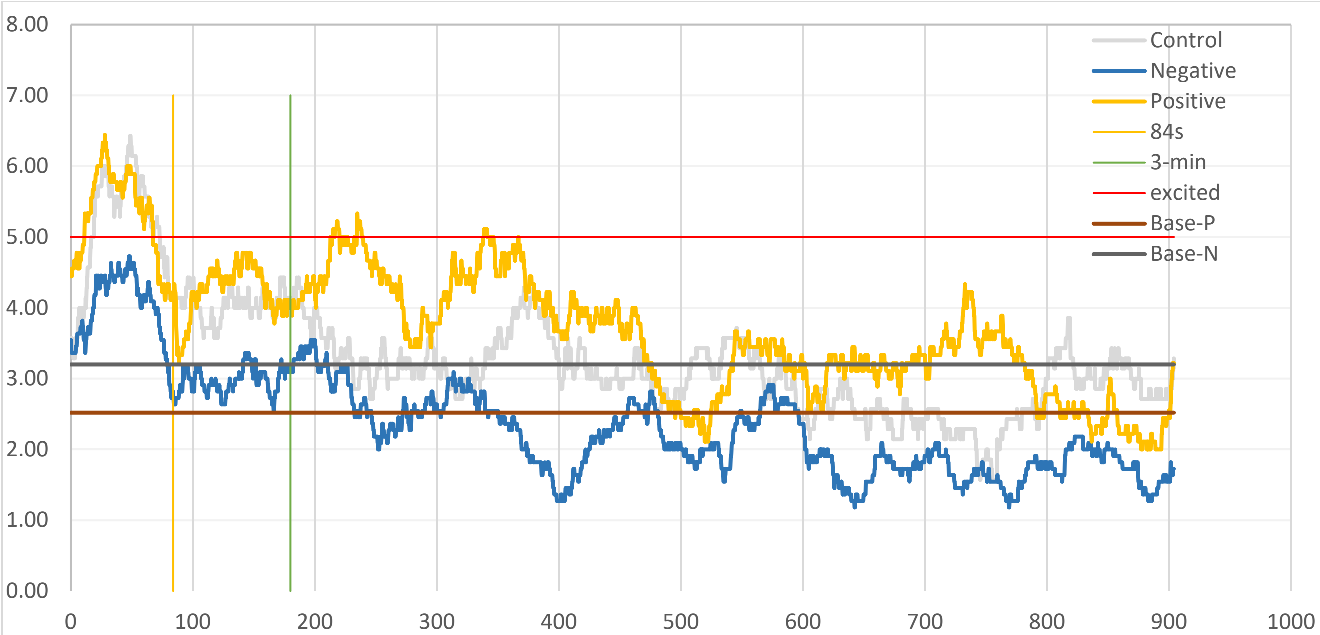


Figure 21. Changes in SCRs/min during SI (three groups)

Overall, the curves for all three groups show a common trend of change: an initial rise followed by a subsequent decline over time. During the first 84 seconds, the three groups had similar large emotional fluctuations compared to their status at the starting point of SI. However, their responses start to diverge after that. Group P bounced back quickly after hitting its lowest point at around 84s (see yellow vertical line) and continued to increase for around 50s while the other two groups roughly maintained the same during that period of time. From the 180 seconds (see green vertical line), the difference between Group P and the other two groups becomes more evident: both Groups C and N saw a general decline, while Group P started to rise rapidly. Between 300-500s seconds, Group N showed very different emotional fluctuations compared to others. Between 700-800 seconds, a peak can be observed in the curve of Group P, while the other two groups' curves are relatively flat. In the last 100 seconds, Group N generally was more emotionally stable than the other two groups. Group C had a noticeable peak at around 820s and had a generally level of arousal than other groups. At the end of SI (around 900 seconds), the source speech stopped abrupted. In response to the abrupt stop, Group C generally did not have many emotional responses, but the experimental groups had stronger responses. In particular, Group P had a sharp increase in arousal at the end. This different between the control and

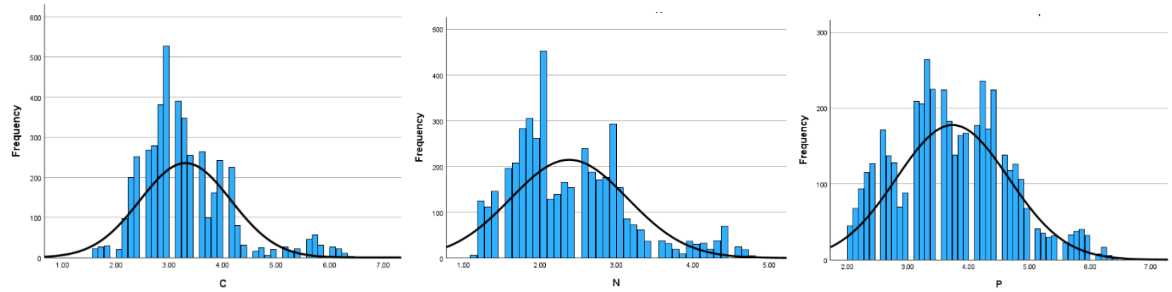
experimental groups indicates that emotion may affect how interpreters respond to a sudden event in SI. Those exposed to positive emotion may be more prone to unexpected events. It's highly likely that their interpreting performance may be different during the time when they were having great emotional fluctuations. A detailed analysis of this will be presented in the next section.
After having a general view of the changes in arousal, their skin conductance data were further analysed to explore more about differences between groups. First, mean values of SCRs/min for each group were calculated and presented in the table below.

Table 23. Between-group comparison of arousal levels (SCRs/min)

	Group C	Group N	Group P
Mean	3.3004	2.3818	3.7342
Skewness	1.184	.885	.290
Std. Error of Skewness	.036	.036	.036
Kurtosis	1.788	.445	-.354
Std. Error of Kurtosis	.073	.073	.073
Range	4.86	3.55	4.44
Minimum	1.57	1.18	2.00
Maximum	6.43	4.73	6.44

Overall, the average SCRs/min value of Group N is notably lower than those observed in the other two groups (mean=2.3818), while Group P shows the highest level of arousal on average (mean=3.7342). In terms of range of values, Group C has the broadest range of values, followed by Group P, and then Group N.

In comparison to the control group, Group N has a substantially lower mean value (mean=2.3818) in a much narrower range, meaning that individuals in Group N generally had less emotional fluctuations, and the fluctuations they had were not strong. This result implies that negative music may have a modulatory effect on emotion, leading to a reduction in both amplitude and range in the emotional responses of the participants. On the other hand, Group P has the highest mean SCRs/min value, with a similar range of values to Group C. This observation indicates that participants in Group P generally tend to have elevated emotional arousal. The increased amplitude may be attributed to the influence of positive music. These differences can be more clearly seen in the comparison of distribution of arousal levels for three groups, as shown in Fig. 4.3 (a) to (c).



(a) (b) (c)

Figure 22. Plots of SCRs/min distribution

(a) Group C (b) Group N (c) Group P

To further compare the differences in arousal levels across groups, statistical tests were performed in SPSS, and the results are presented below.

Table 24. Comparison of SCRs/min across three groups

Ranks

Group	N	Mean Rank
C	7	14.93
N	11	9.23
P	9	19.11
Total	27	

Test Statistics[a,b]

	mean level of scr during 903.8s of SI
Kruskal-Wallis H	7.807
df	2
Asymp. Sig.	.020

a. Kruskal Wallis Test

b. Grouping Variable: C0, N1, P2

The Kruskal-Wallis test was conducted to compare find the effect of condition (i.e., no music, negative music and positive music) on their level of arousal (SCRs/min). Test result shows that the condition has a significant effect on participants' level of arousal in the three groups (p-value=0.02). In other words, participants in different groups were strongly affected by the music. To explore further, the differences between each two groups were tested in SPSS. Because of the small sample size and non-normal distribution of data, the Mann-Whitney U test was used for testing between-group differences. Results are shown below.

Group N vs Group C

Table 25. Comparison of SCRs/min between Groups C and N

Ranks

Group	N	Mean Rank	Sum of Ranks
C	7	12.64	88.50
N	11	7.50	82.50
Total	18		

Test Statistics[a]

	SCRs/min
Mann-Whitney U	16.500
Wilcoxon W	82.500
Z	-1.993
Asymp. Sig. (2-tailed)	.046
Exact Sig. [2*(1-tailed Sig.)]	.044[b]

a. Grouping Variable: C0, N1, P2

b. Not corrected for ties.

As can be seen from the above, Group N is significantly different from Group C in terms of their levels of arousal during SI (p-value=.046). The mean rank of Group N is much lower than that of Group C. In other words, participants who listened to the negative music were less emotional during SI than participants who were not exposed to music. This result indicates that negative music could have some relaxation effect on participants.

Group P vs Group C

By comparing the average SCRs/min during SI, it has found no significant difference at a confidence level of 0.05 (p-value=0.114) based on the result of the Mann-Whitney U test, as shown below.

Table 26. Comparison of SCRs/min between Groups C and P

Ranks

Group	N	Mean Rank	Sum of Ranks
C	7	6.29	44.00
P	9	10.22	92.00
Total	16		

Test Statistics[a]

	SCRs/min
Mann-Whitney U	16.000
Wilcoxon W	44.000
Z	-1.641
Asymp. Sig. (2-tailed)	.101
Exact Sig. [2*(1-tailed Sig.)]	.114[b]

a. Grouping Variable: C0, N1, P2
b. Not corrected for ties.

Group N vs Group P

Two experimental groups were compared using the Mann-Whitney U test, with regard to the number of SCRs per minute during SI. Test result is shown in Table 4.9.

Table 27. Comparison of SCRs/min between Groups N and P

Ranks

Group	N	Mean Rank	Sum of Ranks
N	11	7.73	85.00
P	9	13.89	125.00
Total	18		

Test Statistics[a]

	SCRs/min
Mann-Whitney U	19.000
Wilcoxon W	85.000
Z	-2.317
Asymp. Sig. (2-tailed)	.020
Exact Sig. [2*(1-tailed Sig.)]	.020[b]

a. Grouping Variable: C0, N1, P2
b. Not corrected for ties.

The table above shows that Group N is significantly different from Group P in terms of their levels of arousal during SI (p-value=.020). The mean rank of Group P is much higher than that of Group N, almost double its value. This result suggests that positive and negative music may have different effects on participants' emotion.

4.1.3 Summary

This section has investigated the emotional states of participants in various dimension. Four types of data were analysed, including the ratings of the SAM scale on emotion, difference in SCRs during SI and at resting conditions (Δdf_scr), number of skin conductance peaks, and the average number of SCRs per minute.

According to the ratings of the SAM scale, there was a significant difference at the confidence level of 0.05 between the control group and the negative group (p-value=0.036), while no significant difference was observed between the control and positive groups, nor between the two experimental groups. This result means that the selected piece of negative music had a significant influence on participants' emotion, which features a decline in valence and an increase in arousal. While positive music did not have a significant influence statistically, an increase was observed in both valence and arousal in the positive group, meaning that it was still affected to some degree.

No significant group difference was found in the difference in SCRs during SI and at resting conditions (Δdf_scr) at the confidence level of 0.05. Despite that, it is worth noting that the negative group differed from the other two groups during SI. It had the highest average skin conductance responses during SI and the whole experiment, but its difference from the baseline skin conductance response was the smallest. This is in line with their subjective ratings in the SAM scales, where the arousal was increased from the baseline. Similarly, there was no significant difference at the confidence level of 0.05 in the number of skin conductance peaks among groups. Group N had a smallest number of peaks during SI, followed by Group P. When it comes to the average number of SCRs per minute, there was a significant difference between the negative group and the other groups, with a much lower SCRs/min. The positive group was not significantly different from the control group, but it has the highest mean SCRs/min value during SI.

Both self-reported and measured data show that the negative group had significantly less intensive emotional responses during than other groups, suggesting a calming effect of the negative music. It is likely that participants in this group would perform differently during SI from those in the other groups. The next section will look at participants' performance in SI closely and explore the relationship between their performance and emotion.

4.2 SI Performance

Participants' performance in simultaneous interpreting was evaluated by analysing three aspects of the target speech: omission, error and incompletion. Omissions are items that are originally present in the original speech but have not been included deliberately or accidentally in the target speech, exclusive of repetitions, false starts, as well as lexical fillers (e.g., you know, well, and, so) and unlexicalised fillers (e.g., uh, um). Errors include language errors (grammatical correctness), meaning errors (semantic correctness) and phonological errors (pronunciation correctness). Incompletion refers to the instance occurred when a participant failed to complete an utterance, and a self-correction by the interpreter was not counted as an instance of incompletion. This section starts with an overview of the performance of participants during the whole SI session and then look into their performance during the period when their levels of arousal exceeded 5 SCRs/min. Interview data were also analysed in NVivo to explore any influencing factors on their performance based on participants' retrospective comments about their reasons for their interpretation.

4.2.1 Overall performance

This subsection first presents an overview of participants' performance during SI, and three aspects of the target speech (i.e., omission, error, and incompletion) were analysed. Transcriptions of participants' interpretation were aligned with the source text, and aligned bilingual files were imported into NVivo for analysis. For each participant, any omissions, errors, and incompletions occurred in interpretation were marked against the source text and categorised in NVivo. The unit of analysis is a chunk of an utterance. Results are shown in the tables below.

Table 28. Overall SI performance
(unit: chunk)

Category	*Omission*	*Error*	*Incompletion*	*Total Loss*
Mean	136	34	6	176
Minimum	53	12	1	66

Maximum	221	69	24	314

Table 4.11 shows the average performance of all participants during SI. The total loss in SI is calculated as:

$$\text{Total Loss} = N\_o + N\_e + N\_in \quad (1)$$

where N_o, N_e, and N_in denote the instances of omission, error, and incompletion, respectively. On average, participants made a total loss of 174 chunks during SI. 77.3% of the total loss is attributed to omissions, while error and incompletion only account for 19.3% and 3.4%, respectively. The result also shows a large range in all three aspects of performance, and the total loss ranges from 66 to 314 chunks. This large range means high variability in distribution, so it may be worth exploring the influencing factors on such a great difference among participants.

Table 29. Overall performance across three groups
(unit: chunk; mean value)

Category	*C*	*N*	*P*
Omission	124.71	135.36	146.44
Error	35.86	34.18	33.33
Incompletion	6.14	6.18	5.44
Total Loss	166.71	175.72	185.21

The above table presents a comparison of performance of participants in the control group (C) and experimental groups (N and P). Overall, the control group made the least total loss, while the positive group (P) made the greatest. When it comes to omission, the experimental groups made more omissions than the control group on average. The positive group made more omissions than the other two groups. Regarding error, the difference among three groups is not large. Group C made the largest number of errors during SI on average (Mean=35.86), followed by Group N (Mean=34.18) and Group P (Mean=33.33). In terms of incompletion, the performance of the three groups did not differ greatly. On average, Group P had the least instances of incompletion during SI (Mean=5.44, *SE*=1.082), while Group N had the most (Mean=6.18, *SE*=1.189). To find out the factors influencing participants' performance in SI, Pearson's Chi-Square tests were run in SPSS to test the association between various variables. Test results are summarised in the table below.

Table 30. Influencing factors on SI Performance

Category	**Omission** (*p*-value)	**Error** (*p*-value)	**Incompletion** (*p*-value)
Music (none/negative/positive)	0.298	0.429	0.638
Δdf_scr	0.250	0.308	0.268
Number of peaks	0.221	0.277	0.393
SCRs/min	0.221	0.376	0.191
Training of SI	0.469	0.244	0.355
Professional experience in SI	0.256	0.208	0.720
Gender	0.256	0.372	0.317
EG level	0.461	0.636	0.560
Familiarity with the source speech	0.935	0.656	0.032*
Familiarity with the topic of the source speech	0.438	0.899	0.900
Self-evaluation of SI	0.315	0.109	0.020*

*Significance at the significance level of 0.05

Many factors that may be related to participants' performance in SI were tested. According to the table above, statistically significant association was only found between two factors and the instance of incompletion. One is the participant's familiarity with the source speech, with a p-value of 0.032.

Table 31. Association between speech familiarity and incompletion

Crosstab

Count

		Instance of Incompletion													
		1	2	3	4	5	6	7	8	9	10	11	13	24	Total
Familiarity with SP	1	4	4	0	1	2	3	1	0	1	0	2	1	1	20
	2	0	2	1	0	1	0	0	0	0	1	1	0	0	6
	3	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Total		4	6	1	1	3	3	1	1	1	1	3	1	1	27

According to the table above, the vast majority of participants were not familiar with the source speech. While there is evidence of a strong association between speech familiarity and the occurrence of incompletion, the kind of association is not very clear due to small sample size.

Table 32. Association between self-evaluation and incompletion

Crosstab

Count

		Instance of Incompletion													
		1	2	3	4	5	6	7	8	9	10	11	13	24	Total
SI_rating	5.0	0	0	0	0	0	0	0	1	0	0	0	1	0	2
	5.5	0	1	0	0	0	0	0	0	0	0	0	0	0	1
	6.0	0	2	0	1	0	1	0	0	0	0	2	0	1	7
	6.5	0	0	0	0	0	0	0	0	0	1	1	0	0	2
	7.0	4	1	1	0	3	2	0	0	1	0	0	0	0	12
	7.5	0	0	0	0	0	0	1	0	0	0	0	0	0	1
	8.0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
Total		4	6	1	1	3	3	1	1	1	1	3	1	1	27

The other strong association is between the incompletion and the participant's self-evaluation of performance, with a p-value of 0.020. Participants who made less incompletion tended to rate their performance higher.

Participants in experimental groups did not perform significantly differently in terms of the total instances of omission, error and incompletion. Their measured skin conductance data also do not have strong association with their performance in SI in general. This may be related to the small size of sample. Since there is no significance between the overall performance and emotion, the study then narrows down to participants' performance at emotional states, so as to further explore the relationship between emotion and performance.

4.2.2 Interpreters' performance at emotional states

To understand how interpreters perform at an emotional state, all time points/periods when a participant's level of arousal was above 5 SCRs/min (i.e., at an 'emotional state') were sorted out and marked against the interpretation transcript in NVivo. This subsection first presents the duration and distribution of participants' emotional states during SI, and then introduces the number and types of omissions, errors, and incompletions occurred at emotional states. Finally, participants' responses to an unexpected event during SI were analysed.

(1) Duration

To gain a better understanding of changes in participants' emotion during SI, this study utilizes three ratios to compare the duration of time when participants were at emotional states: ratio of the duration of time at emotional states to the total duration of SI (% of SI), ratio of the duration of time at emotional states to the first 3 minutes of SI (% of first 3 min of SI), and ratio of the duration of time at emotional states in the first 3 minutes of SI to the duration of time at emotional states in SI (3-min vs whole SI). The first ratio (% of SI) gives an overall understanding of the participant's emotional states during SI, indicating the extent to which the participant's performance may be affected by emotion. The second ratio (% of first 3 min of SI) can reveal the level of influence of music on participants' emotions in SI. The effect of music on emotion typically lasts for no more than 3 minutes, so it is likely that the emotion of participants in three groups may differ within this time frame. The third ratio (3-min vs whole SI) shows if emotional states occur mainly within the three minutes of SI, which can help understand the long-lasting effect of emotion.

Table 33. Duration of Time at Level of Arousal Above 5 SCRs/min

Group	*% of SI (%)*	*% of first 3 min of SI*	*3-min vs whole SI (%)*
All groups	14.62	28.73	37.85
C	15.45	30.14	51.11
P	22.12	42.40	34.26
N	7.95	16.64	32.36

Group P reached a level of arousal above 5 SCRs/min during over 22% of time in SI, which is the highest among the three groups. The control group was at emotional states during 15.45% of SI. In contrast, the negative group only reached 5 SCRs/min during 7.95% of SI, which differs a lot from the other groups. This difference is more evident during the initial three minutes of SI. During 42.40% of the first three minutes, the positive group was in emotional states, approximately 2.5 times more than that of the negative group (16.64%). These results suggest a potential impact of positive or negative music on the participants' emotion at the start of interpreting. The positive group appeared more stimulated, while the negative group were calmer in general.

Furthermore, the comparison of the third ratio (3-min vs whole SI) shows that for the control group, approximately 51.11% of the total fluctuations in SI occurred during the first three minutes. Conversely, both experimental groups had a ratio of around 30%, with 34.26% for Group P and 32.36% for Group N. This difference between the control and experimental groups suggests a potential moderating effect of music on participants' emotion at the start of SI, so their emotional responses were not as intense as those of the control group. Subsequent statistical analysis found a significant influence among groups in the ratio of the duration of time at emotional states to the total duration of SI (% of SI), $H(2)=7.897$, p-value=0.019 (see Table 34).

Table 34. Group Comparison of Duration of Emotional States

	% of SI above 5 SCRs/min	% of first 3 min of SI above SCRs/min	3-min vs whole SI (%)
Kruskal-Wallis H	7.897	5.169	2.051
df	2	2	2
Asymp. Sig.	.019	.075	.359

To find out which group(s) has a significant difference in % of SI, Mann-Whitney U tests were performed on each two groups, and the results are shown in tables below.

Table 35. Comparison of % of SI between Groups C and N

Ranks

Group	N	Mean Rank	Sum of Ranks
C	7	12.71	89.00
N	11	7.45	82.00
Total	18		

Test Statistics[a]

	% of SI
Mann-Whitney U	16.000
Wilcoxon W	82.000
Z	-2.048
Asymp. Sig. (2-tailed)	.041
Exact Sig. [2*(1-tailed Sig.)]	.044

a. Grouping Variable: C0, N1, P2

b. Not corrected for ties.

Table 36. Comparison of % of SI between Groups C and P

Ranks

Group	N	Mean Rank	Sum of Ranks
C	7	6.71	47.00
P	9	9.89	89.00
Total	16		

Test Statistics[a]

	% of SI
Mann-Whitney U	19.000
Wilcoxon W	47.000
Z	-1.323
Asymp. Sig. (2-tailed)	.186
Exact Sig. [2*(1-tailed Sig.)]	.210

a. Grouping Variable: C0, N1, P2

b. Not corrected for ties.

Table 37. Comparison of % of SI between Groups N and P

Ranks

Group	N	Mean Rank	Sum of Ranks
N	11	7.64	84.00
P	9	14.00	126.00
Total	20		

Test Statistics[a]

	% of SI
Mann-Whitney U	18.000
Wilcoxon W	84.000
Z	-2.411
Asymp. Sig. (2-tailed)	.016
Exact Sig. [2*(1-tailed Sig.)]	.016

a. Grouping Variable: C0, N1, P2

b. Not corrected for ties.

According to the above test results, the negative group was significantly different at the confidence level of 0.05 from the control group (*p*-value=0.041, see Table 44), and from the positive group (*p*-value=0.016, see Table 46). It had the least percentage of emotional time (above 5 SCRs/min) during SI. There was no significant difference between the control and positive groups (*p*-value=0.186, see Table 45). This result indicates that negative music may have a strong and long-lasting calming effect on participants.

(2) Distribution

The table below presents an overview of the range of SCR levels of participants during SI. The distribution of participants across various ranges of arousal can help us understand the level of influence of positive and negative emotion.

Table 38. Number of participants within different ranges of arousal

Range of SCRs/min	C	P	N	Total
0-5	0	1	4	5
6	**1**	**0**	1	2
6-7	**1**	**0**	3	4
6-8	**1**	**1**	1	3
6-9	**3**	**5**	1	9
6-10	**1**	**2**	1	4
Above 10	**0**	**0**	0	0

The distribution of arousal levels is slightly different across the three groups. For **Group C**, all participants reached a level of arousal above 5 SCRs/min at some point of time during SI. A majority of participants had an arousal level between 6 and 9. One participant (i.e., P11) reached a high level of arousal at s10 SCRs/min. For **Group N**, 4 out of 11 participants (i.e., P12, P15, P20, and P25) did not reach 5 SCRs/min throughout the entire SI process. The remaining 7 participants mostly had an arousal level within the range of 6 to 7 SCRs/min. For **Group P**, one participant (i.e., P6) maintained at a relaxed state (not above 5 SCRs/min) during SI, while all other 8 participants in this group had arousal levels up to 8 SCRs/min or even 10 SCRs/min. None of them were in the lower ranges such as 6-7 SCRs/min. The above distribution suggests that positive music may have an enhancing effect on participants' emotion, since more participants in Group P achieved higher levels of arousal. Similarly, negative music may have a diminishing effect on participants' emotion, as more participants in Group N remained in a relaxed state, and the level of arousal of participants in the negative group was also not high.

(3) Overall performance

To understand participants' SI performance at emotional states, transcripts marked with SCR levels were then checked against the instances of omissions, errors, incompletion to find out any omissions, errors and incompletion occurred when the participant was at an emotional state. A total of 5 participants did not reach a level above 5 SCRs/min at all throughout the interpreting session, including 1 from Group P and 4 from Group N. Therefore, their performance was not included in calculation when counting the instances of omissions, errors and incompletion at emotional states. A comparison of participants' performance in SI is presented below.

Table 39. Group comparison of performance at emotional state
(unit: chunk; mean value)

Category	*C*	*N*	*P*
Omission	21.43	14.86	41.13
Error	5.86	4	8.25
Incompletion	0	0	0
Total Loss	27.29	18.86	49.38

Table 4.22 summarises the instances of omissions, errors, incompletion, and total loss at emotional states. Similar to above, the total loss is the sum of omissions, errors, incompletion, as in Eq. (1) on page 12. It can be seen from the table that Group N had the least total loss, as well as omissions and errors. On the contrary, the most instances of omissions and errors were observed in Group P. Surprisingly, incompletion was not identified in any participant's interpretation at SCR levels above 5 SCRs/min. It is fair to say that there is no relationship between emotion and incompletion occurred in simultaneous interpreting, so it will not be analysed further in this study. The Kruskal Wallis test was performed to compare group differences in total loss at a statistical level, and the results are shown below.

Table 40. Group Comparison of Total Loss in SI

Ranks

Group	N	Mean Rank
C	7	9.57
N	7	7.71
P	8	16.50
Total	22	

Test Statistics[a,b]

	Total Loss
Kruskal-Wallis H	7.740
df	2
Asymp. Sig.	.021

a. Kruskal Wallis Test

b. Grouping Variable: C0, N1, P2

The Kruskal Wallis test result shows that there is a significant difference in their overall performance across groups (p=0.021), meaning that emotion had an effect on their performance during SI. Further Mann-Whitney U tests were performed to find differences in total loss between two groups, and results are presented below.

Table 41. Comparison of Total Loss between Groups C and N

Ranks

Group	N	Mean Rank	Sum of Ranks
C	7	8.14	57.00
N	7	6.86	48.00
Total	14		

Test Statistics[a]

	Total Loss
Mann-Whitney U	20.000
Wilcoxon W	48.000
Z	-.575
Asymp. Sig. (2-tailed)	.565
Exact Sig. [2*(1-tailed Sig.)]	.620

a. Grouping Variable: C0, N1, P2

b. Not corrected for ties.

According to Table 41, no significant difference was found between the control group (C) and the negative group (N) in terms of total loss during SI, *p*-value=0.565. In addition, Group N made less loss in general than the control group. As previously analysed in Section 4.1, the selected piece of negative music had a significant influence on participants' emotion, and Group N showed significantly weaker emotional responses during SI than Group C. Combing the two results, participants affected by the negative music had less total loss than the control group, indicating that negative emotion may have a positive effect on participants' overall performance.

Table 42. Comparison of Total Loss between Groups N and P

Ranks

Group	N	Mean Rank	Sum of Ranks
N	7	4.86	34.00
P	8	10.75	86.00
Total	15		

Test Statistics[a]

	Total Loss
Mann-Whitney U	6.000
Wilcoxon W	34.000
Z	-2.546
Asymp. Sig. (2-tailed)	.011
Exact Sig. [2*(1-tailed Sig.)]	.009

a. Grouping Variable: C0, N1, P2
b. Not corrected for ties.

Table 43. Comparison of Total Loss between Groups C and P

Ranks

Group	N	Mean Rank	Sum of Ranks
C	7	5.43	38.00
P	8	10.25	82.00
Total	15		

Test Statistics[a]

	Total Loss
Mann-Whitney U	10.000
Wilcoxon W	38.000
Z	-2.083
Asymp. Sig. (2-tailed)	.037
Exact Sig. [2*(1-tailed Sig.)]	.040

a. Grouping Variable: C0, N1, P2
b. Not corrected for ties.

When it comes to the positive group, there is a significant difference between the positive and control groups at a confidence level of 0.05, *p*-value=0.037. Participants in Group P made significantly more loss than the control group. This difference may be attributed to the strong emotional responses of participants in the positive group. As analysed in Section 4.1, the positive music did not have a statistically significant impact on participants' emotion in Group P. However, participants in the positive group still had the highest mean SCRs/min value during SI and strong emotional responses for the longest duration in SI. This means that the stimulated positive emotion had a significant negative effect on participants' overall performance, leading to an increase in total loss.

There is also a significant difference between the two experimental groups, *p*-value=0.11. As can be seen from Table 42, the positive group (P) made a lot more loss than the negative group (N). This result indicates that positive and negative emotions have exerted different influence on participants' performance in interpreting. To further explore such an influence, participants' performance was analysed in more detail in the following subsections.

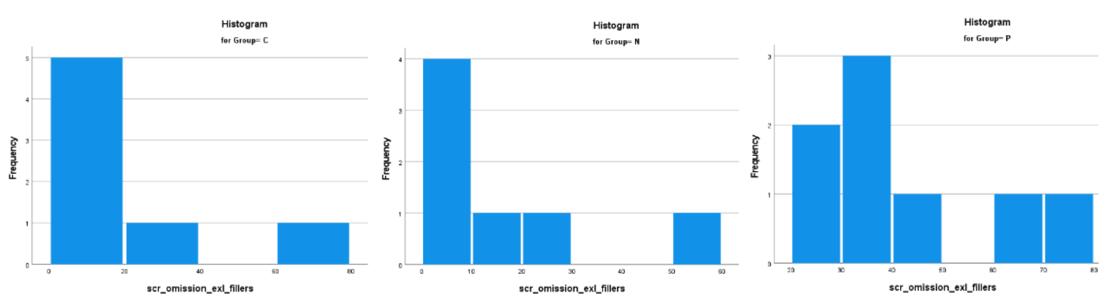
(4) Omissions

Number of omissions

The number of chunks that were omitted during SI at a level of arousal above 5 SCRs/min was counted. Table 44 shows the average, minimum, and maximum instances of omissions made by each group. Figure 23 compares the distribution of the number omissions among groups.

Table 44. Group Comparison of Omission (unit: chunk)

Category	*C*	*N*	*P*	*All groups*
Mean	21.43	14.86	41.13	26.5
Minimum	5	1	21	1
Maximum	76	52	71	76



(a) (b) (c)

Figure 23. Histograms for number of omissions across groups

(a) Group C (b) Group N (c) Group P

Overall, both experimental groups (N and P) show a similar distribution of the number of omissions compared with the control group. However, they differ a lot in the average number of omissions. Group P made a lot more omissions (mean= 41.13), almost three times the number of omissions made by Group N (mean=14.86) and twice the number of omissions made by Group C (mean=21.43). This difference is more obvious in the box plot below.

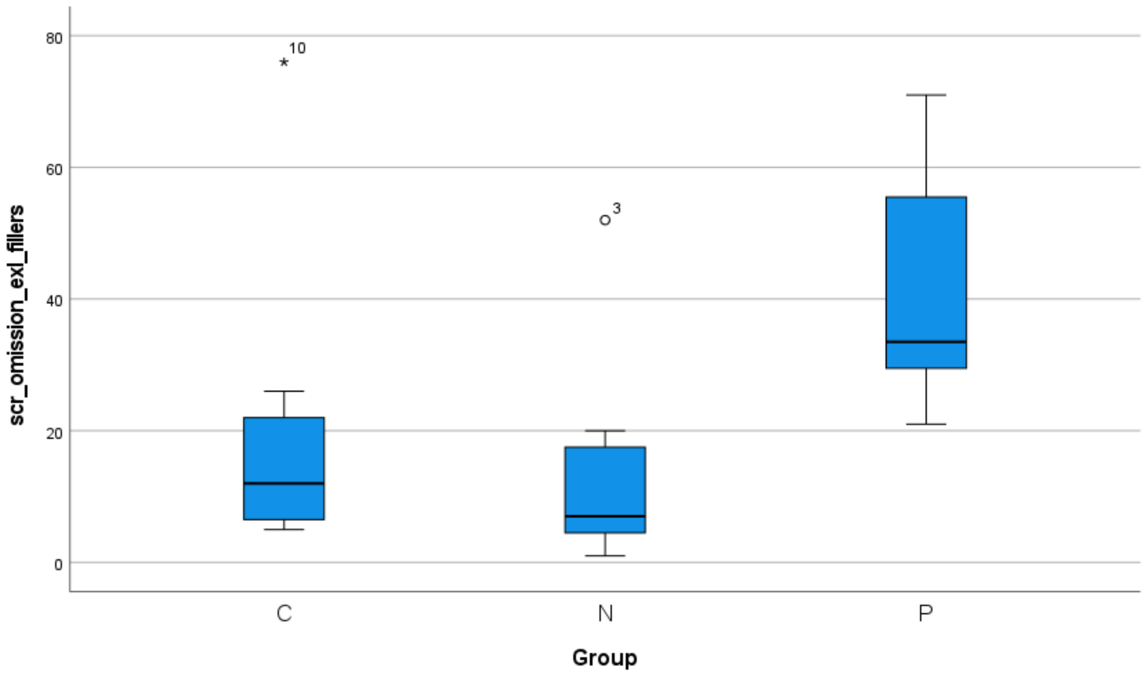


Figure 24. Group comparison of omission

The Kruskal Wallis test was performed to compare groups at a statistical level, and the results are shown below.

Table 45. Significance test of group differences in omission

Ranks

Group	N	Mean Rank
C	7	9.57
N	7	7.57
P	8	16.63
Total	22	

Test Statistics[a,b]

	Omission
Kruskal-Wallis H	8.172
df	2
Asymp. Sig.	.017

a. Kruskal Wallis Test

b. Grouping Variable: C0, N1, P2

The Kruskal Wallis test result shows that there is a significant difference across groups (p=0.017), meaning that participants in the three groups performed very differently, in terms of omissions. To find out which group(s) has a significant difference in the number of omissions, Mann-Whitney U tests were performed on each two groups, and the results are shown below.

Table 46. Comparison of Omission between Groups C and N

Ranks

Group	N	Mean Rank	Sum of Ranks
C	7	8.29	58.00
N	7	6.71	47.00
Total	14		

Test Statistics[a]

	Omission
Mann-Whitney U	19.000
Wilcoxon W	47.000
Z	-.704
Asymp. Sig. (2-tailed)	.481
Exact Sig. [2*(1-tailed Sig.)]	.535

a. Grouping Variable: C0, N1, P2
b. Not corrected for ties.

According to the table above, there is no significant difference between the control (C) and negative (N) groups at a confidence level of 0.05, *p*-value=0.481. Moreover, the negative group even made less omissions than the control group. This result indicates that negative emotion may be conducive to reducing omissions.

Table 47. Comparison of Omission between Groups C and P

Ranks

Group	N	Mean Rank	Sum of Ranks
C	7	5.29	37.00
P	8	10.38	83.00
Total	15		

Test Statistics[a]

	Omission
Mann-Whitney U	9.000
Wilcoxon W	37.000
Z	-2.201
Asymp. Sig. (2-tailed)	.028
Exact Sig. [2*(1-tailed Sig.)]	.029

a. Grouping Variable: C0, N1, P2
b. Not corrected for ties.

In contrast, the positive group (P) differed significantly from the control group at a confidence level of 0.05, *p*-value=0.028. Group P made a lot more omissions than the control group, meaning that participants with positive emotion are more prone to making omissions.

Table 48. Comparison of Omissions between Groups N and P

Ranks

Group	N	Mean Rank	Sum of Ranks
N	7	4.86	34.00
P	8	10.75	86.00
Total	15		

Test Statistics[a]

	Omission
Mann-Whitney U	6.000
Wilcoxon W	34.000
Z	-2.548
Asymp. Sig. (2-tailed)	.011
Exact Sig. [2*(1-tailed Sig.)]	.009

a. Grouping Variable: C0, N1, P2

b. Not corrected for ties.

By comparing the two experimental groups, a significant difference was found between the two in terms of the number of omissions made at emotional states. This means that positive and negative emotions had different effects on how participants' information processing in SI.

Types of omissions

To understand the types of omissions, omissions made at emotional states were categorised based on Jakobson's six functions of language, i.e., referential, poetic, emotive, conative, phatic, metalinguistic.

Table 49. Types of omissions across groups

Function	C	N	P	Total
Referential	90	66	209	365
Poetic	2	2	3	7
Emotive	11	10	22	43
Conative	26	8	63	97
Phatic	7	3	11	21
Metalingual	13	14	26	53
Total	149	103	334	586

Note: C, N, P represent the control, negative and positive groups, respectively.

The above table shows the number of each type of omissions made by the control group (C), the negative (N) group, and the positive (P) group. From the largest to the smallest number, the types of omissions are referential, conative, metalingual, emotive, phatic, and poetic. The three groups had very consistent performance in interpreting poetic elements of the source speech and a similar number of poetic omissions was made. When it comes to other types of omission, the positive group omitted more for each type than other groups. Next, we will combine the statistical results from the last subsection with the results about types of omissions to compare the two experimental groups with the control group.

N vs C

Based on the statistical analysis in the last subsection, it has been found that there is no significant difference between the control (C) and negative (N) groups in terms of the total number of omissions at emotional states, and that the negative group generally made less omissions than the control group. From the above table, it can be seen that the two groups made similar numbers of poetic, emotive, phatic and metalingual omissions. However, the negative group made less referential and conative omissions. Specifically, the number of conative omissions made by the negative group is only less a third of that by the control group. The conative function orients towards the addressee and is used by the speaker to get the attention or reaction of the audience. This indicates that negative emotion may have an impact on how interpreters deal with parts of language that are intended for the audience.

P vs C

Previous analysis has found that the positive group made significantly more omissions than the control group. By comparing the types of omissions, it can be seen that the two groups omitted a similar number of poetic and phatic omissions. However, the positive group omitted a lot more referential, conative, metalingual, and emotive parts of the source speech. To find out which type of omission is more prominent, Mann-Whitney U Test was performed in IBM SPSS Statistics. Results are shown below.

Table 50. Comparison of six functions

Test Statistics[a]

	Referential	Poetic	Emotive	Conative	Phatic	Metalingual
Mann-Whitney U	10.000	28.000	12.000	15.000	22.000	21.500
Wilcoxon W	38.000	64.000	40.000	43.000	50.000	49.500
Z	-2.094	.000	-1.884	-1.511	-.721	-.768
Asymp. Sig. (2-tailed)	.036	1.000	.060	.131	.471	.442
Exact Sig. [2*(1-tailed Sig.)]	.040[b]	1.000[b]	.072[b]	.152[b]	.536[b]	.463[b]

a. Grouping Variable: C0, N1, P2

b. Not corrected for ties.

The above table shows the result of the Mann-Whitney U Test on the differences between the control and positive groups in terms of the number of omissions they made in each type. It can be seen that there is a significant difference between the two groups in the occurrence of referential omissions (p=0.036). It should also be noted that their performance also differs greatly when it comes to emotive omissions (p=0.06). While the difference is not significant at the confidence level of 0.05, it still suggests a great difference as compared to other types.

Causes of omissions

Based on interview data, reasons for omissions reported by participants during the interview were summarised thematically. The table below lists the number of chunks omitted for different reasons. Unconscious omissions refer to chunks that were not heard by participants; conscious omissions are those that participants heard during interpreting but omitted; unknown omissions were those that no specific reasons were given by participants during the interview.

Table 51. Overall comparison of reasons for omissions across groups

Category	C	N	P
	n	n	n
Unconscious	36	28	108
Conscious	64	26	96
Unknown	39	48	117

Note: C, N, P represent the control, negative and positive groups, respectively.
n = number of chunks

According to the table, participants in the positive group made the greatest number of omissions compared to other groups; apart from those with unknown reasons, around half of the omissions were made unconsciously (n = 108), and the half were made consciously (n = 96). Similarly, the negative group also made an almost equal number of conscious omissions (n = 26) and unconscious omissions (n = 28). The control group, on the other hand, appeared to omit a lot more consciously than unconsciously, with 64 chunks conscious omissions and 36 unconscious omissions.

The table above shows the reasons reported by participants about why they did not hear the source speech and then made omissions. In general, the control and negative groups had similar performance, while the positive group made more omissions unconsciously than the other two groups. The control group did not hear the source text only because of their attention was distracted by the PowerPoint (n=2). Similarly, participants in the negative group were also distracted by the PowerPoint (n=2), and they also made omissions because of processing previous utterance in the source language (n=2). The PowerPoint also affected participants in the positive group, but to a greater degree (n=12). In addition to the PowerPoint, the glossary was reported to be a reason for omitting information in the positive group (n=1), suggesting the negative influence of positive emotions on concentration. Furthermore, 2 instances of omissions were made because the participant was confident about anticipation and chose to interpret without paying attention to the source language. The over-reliance on preparation and anticipation suggests that positive emotions may lead to overconfidence, which further affects the allocation of attention during interpreting.

On the other hand, omissions were made by participants due to a greater variety of reasons. Based on the analysis of participants' explanation about the occurrence of omissions, omissions occurred during different processes of SI were analysed (excluding those that were unknown). Results are summarised in the table below.

Table 52. Group comparison of reasons for omissions vs processes in SI

Process	*Sub-category*	*C*	*N*	*P*
Word recognition		37	30	110
	Complete	36	27	106
	Partial	1	3	4
Assembler		30	6	11
	SL	23	4	6

	TL	7	2	5
Executive		40	14	76
	Addressee orientation	10	5	38
	Compensation	0	0	0
	Production control	14	7	14
	Secondary pragmatic assembly	16	2	24
Formulation		0	0	0
Articulation		0	1	4

Note: C, N, P represent the control, negative and positive groups, respectively.

The table above presents the number of omissions that occurred in five processes of simultaneous interpreting, i.e., Word Recognition, Assembler, Executive, Formulation, and Articulation. From earlier in this section (see Table 44), we have known that the Negative group made the least number of omissions overall among three groups.

Compared with the Control group, participants in the Negative group made a similar number of omissions in the process of Word Recognition (n=30 for Group N; n=37 for Group C), as well as during the Articulation of the target speech. This suggests that negative emotions may not have a particular influence on perceptual processing of inputs from the speaker and speech articulation. On the other hand, participants in the Positive group made a lot more omissions (n=110) due to failure of listening the source speech, either partially or completely. This result suggests that positive emotions may have a strong negative effect on perceptual processing, which may be related to attention allocation.

As for the Assembler, the Negative group made much smaller number of omissions (n=6) during the process than the control group (n=30), but similar to that made by the Positive group (n=11). This indicates that both negative and positive emotions may have improved the semantic and/or syntactic processing of the source speech during interpreting.

Regarding the Executive, no omissions were made due to *compensation*. The Negative group omitted the least number of source information (n=14), followed by the Control group (n=40) and the Positive group (n=76), indicating that negative emotions may have improved judgment and coordination during interpreting. In addition, the three groups had difference performance in the rest of three actions (i.e., *addressee orientation*, *production control*, *secondary pragmatic assembly*). The Control group made a similar number of omissions for these three actions, with most consideration for *secondary pragmatic assembly* (n=16), followed by *production control* (n=14), and then *addressee orientation* (n=10). The Negative Group omitted more for the consideration of *production control* (n=7) and *addressee orientation* (n=5), lastly for *secondary pragmatic assembly* (n=2). This indicates the participants under negative emotions may attend to production control more. In comparison, omissions made by the Positive group during the Executive process were mostly due to *addressee orientation* (n=38), followed by *secondary pragmatic assembly* (n=24) and then *production control* (n=14). This result suggests that participants under positive emotions may spend more efforts on the judging the source speech and monitoring their own output.

Furthermore, participants in the Positive group made the largest number of omissions due to failure to articulate or speak out the target speech (n=4), whereas the other two groups had a similar performance in this regard (n=0 for Group C; n=1 for Group N). This result indicates that positive emotions may have negatively affected speech articulation.

To explore the types of omissions occurred during SI, the number of omissions of each function made during each process was listed in the table below.

Table 53. Omissions of six functions in different processes of SI (three groups)

Process	*Sub-category*	*Referential*		*Conative*		*Metalingual*		*Emotive*		*Phatic*		*Poetic*	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Word recognition		122	34%	28	29%	12	23%	8	19%	4	19%	3	43%
	complete	117	96%	27	96%	12	100%	8	100%	2	50%	3	100%
	partial	5	4%	1	4%	0	0%	0	0%	2	50%	0	0%
Assembler		31	9%	6	6%	6	11%	4	9%	0	0%	0	0%
	SL	26	84%	2	33%	5	83%	0	0%	0	0%	0	0%
	TL	5	16%	4	67%	1	17%	4	100%	0	0%	0	0%
Executive		72	20%	18	19%	19	36%	19	44%	2	10%	0	0%
	Addressee orientation	42	58%	6	33%	3	16%	1	5%	1	50%	0	0%
	Compensation	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	Production control	14	19%	9	50%	4	21%	8	42%	0	0%	0	0%

	Secondary pragmatic assembly	16	22%	3	17%	12	63%	10	53%	1	50%	0	0%
Formulation		0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Articulation		5	1%	0	0%	0	0%	0	0%	0	0%	0	0%

Previously we have known that referential information in the source speech was omitted most by participants in general (see Table 49). To understand during which process referential omissions occurred most, the number of referential omissions in each process and the proportion of referential omissions in each process out of the total of referential omissions during SI were calculated. The proportion of omissions occurred in each sub-process of each process of SI was also calculated to obtain more understanding about the relation between subprocesses and referential omissions. Results shows that the occurrence of this type of omissions is likely to be caused by issues with Word Recognition and Executive. 34 percent of the referential omissions were made during Word Recognition, of which 96% were caused by complete failure of hearing the source speech (i.e., the participant did not hear the source speech at all) and 4% were related to partial failure of listening (i.e., the participant could hear some parts of the source speech). Referential omissions related to the Executive accounts for 20% of the total number of referential omissions, which occurred during three actions, i.e., addressee orientation (58%), secondary pragmatic assembly (22%), and production control (19%). Referential information is not oriented at addressee but more about describing a person/object/matter. However, addressee orientation was the mostly considered by student interpreters. This suggests that the interpreters might be more engaged in interpreting than we thought they would be when the audience was absent.

Similarly, the omissions of conative information of the source speech were also more related to two processes of SI: Word Recognition (29%) and Executive (19%). Complete failure of listening the source speech was the main cause of issues during Word Recognition (96%), while partial failure during this process only accounts for 4% of total. Conative omissions occurred due to issues with the Executive account for 19% of the total number of conative omissions, which is similar to that of referential omissions. What differs is that the omission of conative information was more for the consideration of production control (50%), followed by addressee orientation

(33%), secondary pragmatic assembly (17%). It seems that pragmatic factors such as time constraints played a great role in production control.

Unlike the above two types of omissions, the omission of metalingual information in the source speech was more related to the Executive (36%), and then Word Recognition (23%), lastly Assembler (11%). In the Executive, most of the omissions was made due to secondary pragmatic assembly (63%), followed by production control (21%), and addressee orientation (16%). Secondary pragmatic assembly involves the judgment of the importance of information in the source speech. This means that metalingual information may be considered less important by participants in general and therefore was omitted during secondary pragmatic assembly. It is also worth noting that all omissions occurred during Word Recognition were caused by complete failure of listening to the source speech, which again suggests that participants may have allocated less attention to metalingual information in the source speech. Among metalingual omissions, 11% was related to the Assembler, particularly the comprehension of the source language. This may in turn affect Word Recognition and the Executive.

The omission of emotive information in the source speech shows a similar pattern as that of metalingual information. The Executive (44%), Word Recognition (19%), and the Assembler (9%) are the top processes in which this type of omissions occurred. In the Executive, emotive omissions were mostly omitted during secondary pragmatic assembly (53%), followed by production control (42%) and addressee orientation (5%). Similar to metalingual information, 100% of emotive omissions during word recognition was caused by complete failure of listening to the source speech. It is worth noting that the omissions of emotive information during the process of the Assembler were all related to the target language. This suggests that the emotions perceived by the interpreters may have affected the production of the target language during SI.

Phatic language is used to establish social connections during communication. Not much phatic information was omitted from the source speech, and the omissions were mostly due to issues in Word Recognition (19%) and the Executive (10%). During Word Recognition, both complete and partial failure of listening to the phatic information occurred. As for the Executive, the omissions were made for either addressee orientation or secondary pragmatic assembly. No phatic information was omitted during the process of the Assembler and the articulation of the target speech. This result suggests that this type of information may not pose particular challenges to the interpreters on language processing and speech articulation.

Poetic omissions occurred least during SI, and based on the table above, they were made due to complete failure of listening to this information in the source speech (100%). This may be related partially to the features of the source speech, where only a small number of poetic expressions were used; and partially to interpreter training, where poetic expressions are often overlooked during SI, given time constraints and their high cognitive demand.

In the previous section, it has been found that there is a significant difference between the Control and Positive groups in the occurrence of referential omissions (p-value=0.036). On the other hand, the Negative group made a lot less referential omissions than the other groups, though not at the significance level of 0.05. Therefore, the occurrence of referential omissions in different processes of SI was analysed and compared across three groups to further understand the potential influence of negative and positive emotions on SI. The result of analysis is shown in Table 54.

Table 54. Referential omissions across groups in different processes of SI

Process	*Sub-category*	*C*	*N*	*P*
Word recognition		29	21	72
	complete	28	18	71
	partial	1	3	1
Assembler		23	2	6
	SL	21	0	5
	TL	2	2	1
Executive		20	7	45
	Addressee orientation	7	5	30
	Compensation	0	0	0
	Production control	7	2	5
	Secondary pragmatic assembly	6	0	10
Formulation		0	0	0
Articulation		0	1	4

The table above shows the number of referential omissions occurred during each process/sub-processes of SI in three groups. It can be seen from the table that the differences between the Control and the Positive groups are related to four processes of SI: Word Recognition, Assembler, Executive, and Articulation. No referential omissions were made during speech formulation. Compared with the other groups, the Positive group made a large number of referential omissions were made during word recognition (n=72), of which most words were not heard at all during interpreting (n=71). This result indicates that positive emotions may have hinder word recognition during interpreting.

As for the Assembler, both the Positive (n=6) and Negative (n=2) groups made much less referential omissions than the Control group (n=23), indicating that positive and negative emotions may enhance semantic or syntactic processing during SI. The three groups made a similar number of referential omissions related to TL-Assembler, so the enhancing effect of emotions is mainly related to the processing of the source language. Regarding the Executive, the Positive group made more referential omissions for *addressee orientation* (n=30) than the Negative group (n=5) and the Control group (n=7), indicating that positive emotions may have negatively affected participants' monitoring of their own interpreting output. The Negative group did not make any referential omissions due to *secondary pragmatic assembly*, which contrasts from the other two groups. This suggests that negative emotions may have facilitated interpreters' comprehension of the intended meaning of the source utterance, therefore enhancing secondary pragmatic assembly. Speech articulation is another process that shows the potential negative influence of positive emotions on interpreting, where participants in the Positive group made the largest number of referential omissions (n=4) due to failure to speak out in the target language.

In addition to referential omission, the performance of participants in the Control and Positive groups also differs greatly (almost at a 0.05 significance level) when it comes to emotive omissions (p-value=0.06; see Table 50). Therefore, emotive omissions made during different processes of SI was further analysed to understand how participants in different groups dealt with emotive information in the source speech. The result is shown below.

Table 55. Emotive omissions across groups in different processes of SI

Process	*Sub-category*	*C*	*N*	*P*
Word recognition		0	1	7
	complete	0	1	7
	partial	0	0	0
Assembler		1	0	3
	SL	0	0	0
	TL	1	0	3
Executive		6	6	7
	Addressee orientation	0	0	1
	Compensation	0	0	0
	Production control	0	4	4
	Secondary pragmatic assembly	6	2	2
Formulation		0	0	0
Articulation		0	0	0

The table above compares the number of emotive omissions occurred during each process/sub-processes of SI across three groups. According to the table, the three groups mainly differ during three processes of SI: Word Recognition, Assembler, and Executive. No emotive omissions were made during speech formulation and articulation.

Similar to referential omissions, the Positive group made the largest number of emotive omissions during word recognition (n=7), but all due to failure to hear the relevant source speech. This indicates that positive emotions may have hindered word recognition during SI, particularly when the source speech is emotive. The influence of positive emotions on interpreting is also reflected on the number of emotive omissions related to Assembler. All emotive omissions occurred during this process are related to the target language, rather than the source speech. Compared with the other two groups, the positive group made omitted more information due to unable to find the corresponding expressions in the target language, suggesting the potential negative influence of positive emotions on the retrieval of semantic information in the target language during interpreting. In contrast, the Negative group did not make any emotive omissions during the Assembler, indicating that negative emotions may facilitate semantic/syntactic processing during interpreting. When it comes to the Executive, the three groups made a similar number of emotive omissions. However, both experimental groups omitted more emotive information for *production control* (n=4 for both groups) than the Control group (n=0). This suggests that interpreters at emotional states may be more prone to pragmatic factors, such as the speaker's rate of delivery. In addition, less emotive omissions were made by the experimental groups for *secondary pragmatic assembly* (n=2 for both groups) than the Control group (n=6). By looking at this result and the result of referential omissions for *secondary pragmatic assembly*, it reveals how the Positive group responded differently to different types of information in the source speech. In the previous analysis, the Positive group omitted most referential information but least emotive information for *secondary pragmatic assembly*. This suggests that interpreters under positive emotions may attend to the source speech more if the content is emotive. This characteristic was not observed in the Negative group. They performed consistently when it comes to referential and emotive omissions for *secondary pragmatic assembly*.

(5) Errors

Number of errors

The number of chunks that were incorrectly interpreted during SI at a level of arousal above 5 SCRs/min was counted, and the results are shown below.

Table 56. Group comparison of errors

Category	*C*	*N*	*P*	*All groups*
Mean	5.86	4	8.25	6.14
Minimum	0	1	2	0
Maximum	22	13	18	22

From the table above, it can be seen that Group P made the largest number of errors on average (mean=8.25), followed by Group C (mean=5.86) and then Group N (mean=4). The difference between Group P and the other two groups can be more clearly seen in the box plot blow.

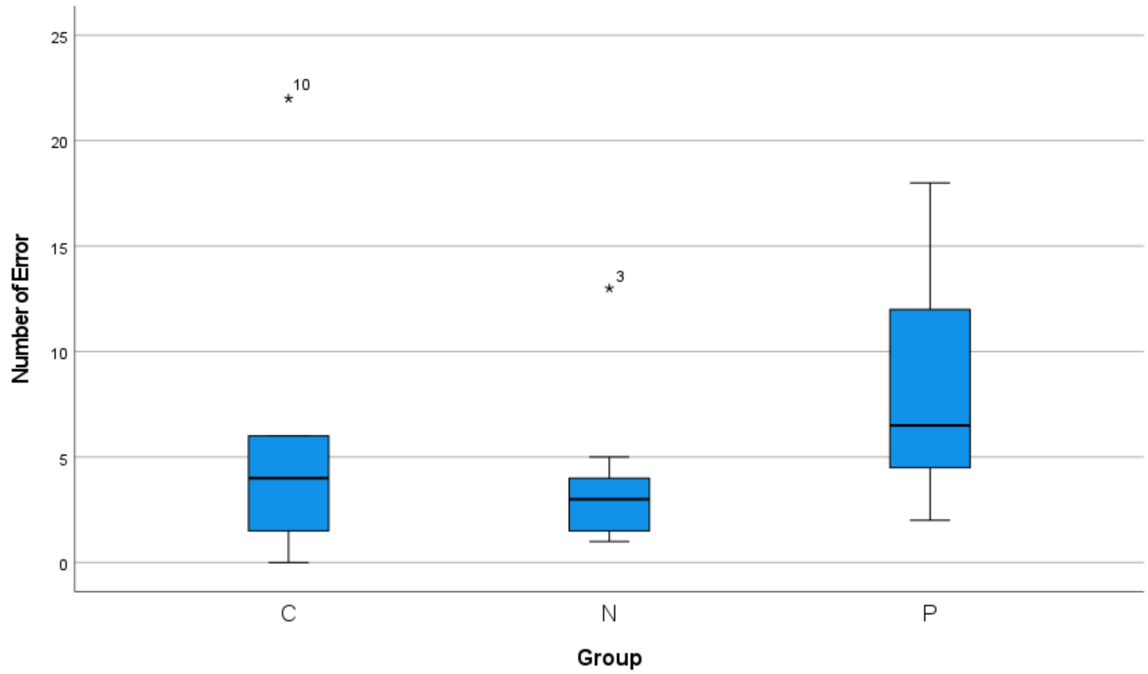
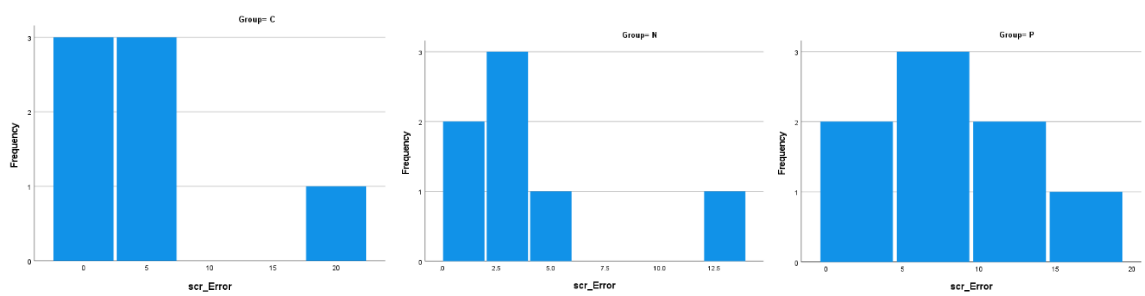


Figure 25. Group comparison of error

To further understand group differences in the occurrence of errors, histograms were generated in SPSS to show the distribution of the average number of errors in each group, as shown below.



(a) (b) (c)

Figure 26. Histograms for number of errors across groups

(a) Group C (b) Group N (c) Group P

The Fig. (a) and Fig. (b) above show a similar bipolar distribution of errors in Groups C and N, in which the majority number of participants made a small number of errors, and some participants made a large number of errors. On the other hand, a more uniform distribution is observed in Group P, and more participants made a higher number of errors. The differences in quantity and distribution between Group P and the other two groups imply that positive emotion may have an effect on errors. In other words, participants who were exposed to positive music are more prone to making errors than others. To compare groups at a statistical level, the Kruskal Wallis test was performed in SPSS, as shown below.

Table 57. Group comparison of errors

Ranks

Group	N	Mean Rank
C	7	10.50
N	7	8.71
P	8	14.81
Total	22	

Test Statistics[a,b]

	Omission
Kruskal-Wallis H	8.172
df	2
Asymp. Sig.	.017

a. Kruskal Wallis Test

b. Grouping Variable: C0, N1, P2

Test result shows that there is no statistically significant difference across groups (p=0.168). This indicates that while Group P made more errors than Group N and Group C, emotion does not have a significant impact on such a difference.

Types of errors

Similar to omissions, errors occurred when participants were at high arousal states were also categorised based on Jakobson's six functions of language, i.e., referential, poetic, emotive, conative, phatic, metalinguistic. Transcriptions were coded in NVivo, and results are shown in the table below.

Table 58. Types of errors across groups

Function	C	N	P	Total
Referential	32	17	36	85
Poetic	0	1	2	3
Emotive	6	1	7	14
Conative	0	5	10	15
Phatic	0	0	0	0
Metalingual	1	1	0	2
Total	39	25	55	119

The above table shows the number of each type of errors made by the control group (C), the negative (N) group, and the positive (P) group. Overall, participants made the greatest number of referential errors, followed by conative and emotive errors. There were some instances of poetic and metalingual errors, but the quantity was very small compared to other types of errors. Phatic errors did not occur at high arousal states. Group C made three types of errors (most to least): referential, emotive and metalingual. Group N made five types of errors (most to least): referential, conative, poetic, emotive and metalingual. Group P made four types of errors (most to least): referential, conative, emotive and poetic.

In the previous subsection, the three groups were compared statistically, and no significant difference was identified across the three groups. However, by further examining the number of errors of each type, further statistical analysis results show significant differences among groups.

Table 59. Comparison of errors between Groups C and P

Errors (Control vs Positive)[a]

	Conative	Emotive	Metalingual	Phatic	E_Poetic	Referential
Mann-Whitney U	10.500	26.500	24.000	28.000	21.000	22.000
Wilcoxon W	38.500	62.500	60.000	64.000	49.000	50.000
Z	-2.424	-.190	-1.069	.000	-1.373	-.703
Asymp. Sig. (2-tailed)	.015	.850	.285	1.000	.170	.482
Exact Sig. [2*(1-tailed Sig.)]	.040[b]	.867[b]	.694[b]	1.000[b]	.463[b]	.536[b]

a. Grouping Variable: C0, N1, P2

b. Not corrected for ties.

The table above shows the result of the Mann-Whitney U test on the difference between the control and the positive groups in terms of the number of errors of six types. It can be seen from the table that there is a significant difference between the two groups in conative errors (p=0.015). The positive group made significantly more conative errors than the control group.

Table 60. Comparison of errors between Groups C and N

Errors (Control and Negative)[a]

	Conative	Emotive	Metalingual	Phatic	Poetic	Referential
Mann-Whitney U	10.500	13.500	24.500	24.500	21.000	18.000
Wilcoxon W	38.500	41.500	52.500	52.500	49.000	46.000
Z	-2.256	-1.663	.000	.000	-1.000	-.847
Asymp. Sig. (2-tailed)	.024	.096	1.000	1.000	.317	.397
Exact Sig. [2*(1-tailed Sig.)]	.073[b]	.165[b]	1.000[b]	1.000[b]	.710[b]	.456[b]

a. Grouping Variable: C0, N1, P2

b. Not corrected for ties.

The table above shows the result of the Mann-Whitney U test on the difference between the control and the negative groups in terms of the number of errors of six types. According to the table, the two groups performed significantly differently on interpreting conative parts of the source speech (*p*=0.024). The negative group made significantly more conative errors than the control group. It is worth noting that the two groups also differ a lot when dealing with emotive parts of the speech (*p*=0.96). While it is not significant at the confidence level of 0.05, the negative group made much less emotive errors than the control group, indicating the influence of negative emotion on processing emotive information.

Table 61. Comparison of errors between Groups N and P

Errors (Negative vs Positive)[a]

	Conative	Emotive	Metalingual	Phatic	Poetic	Referential
Mann-Whitney U	24.500	17.500	24.000	28.000	25.000	15.000
Wilcoxon W	52.500	45.500	60.000	64.000	53.000	43.000
Z	-.433	-1.466	-1.069	.000	-.500	-1.528
Asymp. Sig. (2-tailed)	.665	.143	.285	1.000	.617	.127
Exact Sig. [2*(1-tailed Sig.)]	.694[b]	.232[b]	.694[b]	1.000[b]	.779[b]	.152[b]

a. Grouping Variable: C0, N1, P2

b. Not corrected for ties.

This table shows the Mann-Whitney U test result about the differences between the negative and the positive groups in terms of the number of errors of six types. The positive group made a lot more referential, emotive and conative errors than the negative group. However, there is no significant difference at the confidence level of 0.05 in any of these types.

Causes of errors

Based on interview data, reasons for errors reported by participants during the interview were summarised thematically, as shown in the table below.

Table 62. Overall comparison of reasons for errors across groups

Category	C	N	P
	n	n	n
Unconscious	6	5	11
Conscious	18	11	20
Unknown	14	8	23

Note: C, N, P represent the control, negative and positive groups, respectively.
n = number of chunks.

The table above presents the number of errors that were made by participants for various reasons. The consciousness was reported by participants during interviews about if they had heard the source speech during interpreting. Unknown errors were those that no specific reasons were given by participants. Compared to the control and negative groups, participants in the positive group made the greatest number of errors both consciously (n=20) and unconsciously (n=11). The control and negative groups made a similar number of errors unconsciously (n=6 for Group C; n=5 for Group N), while the number of unconscious errors made by the positive groups was the total of those made by the control and negative groups combined (n=11). Regarding conscious errors, a similar number of errors were made by the control and positive groups (n=18 for Group C; n=20 for Group P), whereas participants in the negative group made the least number of errors consciously (n=11). These results indicate that positive and negative emotions may influence different cognitive processes.

To explore further, reasons reported by participants were categorised based on processes of SI and then compared between groups. Results are shown in Table 63.

Table 63. Group comparison of reasons for errors vs processes in SI

Process	*Sub-category*	*C*	*N*	*P*
Word recognition		8	6	8
	Complete	4	4	3
	Partial	4	2	5
Assembler		15	8	13
	SL	7	4	5
	TL	8	4	8

Executive		3	1	3
	Addressee orientation	1	0	2
	Compensation	1	0	0
	Production control	1	1	1
	Secondary pragmatic assembly	0	0	0
Formulation		0	0	0
Articulation		0	0	0

The table above compares the number of errors occurred during each process/sub-processes of SI across three groups. It can be seen from the table that the three groups made a similar number of errors during Word Recognition and the Executive, which differs from the occurrence of omissions. No errors were made due to reasons related to speech formulation and articulation. The main difference in errors across the groups is relate to the Assembler. The Negative group made the least number of errors during the processing of both the source (n=4) and target (n=4) languages, indicating that negative emotions is conducive to language processing during interpreting. In comparison with the Control group, the Positive group made less errors related to the source language and the same number of errors related to the target language. This suggests that positive emotions may also facilitate language processing, but only the source language.

Table 64 presents the types of errors occurred in difference processes of SI. This provides insights into the relation between language functions and interpreting processes.

Table 64. Errors of different functions in different processes of SI (three groups)

Process	*Sub-category*	*Conative*	*Emotive*	*Metalingual*	*Phatic*	*Poetic*	*Referential*
Word recognition		2	2	0	0	0	19
	Complete	1	0	0	0	0	10
	Partial	1	2	0	0	0	9
Assembler		5	4	0	0	1	26
	SL	3	3	0	0	0	10
	TL	2	1	0	0	1	16
Executive		0	1	0	0	0	6
	Addressee orientation	0	1	0	0	0	2
	Compensation	0	0	0	0	0	1
	Production control	0	0	0	0	0	3
	Secondary pragmatic assembly	0	0	0	0	0	**0**
Formulation		0	0	0	0	0	0

Articulation	0	0	0	0	0	0

According to the table, different types of errors during different processes of SI. Participants did not make any errors when interpreting metalingual and phatic information, and only a small number of errors were made when interpreting poetic information.

The occurrence of conative errors was only related to Word Recognition (n=2) and the Assembler (n=5). Out of the two instances of conative errors, one was caused due to failure to hear the relevant part of the source speech, and the other was caused because the source information was not heard fully by the participant. As for the Assembler, difficulties in the processing of source and target languages both contribute to the occurrence of conative errors.

The occurrence of emotive errors was related to three processes: Word Recognition (n=2), the Assembler (n=4), and the Executive (n=1). Unlike conative errors, emotive errors occurred during Word Recognition were caused by failure to hear the complete information in the source speech. When it comes to the Assembler, the occurrence of emotive errors is more related to the processing of the source language (3 out of 4) than that of the target language. Only one instance of error was made during executive control, which was only for *addressee orientation*, suggesting the potential influence of emotive speech on interpreters' self-monitoring.

Referential errors occurred during different processes of SI, including Word Recognition (n=19), the Assembler (n=26), and the Executive (n=6). During Word Recognition, around half of referential errors was caused by complete failure to hear the source speech (n=10), while the other half was caused by partial failure to hear the source speech (n=9). Regarding the Assembler, more referential errors were related to the processing of the target speech (n=16) and some errors were related to the processing of the source speech (n=10). As for the Executive, three actions were related to the occurrence of referential errors: *addressee orientation* (n=2), *compensation* (n=1), and *production control* (n=3).

In the previous section (see Table 59 and Table 60), it has been found that both experimental groups made significantly more conative errors than the control group (p-value=0.015 for the Positive group; p-value=0.024 for the Negative group). Therefore, conative errors occurred during each process/sub-process of SI were further compared across the three groups to explore the influence of emotions on interpreting conative information. The result is presented in Table 65.

Table 65. Group comparison of conative errors in different process of SI

Process	***Sub-category***	***C***	***P***	***N***
Word recognition		0	1	1
	Complete	0	0	1
	Partial	0	1	0
Assembler		0	3	2
	SL	0	1	2
	TL	0	2	0
Executive		0	0	0
	Addressee orientation	0	0	0
	Compensation	0	0	0
	Production control	0	0	0
	Secondary pragmatic assembly	0	0	0
Formulation		0	0	0
Articulation		0	0	0

The table above shows the number of conative errors occurred during each process/sub-processes of SI across three groups. Surprisingly, the control group did not make errors when interpreting conative information, while both experimental groups did. The differences between the Control group and two experimental groups are evident in two processes of SI: Word Recognition and the Assembler. In the Word Recognition process, the occurrence of the conative error in the Positive group was attributed to the partial failure of hearing the relevant part of the source speech, while the instance of the conative error in the Negative group was related to the complete failure of hearing the relevant part of the source speech. This result indicates that interpreters may be affected differently by positive and negative emotions during word recognition of conative information in SI. However, such an influence is not obvious given the small number of instances. On the other hand, the impact of positive and negative emotions seems more pronounced regarding language processing in the Assembler. By comparing the Control and the Positive groups, it can be seen that the two groups differ in the processing of both the source language (n=1 for the Positive group; n=0 for the Control group) and the target language (n=2 for Positive group; n=0 for the Control group), with more conative errors caused by TL-Assembler. This result indicates that positive emotions may hinder semantic and/or syntactic processing primarily in TL. The comparison between the Control and the Negative groups shows that differences between the two groups are entirely related to the processing of conative information of the source speech. This result implies negative emotions might also hinder language processing, but such an influence is only on the processing of the source language.

4.2.3 Interpreters' responses to unexpected scenario

The source speech was trimmed to shorten the length of the speech, and the video stopped playing at the trimmed end point. While participants were informed of the length of the source speech during the briefing session, their response to the sudden stop of the source speech differed greatly. The last sentence of the source speech contains 5 chunks. To find out how participants respond to the unexpected event, the number of chunks omitted from the last sentence were counted. Results are presented below.

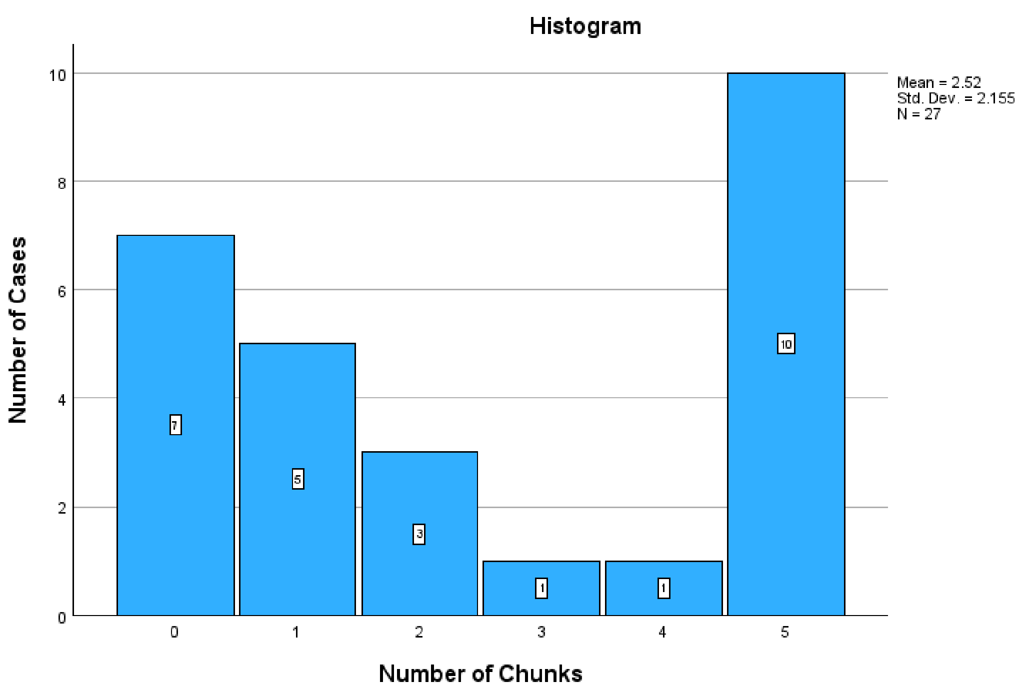


Figure 27. Number of chunks omitted from the last sentence

It can be seen from the above figure that only 26% participants (7 out of 27) managed to interpret the last sentence correctly, while 10 participants omitted the last sentence completely. The number of chunks omitted from the last sentence was compared across the three groups, and the results are presented below.

Table 66. Number of chunks omitted across groups

Category	*C*	*N*	*P*
Mean	3.43	2.36	2.00
Median	5	2	1
Minimum	1	0	0
Maximum	5	5	5

According to the table above, the experimental groups (N and P) generally made less omissions compared to the control group. on average, participants in Group C omitted over 3 chunks (Mean=3.43) out of 5 chunks, while those in Groups N and P omitted around 2 chunks (Mean=2.36 for Group N; Mean=2 for Group P). The figure below shows a more visualised difference in their performance across group.

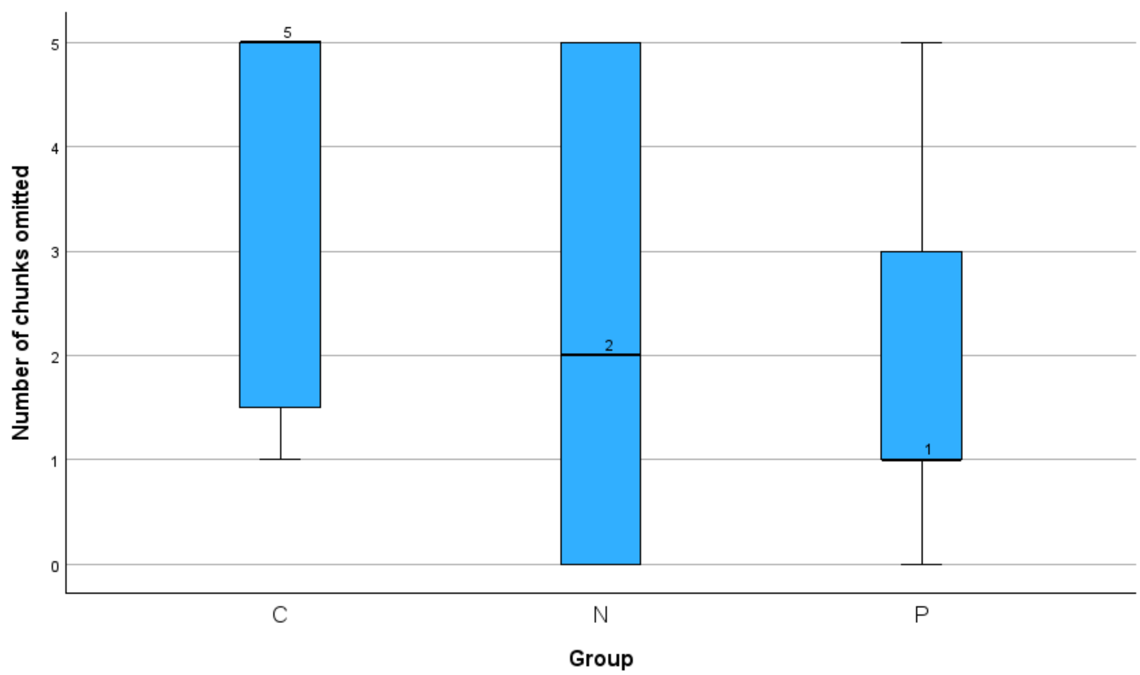


Figure 28. Comparison of omissions across groups

It can be clearly seen from the figure above that Group P generally responded better to the unexpected event, with less omissions in the last sentence. However, the result of the Spearman's test shows that there is no significant difference across groups in the number of chunks omitted from the last sentence (p-value=0.215), as shown in the table below.

Table 67. Correlation between group and omissions in the last sentence

Correlations

			C0, N1, P2	COUNT_omit_lastsent
Spearman's rho	C0, N1, P2	Correlation Coefficient	1.000	-.246
		Sig. (2-tailed)	.	.215
		N	27	27
	COUNT_omit_lastsent	Correlation Coefficient	-.246	1.000
		Sig. (2-tailed)	.215	.
		N	27	27

A series of Spearman's test were run to find out the potential influencing factors, and the result is shown below.

Table 68. Correlations among various factors

Correlations

			C0, N1, P2	COUNT_omit_lastsent	no-music0, music 1	Stage of Study	SI Experience	EGlevel	TotalSCR	COUNT_peak
Spearman's rho	C0, N1, P2	Correlation Coefficient	1.000	-.246	.810**	-.206	.065	-.294	.193	.000
		Sig. (2-tailed)	.	.215	<.001	.302	.746	.136	.335	1.000
		N	27	27	27	27	27	27	27	27
	COUNT_omit_lastsent	Correlation Coefficient	-.246	1.000	-.293	.201	.363	.035	.073	.090
		Sig. (2-tailed)	.215	.	.138	.314	.063	.864	.719	.657
		N	27	27	27	27	27	27	27	27
	no-music0, music 1	Correlation Coefficient	.810**	-.293	1.000	-.319	.282	-.106	-.011	-.109
		Sig. (2-tailed)	<.001	.138	.	.105	.154	.597	.957	.590
		N	27	27	27	27	27	27	27	27
	Stage of Study	Correlation Coefficient	-.206	.201	-.319	1.000	.201	-.106	.310	.344
		Sig. (2-tailed)	.302	.314	.105	.	.314	.598	.116	.079
		N	27	27	27	27	27	27	27	27
	SI Experience	Correlation Coefficient	.065	.363	.282	.201	1.000	.113	.012	.018
		Sig. (2-tailed)	.746	.063	.154	.314	.	.574	.952	.928
		N	27	27	27	27	27	27	27	27
	EGlevel	Correlation Coefficient	-.294	.035	-.106	-.106	.113	1.000	-.019	-.029
		Sig. (2-tailed)	.136	.864	.597	.598	.574	.	.925	.888
		N	27	27	27	27	27	27	27	27
	TotalSCR	Correlation Coefficient	.193	.073	-.011	.310	.012	-.019	1.000	.474*
		Sig. (2-tailed)	.335	.719	.957	.116	.952	.925	.	.013
		N	27	27	27	27	27	27	27	27
	COUNT_peak	Correlation Coefficient	.000	.090	-.109	.344	.018	-.029	.474*	1.000
		Sig. (2-tailed)	1.000	.657	.590	.079	.928	.888	.013	.
		N	27	27	27	27	27	27	27	27

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

While there was no correlation at statistical significance level, experience in SI seems to be an influencing factor on how participants respond to an unexpected event. Participants with professional SI experience tended to omit more than those without, as shown below.

Table 69. Kruskal Wallis Test result of the effect of SI experience on omissions

Ranks

SI Experience	N	Mean Rank
0	22	12.70
1	5	19.70
Total	27	

*0=no experience;

1=with experience

Test Statistics[a,b]

	COUNT_omit_lastsent
Kruskal-Wallis H	3.420
df	1
Asymp. Sig.	.064

a. Kruskal Wallis Test

b. Grouping Variable: SI Experience

4.2.4 Interpreters' self-evaluation of performance in SI

Participants were asked to rate their performance in SI on a scale of 1 to 10, with 1 being extremely poor, and 10 being extremely good. The average score and the range of scores for each group was calculated, and the results were compared between groups, as shown in the table below.

Table 70. Self-evaluation of SI performance

Group	Average of rating	Range of rating
C	6.57	5.5-8
N	6.41	5-8
P	6.75	6-7.5

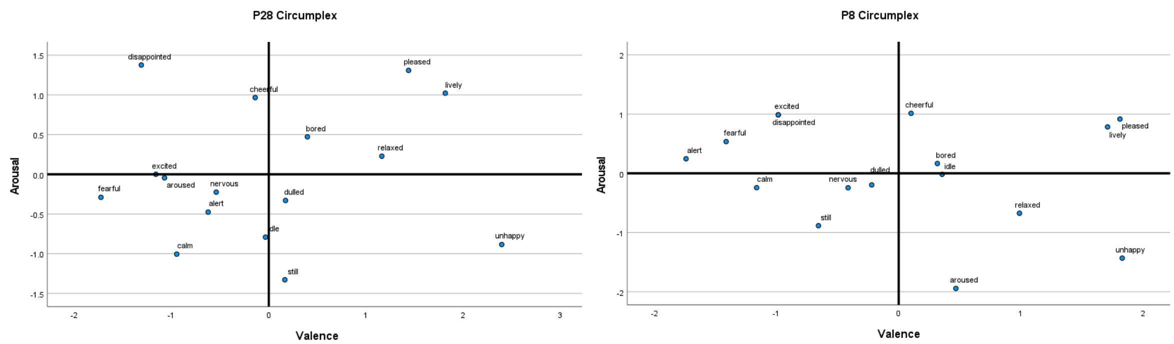
From the ratings of the three groups, it can be seen that Group N scored the lowest on their performance; Group P was generally satisfied with their performance and scored the highest; Group C was in the middle. This suggests that emotion may have an effect on the evaluation of self-performance in SI. Specifically, positive emotions may have enhanced satisfaction, while subjects in the experience of negative emotions held more negative views about their performance.

The analysis of interview data shows that many participants in the Negative group were particularly sensitive to mistakes in interpretation. When they thought they were not performing well, they became anxious and flustered. Such emotions can, to some extent, affect the subsequent interpreting process, for example by lowering their self-confidence, which further leads to distraction. However, whether participants experience negative emotions in response to poor performance seems to be related to their previous emotional states. For example, Participant 29 expressed that when she was in excited, she did not care about mistakes and carried on as normal, even though she noticed that they had made a mistake. This indicates that interpreters' self-monitoring of their own performance may contribute to their emotional changes in simultaneous interpreting.

In addition, interview data showed that many subjects held an expectation of their performance in simultaneous interpreting and would monitor their performance during interpreting against such an expectation. When the expected performance did not match their actual performance, this disparity led to negative emotions such as dissatisfaction, shock, and nervousness. In addition to the expectations of their own performance, the participants also anticipated the speaker's emotion, style of delivery, or difficulty based on the preparation materials provided. And when the speaker's speech rate was unexpected, emotional responses seemed to occur. When the speaker was talking fast, the participants were mostly nervous, anxious, and annoyed. In the experiences of nervousness and anxiety, some participants made omissions and some actively adjusted their translation strategies. For those who were annoyed, they responded with a tendency of rejection. One said: 'I don't want to listen to him anymore', resulting in conscious omissions. When the speaker spoke slowly, some participants became confused and thought about the reasons why the speaker spoke slowly during interpreting, while others reflected on their performance in interpreting previous parts of the speech. Some subjects expected the speaker to be volatile and were pleased when he or she was not. Some subjects felt reassured that the content of the presentation was in line with the prepared material. Nervousness was experienced in cases where the participant could not predict how the presentation would develop. These examples suggest that interpreters' comparison between expectations and reality may also contribute to how they responded in interpreting.

4.3 Emotional Granularity and Emotion Perception

In this study, emotional granularity (EG) was measured to understand participants' ability in differentiating emotions. Each participant was asked to rate the similarity of each two different words from a set of 16 adjectives related to emotion from 1 to 7, where 1 = no similarity, and 7 = extremely similar. These adjectives were adopted from literature, including *excited*, *lively*, *cheerful*, *pleased*, *calm*, *relaxed*, *idle*, *still*, *dulled*, *bored*, *unhappy*, *disappointed*, *nervous*, *fearful*, *alert*, and *aroused* (Barrett, 2004, p. 266). For each participant, a total of 120 scores were generated from the rating. These scores were manually input into SPSS to generate a circumplex model of emotion, which shows emotion from two dimensions, i.e., valence and arousal. The circumplex model was obtained by generating a distance matrix of the adjectives through multidimensional scaling (ALSCAL) in SPSS. For ALSCAL, the interval for measurement was Euclidean distance, and values were transformed with Z-scores. The horizontal axis and vertical axis represent the valence dimension and the arousal dimension of emotion.



(a) (b)

Figure 29. Example computed circumplex models of emotion

(a) Participant 28 (b) Participant 8

The complexity of the circumplex model reflects the level of emotional granularity of the individual: the flatter the model, the lower emotional granularity. The above figures are examples of participants with (a) higher emotional granularity/finely grained perception of emotion and (b) lower emotional granularity/coarsely grained perception of emotion. Circumplex models were produced for all 27 participants, and the results are shown below.

Table 71. Emotional granularity levels by groups

		Group			
		C	N	P	Total
EG	0	3	4	7	14
	1	4	7	2	13
Total		7	11	9	27

In the above table, 0 represents low EG, and 1 represents high EG. Based on their rating scores, 14 out of 27 participants have relatively low EG, and 13 out of 27 participants have relatively high EG. In the first phase of this research project, the most neutral speech was selected as the source speech (text sentiment score=-5.4). Participants were asked to rate the emotionality of the source speech using the 9-point Self-Assessment Manikin (SAM) scale. Results are shown below:

Table 72. Ratings of emotionality of the source speech

Ratings of the source speech (Valence)			
		Frequency	Percentage
Valid	5	3	11.1
	6	4	14.8
	7	12	44.4
	8	6	22.2
	9	2	7.4
	Total	27	100.0

Ratings of the source speech (Arousal)			
		Frequency	Percentage
Valid	2	1	3.7
	3	2	7.4
	4	4	14.8
	5	8	29.6
	6	3	11.1
	7	7	25.9
	8	2	7.4
	Total	27	100.0

To explore the relationship between granularity and the perception of emotion, Mann-Whitney U test was performed to test if there are significant group differences in the perception of the emotionality of the source speech. Results are presented in below.

Table 73. Effect of EG on emotion perception

Effect of EG on Emotion Perception (Valence)			
EG	N	Mean Rank	Sum of Ranks
0	14	14.21	199.00
1	13	13.77	179.00
Total	27		

* sig.(2-tailed) = .878; Z=-.154

Effect of EG on Emotion Perception (Arousal)			
EG	N	Mean Rank	Sum of Ranks
0	14	17.54	245.50
1	13	10.19	132.50
Total	27		

* sig.(2-tailed) = .014; Z=-2.461

In the above table, 0 represents low EG, and 1 represents high EG. Results show that participants with different levels of emotional granularity had differentiated perception of the emotionality of the source speech. Specifically, participants with lower granularity perceived the speaker's emotions significantly more intensely than those with higher granularity (p-value=.014). In addition, interview data show that the emotions of some of the participants in Group N changed along with their perceived emotions of the speaker, but their perception of the speaker's emotions varied greatly. Some subjects (e.g. Participant 3) perceived the speaker to be agitated and to have a reproachful tone in their speech, so they felt alerted and actively brought the tone of agitation into interpretation. Some subjects (e.g. Participant 9), on the other hand, perceived that the speaker was just narrating calmly and that she was calm. Such a difference in emotion is likely to be attributed to the different emotions they developed while listening to the music. For example, P3 felt a strong sense of sadness after listening to music, and it is likely that this emotion influenced his perception of the speaker's emotion, believing that the speaker also expressed high-arousal negative-valence emotion like what he experienced. These findings show that interpreters with different levels of emotional granularity perceive the source speech differently, which may further affect their performance in interpreting.

Further analysis of potential influence of emotional granularity on participants' speech outputs in SI shows that the number of omissions, errors or incompletions did not differ significantly between those with high and low granularity levels. This suggests that the impact of emotional granularity was only on participants' perception of the emotionality and difficulty of the source speech. Furthermore, the source speech was considered emotionally neutral based on text sentiment analysis. However, participants generally perceived the speech's valence more positive, indicating the potential influence of audio-visual inputs and their own emotions on their perception of emotion.

4.4 Summary of Findings

This chapter has investigated the effect of emotion on participants' performance in simultaneous interpreting to address three research questions: (1) Are interpreters' emotions affected by positive/negative emotional stimuli? (2) If affected, how does it impact their performance in terms of omissions, errors, and incompletions? (3) What are the possible contributing factors? This section will summarise the key results and findings related to each question.

RQ1: Are interpreters' emotions affected by positive/negative emotional stimuli?

One of the aims of this study is to investigate if an interpreter's emotion would be affected after exposed to emotional stimuli. The data shows that student interpreters' emotions in this study were affected by emotionally negative or positive stimuli (i.e., music) to varying degrees. This was based on both the analysis of changes in their self-reported emotions before and after being exposed to the stimuli and the analysis of the physiological indicator (i.e., skin conductance responses). The result shows that there was a significant difference between the negative group and the other groups, with a much lower SCRs/min. The positive group was not significantly different from the control group, but it has the highest mean SCRs/min value during SI. The result of self-reported ratings of emotion shows that negative music has a significant effect on participants' perceived emotion, which is characterised by great decline in both valence and arousal. Both self-reported and measured data show that the negative group had significantly less intensive emotional responses than other groups, suggesting a calming effect of the negative music. In addition, participants with different levels of emotional granularity had differentiated perception of the difficulty and emotionality of the source speech. Specifically, participants with lower granularity perceived the speaker's emotions significantly more intensely than those with higher granularity (*p*-value=.014). Regarding the overall difficulty of the speech, participants with lower granularity considered the speech significantly more difficult (p-value=.050). The above results suggest that there may be individual differences in student interpreters' perception of emotional stimuli (music) and the source speech, which may be related to their personal experiences and knowledge about emotion.

RQ2: If affected, how does it impact their performance in terms of omissions, errors, and incompletions?

Another question of this project is to explore how interpreters would perform when they are at emotional states. The results show that participants in experimental groups did not perform significantly differently in terms of the total instances of omission, error, and incompletion. Based on the statistical analysis in the last chapter, it has been found that there is no significant difference between the control and negative groups in terms of the total number of omissions at emotional states. However, the negative group made less referential and conative omissions than the control group. Specifically, the number of conative omissions made by the negative group is only less a third of that by the control group. The positive group made significantly more omissions than the control group. There is a significant difference between the two groups in the occurrence of referential omissions (*p*-value=0.036). Their performance also differs greatly when it comes to emotive omissions (*p*-value =0.06), though it is not significant statistically. Test result shows that there is no statistically significant difference across groups (p-value =0.168) in the total number of errors. However, further group comparison of different types of errors show that the positive group made significantly more conative errors than the control group (p-value =0.015). The negative group also made significantly more conative errors than the control group (p-value =0.024). It is worth noting that the negative group made much less emotive errors than the control group (p-value =0.96). Incompletion did not occur during the period when participants reached the level of arousal. The above results suggest that positive emotions may negatively affect student interpreters' information processing during SI, while negative emotions may be conducive to the process of SI.

RQ3: What are the possible contributing factors?

In addition to the above two questions, the study also aims to find out any influence of emotions on performance. The analysis of physiological data and interpretation suggests that emotion has a great impact on student interpreters' performance in simultaneous interpreting, and that positive and negative emotions have different effects on their performance. Such an influence is mainly manifested in the occurrence of omissions and errors during several processes of simultaneous interpreting, such as word recognition, executive control, and speech articulation. Based on the model of SI (Setton, 1999), model of perceptual processing (Solomon, 2010), and the theory of constructed emotion (Barrett, 2014), the emotional influences may be related to the impact of negative and positive emotions on attention, semantic and working memory, information processing speed, as well as individual differences in emotion perception and expressions.

The next chapter will attempt to explore the mechanism behind such differences based on theoretical references and participants' retrospective comments on their performance during the interview.

Chapter 5. Discussion

The previous chapter has presented major results of analysis of qualitative and quantitative data. This chapter aims to discuss the implications of the major results and offer insights into future research on the influence of interpreters' emotion on their performance in simultaneous interpreting. The chapter opens with interpreters' perception of emotion, including that of music, the source speech and their own performance (Section 5.1). Section 5.2 focuses on the impact of emotion on interpreters' management of attention to various sensory inputs during SI. The discussion about the impact of emotion on semantic processing is presented in Section 5.3, followed by Section 5.4, where the impact emotion on information processing was discussed. Finally, Section 5.5 explains how the findings of this study contribute to further understanding about the process of simultaneous interpreting, with a particular focus on Setton's model of SI.

5.1 Individual Differences in Emotion Perception in SI

This study found that participants within the same group also showed varied perception of the emotionality of the source speech and their own emotions. Such individual differences may be related to various factors, such as their knowledge about emotions, cultural norms in emotion perception, emotional experiences from other tasks (such as interpreting) and personal life experience (e.g., religion). This section discusses key findings related to individual differences in student interpreters' perception of music stimuli (Subsection 5.1.1), the source speech (Subsection 5.1.2) and their own performance in SI (Subsection 5.1.3).

5.1.1 Perception of music emotionality

In this study, a negative piece and a positive piece of music were used to induce student interpreters' emotions. Their emotion perception and experiences were analysed based on scale ratings, physiological data, and interview data. The analysis of pre- and post-condition comparison of self-assessment of emotional states (Subsection 4.4.1-1), between-group comparison of self-assessment of emotional states (Subsection 4.4.1-2), and group comparison of self-reports in interview (Subsection 4.4.1-3) suggest that both pieces of music are effective in emotional induction, but their significance was manifested in different dimensions of emotion, with varying persistence. Specifically, positive music induced significant changes in arousal, while negative music led to significant changes in valence.

This finding is partially consistent with findings from (Ribeiro *et al.*, 2019), which used the same positive and negative music pieces for emotion induction. In their study, the majority of participants reported higher arousal ratings after listening to the positive music (not at a statistically significant level), and the music elicited an increase in skin conductance level in comparison to baseline, also not at a significance of 0.05. Similar to their results about ratings of valence and measurement of skin conductance, this study also only observed changes, not at a statistically significant level. Unlike their insignificant rating results, this study found a significant increase in arousal ratings after and before participants were exposed to the positive music. This suggests that at least for Chinese student interpreters, this piece music appeared to have a strong emotionally stimulating effect. In addition, the present study found that the effect of emotion induction by the selected music piece may last longer than expected. According to previous research, the persistence of the effect of the positive condition usually last no more than 2 minutes (Ribeiro, Santos & Oliveira-Silva, 2019). From Figure 21, it can be seen that the average SCRs/min level of the Positive group only dropped to the baseline level at around 500s (around 8.30 minutes). This duration is even longer than what has been found in Ribeiro et al. (2019), in which increased SCL scores (compared to baseline) were detected for recovery phase after the participants were exposed to the positive music for 6 minutes. This means that the emotions elicited by the selected positive music may have a long-lasting effect on student Chinese interpreters, with a persistence duration of at least 8 minutes.

Regarding the negative music, most participants (79%) in their study reported the emotions of sadness in their self-assessment of valence, and they also found higher skin conductance levels when participants were in the negative condition (not statistically significant from baseline). Similarly, the current study also found higher levels of arousal in interpreters' average skin conductance responses to the negative music in comparison to baseline, also not statistically significant. What differs from their valence ratings is that this present study found a significant decline in valence after interpreters listened to the negative music, compared to the ratings before they listened to the music. Regarding the persistence of stimulation, the Negative group generally returned to the baseline level of skin conductance at around 100s (see Figure 21). This is similarly to the duration what the literature has advised, which is around 2-4 minutes (Ribeiro, Santos & Oliveira-Silva, 2019). However, it is unexpectedly shorter than what has been suggested in Ribeiro et al. (2019). In their study, their participants' self-reported time for return to the neutral state was 2 min, and skin conductance levels maintained high for 6 minutes upon exposure to the negative music. The recovery time of 100s is shorter than both values in literature. Based on results of this study and literature, the differences in dimensions of emotion impacted by negative and positive music pieces may be related to several reasons, such as the past experiences interpreters recalled while they were listening to the music, their subjective judgment of the scale, and their differences in bodily responses.

According to the theory of constructed emotion (Barrett, 2017), past experience contributes to the shaping of emotions. Individuals may have different perceptions of the same emotional stimuli (e.g., music) because of their personal experiences in the past (childhood, religion, etc.). In this study, interpreters were asked about what they were thinking about while listening to the music at interviews, and the analysis of interview data suggests that the events they recalled while listening to the positive music may have influenced their perception of the emotionality of music. For example, one participant in the positive group (Participant 15) said in the interview that "When I was happy, I used to think about the times when I hung out and exercised with my classmates. It made me really happy to exercise with them. Then we used to go out and have fun together... But then as soon as those thoughts passed, there wasn't anything else that made me happy. That's when I started thinking about some scary things, like getting into a car accident. I imagined myself standing in the middle of the road while a big truck was coming towards me, but it was too terrifying, so I quickly tried to think of something else. So, I then thought about the time spent at home with my parents which also made me feel a little happier again.[3]" The

[3] This is a direct English translation of the participant's description during interview. Her original words in Chinese are: "开心的时候就在想，嗯，过去和同学们一起出去玩，然后一起去运动。额，然后因为就是运动时候，我就很开心。然后还有是和同学们出去，额，游玩的时候。。。然后但是后来想了一遍都想完了，然后就没有什么开心的事了。就开始想，就是，一些恐怖的事情。比方说出车祸什么的。我在想我在马路中间，然后一

interpreter's recall of both positive and negative events while listening to the positive music suggests that emotional experience was influenced by personal memories, and that a mixture of emotions may be induced. This reflects the key role of prior experience in shaping emotional responses to stimuli, as highlighted in the theory of constructed emotion (Barrett, 2017), and may explain why the ratings of valence were not significantly higher after listening to the positive than before listening. It highlights the complex nature of emotional responses to music and the importance of individual differences in interpreting and experiencing different emotions.

In addition to past experience, a synthesis of interview data, scale ratings and skin conductance data suggests that interpreters' subjectivity in interpreting the scale may also cause the insignificant result of arousal ratings. Despite their bodily responses, interpreters may perceive changes between scale points differently. For example, Participants 1 and 8 in this project had the greatest changes in skin conductance responses in comparison to the baseline, i.e., 1.25 and 1.36 microsiemens, respectively. According to their SAM ratings, their emotional states both changed from score 5 of valence and score 2 of arousal (in Scale 3) before listening to music to score 4 of valence and score 2 of arousal (in Scale 4) after listening to music. For both, the change before and after listening to the negative music piece was -1 in valence, and 0 in arousal. Their self-assessment result suggests that they did not have strong emotional responses to the stimuli, which differs from the results of their skin conductance responses. Moreover, the analysis of their description during interview shows that they both recalled negative events such as "war, disaster…the Spanish flu" (Participant 1) and "school bullying" (Participant 8). Both bodily responses and interview description indicate that their emotional arousal should have been greatly influenced. However, they ratings before and after listening to music only changed 1 score. One possibly is that they tend to have great bodily responses even when their emotions do not change much. Another possibility is that a change from 5 (the neutral state) to 4 (slightly negative) is already a great change to them based on their standards. The SAM scale has high reliability in literature and in previous rounds of testing in this study. While the description of the rating scale

辆、一辆大货车正在向我开过来，然后但是太恐怖了，于是让自己赶紧想一些别的。然后就想，额，之前在家的时候，额，就是和父母一起的那些时光，就是也是让自己又开心了一点。"

had been provided to them before they started the experiment, and a visual manikin version of the scale was use, they might still interpret the scores, or manikin faces differently. This is unfortunately a weakness of a scale rating. Such discrepancy may be reduced by employing a higher-order scale like a nine- or ten-point rating scale to give the raters more options. Another way is to provide more training on the use the scale, such as practising with the scale before the formal experiment, in addition to the description alone. A version translated from English into Chinese may also help Chinese student interpreters gain more accurate understanding about the rating scale.

Another reason for the differences in perception of music stimuli could be interpreters' individual differences in bodily responses to emotional stimuli. In other words, large changes in perceived emotions may not necessarily manifest as great bodily responses, leading to insignificance in the measurement of skin conductance. This project found that there were cases where participants' SAM ratings changed greatly before and after listening to the negative music, but their bodily responses are minimal. For example, Participant 3 only had a change of 0.26 microsiemens from the baseline level in her skin conductance responses after exposure to the negative music, which ranks third from last in terms of changes in average skin conductance responses in the Negative group. The result of this physiological measurement suggests that her emotional states may not have changed much from her rested status. However, the analysis of her interview data suggests the opposite. When she was asked about how she felt while listening to the music, she described visiting her grandfather in the hospital before he passed away. She said:

> The music made me feel sad and reminded me of my own sad story that almost made me cry ... When I was little, my grandfather passed away quite early because of late-stage stomach cancer ... I went to see him at the hospital. Before I left, he suddenly took out a brand new twenty-yuan note and wanted to give it to me. He told me he exchanged a new note just for me. I were still young at that time, but I still felt swamped by my emotions … "I don't need it," I said. He insisted with tears in his eyes, "Take it. Come on." I [sniffling]

took the note and dashed away. Outside the room, I started crying.[4]

(Participant 3)

Based on her description above, she probably felt quite sad while she was listening to the negative music during the experiment. She even choked up slightly while recalling this event during the interview. The great change in her emotional states was also reflected from her self-reported ratings, where the valence score changed from 5 to 4, and the arousal from 2 to 3. Such a decline in valence and an increase in arousal suggest that her emotional states changed from neutral to negative. Because of her self-reports, both at interview and in scale ratings the variation in her skin conductance responses was expected to be large in comparison with baseline. However, the participant's variations in skin conductance were minor. Above example indicated that listeners' great emotional fluctuations may not necessarily manifest as great changes in bodily responses, i.e., skin conductance in this case. However, this study did not measure other physiological indicators, such as heart rate, respiratory rate, and body temperature. While participants were asked about their heart rate, breath and temperature during the interview, these indicators were not monitored through the interpreting. Therefore, no further analysis could be conducted to see if great emotional fluctuations might manifest as great changes in these indicators. Based on the finding, it is likely to observe great changes in these indicators, given the participants' self-reports. In future studies, it is recommended to adopt multiple measurements to obtain understanding about their emotions from different sources.

5.1.2 Perception of speech emotionality

In this study, participants' ability in differentiating emotions (i.e., emotional granularity) was evaluated by analysing their ratings of 16 emotive words. The analysis of the ratings showed that

[4] This is a direct English translation of the participant's description during interview. Her original words in Chinese are: "音乐呢就是悲伤，想着我的那个悲伤的故事我快哭出来了都⋯小的时候，因为我爷爷可能去世的比较早嘛，就是那会儿，啧，额……他当时是因为，呃，胃癌晚期……然后去医院看他……最后我说要走了，然后他就突然掏出来一张崭新的 20 块钱说要给我。然后然后他就说那张钱就是他特意换成新的的，要给我。然后我那那那一刻，就是我当时虽然很小，但是我那会儿就有点绷不住，然后我就我说我不要。他说你拿着，你赶紧拿着。然后他当时其实就已经快哭了，就是眼眶里，然后泪水在在在转动，然后我我当时[吸鼻子]就拿着钱，我我就赶紧跑了。然后跑出去之后，我就开始哭。"

participants with different levels of emotional granularity had differentiated perception of the emotionality of the source speech (see Section 4.3). Specifically, participants with lower granularity perceived the speaker's emotions significantly more intensely than those with higher granularity (p-value=.014). The selected source speech was relatively neutral based on text sentiment analysis and previous subjective ratings by participants in pre-testing. In line with expectations, interpreters with higher emotional granularity rated the emotionality of the source speech much lower and closer to the neutral score than those with lower granularity, suggesting that higher emotional granularity may lead to more accurate perception of the emotionality of the source speech.

This finding confirms the importance of emotional granularity in emotion perception in interpreting and aligns with previous research on emotional granularity and emotion differentiation in literature. While no research in interpreting studies has investigated interpreters' emotional granularity to date, many studies in the field of psychology found that individuals with a great ability to perceive and differentiate between emotional states or high in emotion differentiation tend to demonstrate more accurate understanding of their own and others' emotional expressions, and this enhanced perception can in turn facilitate more effective interpersonal communication (Erbas *et al.*, 2016; Israelashvili *et al.*, 2019; Tan, Wachsmuth and Tugade, 2022). According to the psychological constructionist view, the perception of emotional expressions is not a direct translation of the physical cues but rather a constructive process influenced by various contextual factors, and one crucial factor that underpins the perception and experience of emotions is the perceiver's conceptual knowledge about emotions (Barrett, 2004, 2014, 2017). Emotion words and the concepts they represent are crucial in creating perceptions and experiences of emotion in the first place (Lindquist, 2017). In this study, student interpreters with lower granularity generally rated the arousal level of the source speech higher. In this sense, the higher ratings may be attributed to their lack of knowledge about words that describe low-arousal emotional states, thus leading to difficulties in differentiating the arousal level of the source speech accurately. For example, below is a computed circumplex model of emotion for Participant 8 (from the Negative group) based on her ratings of emotive words.

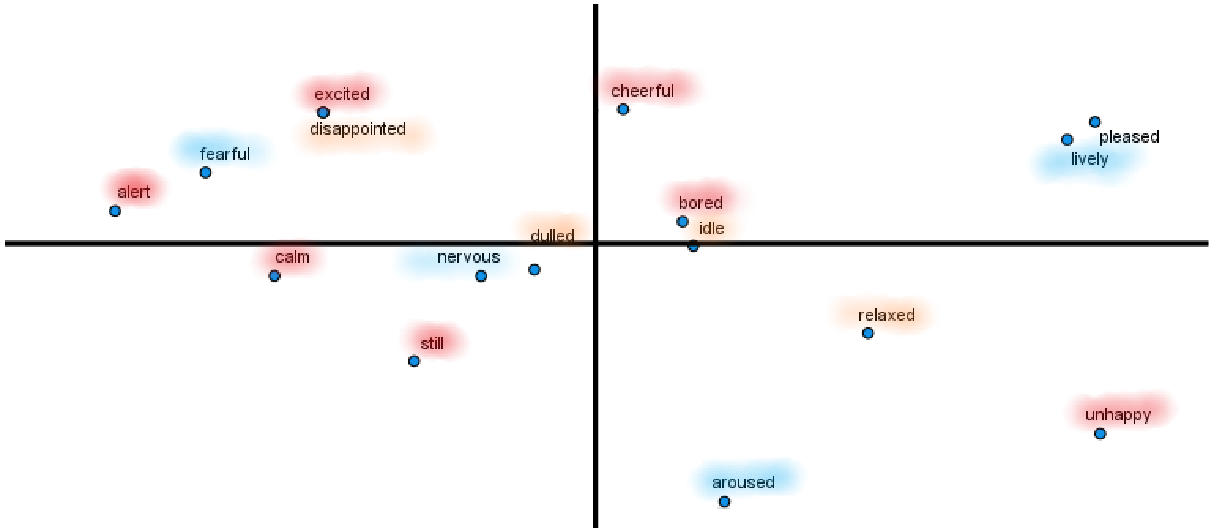


Figure 30. Colour-coded circumplex of emotion of P8

The origin of the coordinate system suggests a neutral emotional state. The horizontal axis represents valence, from negative on the left to positive on the right. The vertical axis represents arousal, with high on the top and low on the bottom. Red, orange and blue denote wrong categorisation of valence, arousal (over-rated), and arousal (under-rated), respectively. 7 out of 16 words were misperceived in terms of their valence. Excited, for example, is a positive-valence high-arousal emotion but was rated as a negative-valence high-arousal emotion. And all other emotional states, except ‘pleased’, were all either over-rated or under-rated for their arousal levels. Surprisingly, because of the large number of misperceptions, the participant actually rated the source speech as absolute neutral, i.e., ratings of 5 for both valence and arousal and commented the speaker as ‘neither happy nor sad’ (Chinese: 他没有很开心，也没有很难过). This is lower than the average of ratings by other participants, and so many misperceived emotional states may be problematic in real life.

While this is a special case, interpreters’ understanding of the emotionality of the source speech is crucial for effective emotional communication as their perception would shape the way the message is conveyed. Researchers have found that interpreters empathize emotionally with the speaker’s emotional state during SI and construct their own emotional responses based on the emotional information he or she perceived from the speaker (Korpal and Jasielska, 2019). If interpreters lack such ability, they may misperceive the neutral or emotive content of the source, leading to inaccurate interpretation or inappropriate adoption of emotional regulation strategies during interpreting. For example, if this interpreter perceived ‘excited’ as a negative-valence high-arousal emotion, she might try to suppress it to achieve a more ‘neutral’ speech, which is the norm in conference interpreting. This echoes what previous researchers have observed in medical settings where emotive content made by the patient and the doctor were largely “reduced, increased or omitted” in the target speeches rendered by the interpreters (Krystallidou *et al.*, 2018, p. 38).

Context is crucial for in emotion regulation (Aldao, 2013). EG is beneficial in processing information in a context-sensitive manner, which would facilitate emotional regulation (Wilson-Mendenhall and Dunne, 2021). If this is neglected, the changes in emotionality of speeches could further negatively impact the overall communication between the speaker and the audience. Therefore, more attention should be paid to understanding student interpreters’ emotional granularity and provide relevant training to cultivate their knowledge about different emotional states. This is especially important for language systems with diverse and subtle expressions of emotions, such as Chinese. Recent research suggests that EG for negative emotions may be shaped by the diversity of daily life experiences (Hoemann *et al.*, 2023). Future studies could investigate how such experiential diversity contributes to the development of EG among student interpreters.

5.1.3 Perception of self-performance in SI

One finding of this present study is that positive and negative emotions seem to have varying effects on interpreters’ perception of their own performance during simultaneous interpreting. The analysis of interpreters’ ratings of their interpreting performance showed that student interpreters in the Positive group rated their performance with the highest score, followed by the Control group and the Negative group (see Table 70). In addition to ratings, the analysis of interview data also shows the potential influence of emotions on confidence. When participants were asked about the influence of emotion on their performance, none of the participants in the Positive group mentioned the influence of emotion on confidence, indicating that they might not think their confidence was affected by their emotions. In contrast, two participants (Participants 7 and 12) from the Negative group pointed out the varying influence of emotions on their performance. These results suggest that student interpreters in positive emotions may have more confidence about their performance, while interpreters in negative emotions may be less confident about their own interpretation.

The varying influences of negative and positive emotions on confidence in this study is partially in line with existing study in the field of psychology and interpreting studies. Emotion can affect self-confidence by influencing one's perception of their abilities and their belief in their potential for success (Mano *et al.*, 2019). Positive emotions (e.g. excitement) generally make individuals be more confident about their beliefs, while negative emotions (e.g. anxiety) reduce confidence (Bilovich, Johnson and Tuckett, 2020). Similarly, the present study also found that a moderate level of stimulation of positive emotions may promote interpreters' self-perception of their performance in general. For example, "When [I'm] happy… [I] do simultaneous interpreting with a better mindset," [Chinese: "开心的状态…就是比较积极的心态去做同传"] said Participant 12. Her description suggests that positive emotion (e.g., happiness) helped her adopt a more positive attitude towards the interpreting task. Negative emotions may also lead to a decline in confidence. For instance, Participant 7 said: "I'd feel anxious and frustrated if I didn't hear a large chunk. Like if it's at the start, there's a lot that I don't understand and can't interpret it, I think it affects my later SI performance. … about 30 percent, [affects] my confidence about interpreting."[5] This description suggests that omissions (due to varying reasons) may lead to negative emotions (e.g., anxiety and frustration), further affecting interpreters' confidence about their performance during simultaneous interpreting.

What differed from literature is that the positive influence of positive emotions on self-perception of performance did not necessarily lead to improvements in interpreting performance. In

[5] Original words in Chinese: 如果如果真的就有一大段没听到的话，会有一些慌张吧，然后有一些沮，会有一些沮丧我觉得。比如说比如刚开始，可能如果刚开始的话，那然后就一大串啊，突然就觉得没有听懂啊，然后又翻不出来啊，后面我觉得对同传的表现是有影响的。⋯ 嗯，我觉得会有一个，会有大概 30%的影响吧。⋯ 就影响，对接下来翻译的信心啊。

interpreting studies, confidence is considered a key personality trait of interpreters and is important for interpreter training (Shaw, Grbic and Franklin, 2004). This was supported by a later study on students' confidence in English to Persian consecutive interpreting, in which students' confidence in their performance in consecutive interpreting was found conducive to reducing stress, thereby improving the overall quality of interpreting (Shafiei, 2022). Student interpreters who displayed confidence were supposed to outperform those who lacked such confidence, as suggested by previous findings in literature (Shaw, Grbic and Franklin, 2004). However, the comparison of performance across three groups showed that student interpreters under positive emotions (with confidence in their performance) made the largest number of omissions, much more than those under negative emotions. This suggests that in this study, positive emotions might not simply promote confidence sightly. Instead, it might lead to over-confidence, while negative emotions might lead to under-confidence.

Overconfidence refers to the overestimation of one's own capabilities (Marshall *et al.*, 2013). Likewise, underconfidence refers to the underestimation of one's capabilities. (Moores and Chang, 2009) suggested that "there is evidence to suggest that one can become overconfident when a person's belief about their expected level of performance exceeds their actual performance," and, therein, that "self-efficacy is only satisfaction in one's level of performance, and complacency may result, leading to a negative relationship between self-efficacy and performance". According to literature, students used their emotions as cues for prediction in language processing; positive emotions often led to over-confidence about their understanding of text and negative emotions to under-confidence (Prinz-Weiß et al., 2022). Overconfidence at the start, as suggested by previous researchers, would then negatively affect individuals' performance in the subsequent task (Moores and Chang, 2009). The present study exposed student interpreters to emotional stimuli before they started the interpreting task, and this aligns with the above findings. In addition, simultaneous interpreting itself is a very time-sensitive task, where interpreters need to manage multiple subprocesses and produce target speeches in a few seconds after the speaker. Research found that in time-limited situations, people with high self-efficacy (i.e., one's belief in capacity) tended to reduce resource allocation (Beck and Schmidt, 2018). In this sense, if student interpreters in positive emotions become overly confident about their understanding of one of the interpreting inputs (from the speaker's speech input, from the PowerPoint slides, from the glossary), they may allocate less resource to other inputs and their own interpretation of previous utterances, further leading to omissions and errors. This reduced resource allocation may further have an impact on interpreters' processing of various sensory inputs in SI, which will be explained in more detail in the next section.

The finding from this study about the emotional influences (particularly that of positive emotions) on student interpreters' perception of their own performance in SI sheds light on the potential relationship between self-efficacy or confidence and interpreting performance, which may be explored further in future studies. It is suggested to consider comparing professional and student interpreters, with consideration of age and interpreting experience. These two factors seem to affect professional interpreters' self-confidence in practice (Zwischenberger, 2015).

5.2 Impact of Emotion on Attention Management in SI

The results of analysis of participants' self-reports during interview, shown in Subsections 4.1.1 (2) and 4.2.2 (4), suggest that interpreters' emotions may have a great impact on their overall focus on the source speech and the allocation of attention to multiple sensory inputs during SI. Such impact appears to vary from negative and positive emotions. This section will discuss this key finding based on Setton (1999)'s processing model of SI and Solomon et al. (2010)'s model of perceptual processing.

5.2.1 Overall focus on interpretation

This study found that exposure to experiences of negative emotions prior to the interpreting task may improve student interpreters' overall focus in simultaneous interpreting, leading to overall better performance in SI; exposure to positive emotions may decrease focus, leading to overall poor performance in SI. The enhancing effect of negative emotions on overall focus is evidenced by the smallest number of omissions (Table 44) and errors (Table 56) made by student interpreters in the Negative group, as well as student interpreters' self-reports during interview (see Subsections 4.1.1). On the other hand, the effect of positive emotions on focus is evidenced by significant more omissions made by student interpreters in the Positive group (Table 44). This finding is unexpected because it is not in line with earlier research on the impact of negative emotions on interpreting quality, but it is consistent with many studies about emotion and attention in the field of psychology.

According to previous interpreting studies, negative emotions (such as psychological stress and anxiety) are often associated with low quality outputs in interpreting, such as more disfluencies in target speeches (Zhao, 2022), increased omissions, difficulties in maintaining focus during extended duration of interpreting. However, this study suggests that a low level of arousal from negative emotions may lead to a more focused and detailed processing style, allowing interpreters to pay closer attention to the details of the source speech, thereby enhancing performance in SI. For example, Participant 15 from the Negative group said: "I originally thought it [sadness] would make me unable to focus, but actually it didn't. Just before I felt sad, I was a bit impatient. It felt like, oh, why hasn't it started yet? That kind of feeling. But after the sadness passed, I actually calmed down and I felt very focused during interpreting.'[6] This participant's description reveals the interpreter's presumption about the negative impact of negative emotions (such as, sadness and impatience like she experienced) on focus. But the analysis of her target speech shows that she was one of the few participants that made a very small number of omissions, errors and incompletions. This matches her feeling of 'very focused' reported during the interview. This suggests that prior exposure to negative emotions, such as sadness or frustration, may improve student interpreters' overall concentration in a subsequent task (simultaneous interpreting, in this case). Such facilitation of negative emotions is in line with literature, it is generally agreed that positive emotions are associated with broad focus of attention and heuristic-based processing style while negative moods with more local focus of attention and detail-oriented processing style (Miron, Naftalovich and Kalanthroff, 2020; Naranowicz, 2022; Salsano *et al.*, 2024).

There are a few possible reasons why this finding differs from previous research on psychological stress or anxiety and interpreting quality. First, previous studies often investigated the impact of

[6] Original words in Chinese: 我本来以为会让我觉得不能专注，但是其实没有…就是悲伤之前，其实我是有点毛躁的。就是感觉，啊呀，怎么还不开始。就是那种感觉，但是我感觉，就是悲伤完了，我反倒就是静下来了，然后翻的时候就感觉很专注。

psychological stress or anxiety by manipulating speech factors, such as accent, language directionality, lexical complexity. However, the impact from such difficulties may be interfered by student interpreters' interpreting skills and language proficiency a lot, so the impact of negative emotions may be magnified by the influence of these speech factors. This present study, in contrast, induced interpreters' emotions before the interpreting task and greatly lowered the difficulty of the source speech so that such interference is reduced, hence the differences in findings. Second, emotional stress is quite different from the induced negative emotions in this study. The music piece selected for inducing negative emotion (*Adagio in G minor by Albinoni*) was produced shortly after World War II and was originally part of a church sonata (Schwarm, 2024). It expressed heavy negative feelings and has been used for mainly inducing sadness (Ribeiro *et al.*, 2019). Emotional stress is characterised as negative valence and high arousal (Russell and Lemay, 2000), while sadness is categorised as a negative-valence and low-arousal emotion (Russell and Lemay, 2000; Mizrahi Lakan, Millgram and Tamir, 2023). While both are negative-valence emotions, the differences in the level of arousal may result in various effects. According to literature, increased arousal leads to reduced attention and concentration (Easterbrook, 1959). This may explain why the finding of this study shows an enhancing effect of negative emotions (low-arousal) on focus, whereas previous research found a reducing effect of negative emotions.

However, this enhancing effect of negative emotions on focus may be influenced by other factors, such as the speaker's speech rate. For example, Participant 7 from the Negative group mentioned that as a result of feeling pressured and rushed, she was not able to fully concentrate on her interpreting. For example, 'when the speaker spoke quickly, I actually felt nervous and wanted to focus more on it but found it harder to concentrate at that time. Just nervous. The more I tried to focus, the harder it became'[7]. This suggests that the impact of negative emotions on focus during interpreting tasks may vary from person to person and can be influenced by the speaker's speech

[7] Original words in Chinese: 比如说这个讲者讲讲得快的时候，然后我就会，我其实确实自然而然就觉得有一些紧张，然后我就会很想要赶快 focus 在上面，但其实在这个阶段的时候，反而其实在这个阶段的时候，反而觉得感觉自己更不能专心了。这就是紧张，越想 focus，但越觉得不容易 focus。

rate. This is in line with previous studies about speech rate and interpreting quality in simultaneous interpreting. That is, fast speech rate has been found to be a key factor that can disrupt performance and increase cognitive burden on interpreters, making it more difficult for them to maintain focus and accuracy (Chernov, 2004; Korpal, 2012; Rosendo and Galván, 2019). However, it is surprised that the speech rate of the source speech has already been slowed down from the original speed (167 WPM) to 0.8x speed (131 WPM), which was rated as the most natural speed by both Chinese and English native speakers. This natural speed was found comfortable by most participants during the experiments, so it was not expected to cause difficulties. In this case, it is likely that when interpreters were emotional, they might be more easily affected by speech rate during simultaneous interpreting than those in neutral conditions.

Based on the above, the finding of this study contributes to the existing literature by suggesting low-arousal negative-valence exposure for student interpreters before they start simultaneous interpreting, to help them improve focus on the interpreting task. It is also worth exploring the combined effects of emotions and speed rate in future research.

5.2.2 Attention to sensory inputs

One of the key findings of this study is that negative emotion facilitates attention allocation to sensory inputs during SI, while positive emotion impairs. This finding was derived from the analysis of interpreters' explanation of their omissions during interview. Many participants from the Positive group reported that they failed to hear the source speech because they were distracted by other inputs, such as PowerPoint slides and the glossary, resulting in omissions (see Subsection 4.2.2-4). For example, Participant 30 in the Positive group omitted two sentences consecutively after interpreting the sentence "The green ones are the ones who learned by comprehensible input". When asked about her interpretation in this instance during interview, she said: "…like 'comprehensible input', at that time, I was looking for it, but by the time I found it, the speaker might have said two more sentences, so I couldn't catch up. Then, I have to let it go and continue interpreting."

This example reflects the interpreter's mismanagement of attention to two types of sensory inputs: sight (i.e., visual) and sound (i.e., hearing). According to the model of perceptual process, how people perceive the meaning of the inputs depends on how they select, organize and interpret them, and the meaning-making process only occurs after a sensory input has been received and attended to by the recipient in perceptual processing (Solomon, 2010). In the above example, the interpreter was looking for the provided Chinese translation of 'comprehensible input' on the glossary. Her attention shifted from processing the sound input of the speaker's voice to processing the sight input from the glossary. As a result, the upcoming two sentences did not receive attention from the interpreter and the processing process of the two sentences stopped at the sensation stage before the meaning of sensory inputs could be interpreted, thus resulting in the omissions of the following two sentences in her target speech.

Based on the finding, the processing model of SI (Setton, 1999) and the model of the perceptual process (Solomon, 2010), this study produced the following illustration to describe the mechanism of the impact of emotion on the processing of sensory inputs during simultaneous interpreting.

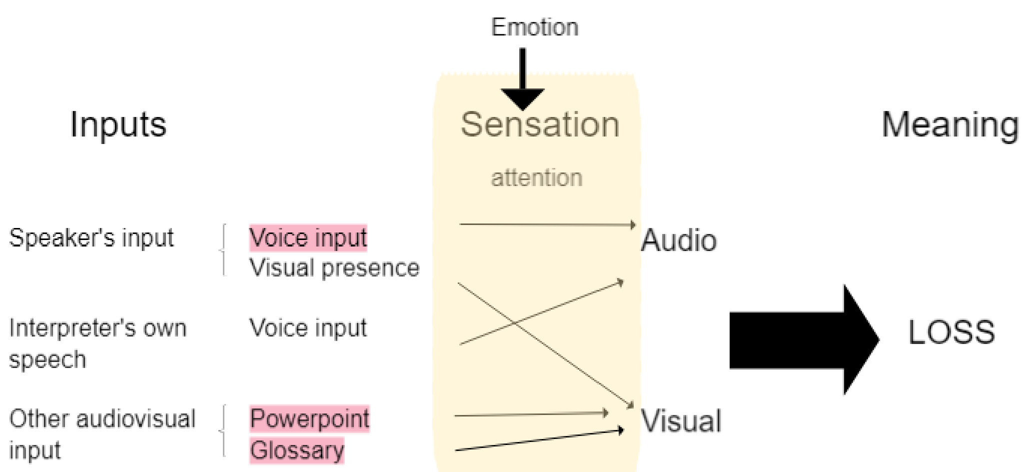


Figure 31. Impact of positive emotions on sensory inputs in SI

In the above figure, the top headings 'inputs', 'sensation', and 'meaning' are borrowed from the model of the perceptual process (Solomon, 2010). The left "speaker input, other audiovisual input, and interpreter's own speech" are the three main types of inputs from the processing model of simultaneous interpreting (Setton, 1999). To the right of the three main types of inputs are inputs from this research project. In this project, participants were provided with PowerPoint slides and a glossary to support their interpretation, so they are included as ‘other audiovisual input’ in the above figure.

According to literature, each input may require attention during interpreting. Attention is affected by emotion (Setton, 2010). As revealed from this project, positive emotion has a negative effect on attention management to sensory inputs, particularly the voice input from the speaker, as well as PowerPoint slides and the glossary (as highlighted in red). This finding is line with previous research: experiencing positive emotions could potentially broaden individuals’ attentional focus, resulting in a more comprehensive processing style while also hindering tasks that demand focused attention (Naranowicz, 2022). Therefore, when individuals are in a positive emotional state, they may be more prone to distractions from various inputs, thereby affecting their processing of the information from the source speech. It also adds further evidence to the dominance of visual inputs over auditory inputs in simultaneous interpreting, which also aligns with Colavita visual dominance effect, i.e., the tendency to respond more often or strongly to a visual stimulus than to an auditory stimulus presented at the same time (Colavita, 1974). While previous research found such a dominance in the target speeches produced by freelance conference interpreters in English-to-Polish simultaneous interpreting (Chmiel, Janikowski and Lijewska, 2020), findings from this study suggest that student interpreters in English-to-Chinese simultaneous interpreting also seemed to prioritise visual inputs over auditory inputs, particularly when they were in a positive emotional state. Having said that, it does not mean that the presence of visual inputs would necessarily lead to more occurrence of omission or errors. This may be explored in future studies by conducting experiments to compare the accuracy with or without visual inputs under emotional stimulation.

The impact of emotions on the processing of sensory input calls attention to interpreter training, as students are often not particularly trained in how to allocate their attention more efficiently to various sensory inputs. This may help them perform better when they are emotional in real-world interpreting scenarios.

5.3 Impact of Emotion on Semantic Memory in SI

Findings of previous research have highlighted the significant role that emotion plays in shaping various cognitive processes, including semantic activation and verbal working memory processing. This research project also identified potential influences of emotion on interpreters' retrieval of semantic information and accuracy of their memories of speech records in the context of interpreting. This section will discuss such influences based on findings and previous studies in literature.

5.3.1 Semantic processing of SL and TL

This study investigated the influence of student interpreters' emotions on their performance in simultaneous interpreting. The analysis of results in Subsection 4.2.2 suggests that positive and negative emotions may be conducive to semantic processing in general. This enhancing effect is evidenced by much less referential omissions (related to the Assembler) made by the Positive and Negative groups, in comparison to those made by the Control group, as shown in Table 52. The observation that negative emotions facilitated language processing is consistent with previous research, which found that negative emotions lead to stronger activation in semantic memory (Naranowicz, 2022). The stronger activation in semantic memory in the negative emotion group allows interpreters to retrieve information more quickly and effectively, leading to improved comprehension of the source language and ultimately better performance in interpreting tasks. In addition, negative emotions may also lead to a more focused and detailed processing style, allowing interpreters to pay closer attention to the specific semantic details of the source speech. The potential facilitating effect of positive emotions in this study aligns with existing literature where positive emotion was found to enhance association memory, i.e., memory for word-and-word pairs (Madan, Scott and Kensinger, 2019).

In addition to the overall enhancing effect, further comparison between the two experimental groups showed that the influence of emotion on semantic processing seems to vary depending on the function of the source language. Referential information was the type of information where the positive group omitted significantly more than the control group, while the negative group did not (see Table 50). Based on interviews conducted with participants, it was found that referential information omitted by the positive group was primarily associated with Assembler-SL processing (i.e., decoding of the source language), while fewer referential omissions were caused by Assembler-SL in the negative group. The three groups made a similar number of referential omissions related to Assembler-TL (encoding of the target language), so the enhancing effect of emotions was mainly related to the processing of the source language.

A key finding of this study is that positive emotional states may impair the semantic processing of referential information in the source language, leading to more referential omissions in the interpretation process. This is consistent with previous research showing that positive emotions may negatively affect the accuracy of language comprehension. For example, individual in positive emotional states may struggle to efficiently access the appropriate lexical items and grammatical structures needed to accurately understand the meaning of the source language, which resulted in higher error rates and longer reaction times to semantic inputs (Jiménez-Ortega *et al.*, 2012). In addition, it adds potential support to the influences of positive emotions on semantic processing through spreading activation within semantic memory. Semantic priming refers to the phenomenon where the processing of a word (the target) is facilitated by the exposure to a related word, i.e., the prime (Hoedemaker and Gordon, 2017). Previous research found that individuals in a positive mood showed stronger semantic priming effects for high-associative-strength prime-target pairs (concepts that are closely related) but not for low-associative-strength pairs (concepts that are distantly related), and that the facilitatory effect of positive mood on spreading activation diminishes as the associative strength between concepts decreases (Hänze and Hesse, 1993). In other words, the further apart two concepts are in semantic memory, the less likely a positive mood will help in activating and retrieving them.

From the analysis of participants' interpretation transcriptions and their descriptions during interviews, it has been found that parts of the source speech omitted or misinterpreted often do not contain technical terms or grammatically complex. Common words and phrases were still lost or inaccurately interpreted by interpreters during simultaneous interpreting. For instance, Participant 10 from the Positive group interpreted "Zoe came from Australia, went to Holland, was trying to learn Dutch, struggling extremely extremely a great deal" as "Zoe comes from Australia. [long pause] She studied, she studied for a long time. [Chinese: "Zoe 她来自澳大利亚 [long pause]她学得，她学了很长的时间"]. In this interpretation, the words in bold (i.e., Holland and Dutch) were omitted, and the negative feelings expressed in the underlined part was replaced with the description of the long duration of study. When asked about her interpretation of this sentence, she said: "I heard 'went to Holland', but at the time I didn't know how to interpret it, and then it passed...I couldn't recall what it is in Chinese for 'Holland' ... I didn't understand 'A great a great deal' here. What I heard before was, I said studying was really really hard."[8]

Her description suggests that she failed to retrieve the expression of 'Holland' in the target language, resulting in an omission. The word 'Holland' is a common word, with a Gunning fog index of 0.4 and a Flesch–Kincaid readability score of 8.4. The scores show that the word should be easily understood by elementary or secondary school students. The participant passed the IELTS requirement of the T&I programme, so should have reached an advanced English level. In this sense, this word should not pose a great challenge to her. However, in emotional states, positive emotions may lead to slower activation of the semantic memory. The associative strength between 'Australia' and 'Holland' might be considered low because they do not share many immediate or obvious connections, geographic or culturally. When thinking about one, the other doesn't naturally come to mind unless there's a specific context linking them. In this specific speech, such a context was not given. Following the finding of previous research (Hoedemaker and Gordon, 2017), the facilitatory effect of positive emotions on semantic processing might decrease, and the processing of the target word 'Holland' became slightly slower in this sense. Such a slight delay in semantic processing may be magnified by the complex execution of several processes at the same time during simultaneous interpreting. When the next piece of information comes, interpreters may need to move on from the current part in order to catch up with the

8 Original Chinese words: "我听到 went to Holland，但是我当时没有反应过来就怎么翻，就过去了…我没有想到 holland 的是什么，中文…A great a great deal 这儿我没有听明白。前面我听到的就是，我说学得特别特别地辛苦。"

speaker. Therefore, information loss may occur if target expressions cannot be quickly retrieved from semantic memory.

In sum, negative and positive emotions seem to facilitate semantic processing in simultaneous interpreting; however, emotional influences may vary depending on the function of the source language. Their facilitatory effects may be diminished if the source utterances serve a referential function, and the concepts in the utterances are distantly related. Further exploration on the influence of positive or negative emotions on prime-target pairs may provide a better understanding about the emotional influences on semantic processing.

5.3.2 False memory of speech records

The current study found that student interpreters experiencing positive emotions may be susceptible to false memories about their interpretation. They tended to recall content that the speaker or they did not say, which then affected how they interpreted the following utterances. Results of analysis of omissions show that the Positive group made the greatest number of omissions related to executive control, among half of which are related to addressee orientation, as shown in Table 52. By looking at the analysis of interview data, it appeared that the Positive group's high number of omissions related to addressee orientation are mainly related to the impact of positive emotions on false memory.

This finding is generally in line with existing studies in this area. Research indicates that positive emotional states can enhance the likelihood of false memory occurrences, as evidenced by various studies (Kensinger and Schacter, 2006). In one study that also used Bach's *Brandenburg Concerto* (*No. 3*) to induce positive emotions in Chinese graduate students, those experiencing positive emotions had a higher false memory rate in a word recall task (85%) compared to those experiencing negative emotions (72%), which may be caused by enhanced semantic association from stronger activation in brain regions that are related to semantic coding, i.e., Brodmann areas 24 and 45 (Li *et al.*, 2021). Furthermore, positive emotion could also decreased memory accuracy in recalling the general meaning and details of neutral information (Moore, Urban-Wojcik and Martin, 2021). Similar to the above studies, this study also used a relatively neutral source speech and induced positive emotions in Chinese graduate students with Bach's *Brandenburg Concerto* (*No. 2*, not *No.3*). It also observed that student interpreters produced more false memories when they were in positive emotional states, but the impact was only manifested in the positive group. This differs from findings in some studies which suggested negative caused more false memories (Brainerd *et al.*, 2008; Dehon, Larøi and Van der Linden, 2010). From the analysis of the target speeches produced by interpreters in negative condition, negative emotions did not seem to have a significant impact memory accuracy.

It should be noted that this finding does not determine whether the influence of positive emotion is caused by valence or arousal levels, which a key controversial point in literature. Some evidence demonstrated that the emotional impact on the occurrences of false memory was driven by only one dimension of emotion, i.e., valence (Storbeck, 2013). Competing voices argue that emotional arousal, rather than valence, influences false memory formation, as shown in research on false memory formation using the Deese-Roediger-McDermott paradigm (Ayyıldız, 2022). However, as suggested by other researchers, "memory impairment associated with the positive condition was not purely a function of arousal" (Moore, Urban-Wojcik and Martin, 2021, p. 785). Both arousal and valence may affect the formation of false memory.

The finding of this study also adds support to this proposition as generally high arousal levels (above 5 SCRs/min) and more false memory occurrences were observed in the analysis of physiological and speech data of student interpreters in the Positive group than those in control and negative groups. For instance, Participant 19 from the Positive group omitted "what was really cool was that" from the original speech: "What was really cool was that in six months, I was fluent in, in mandarin Chinese." When asked about this, she said "I said [that]. What I said was 'and what's really cool is' [Chinese: 说了，我说的是而且很酷的是]." In this example, the interpreter was quite sure that she interpreted the underlined part of the source speech while she actually didn't say what she remembered. As a result, the underlined part was missed out from the target speech, and because of her false memory, it was not compensated later either. When interpreting this part, her skin conductance was at a level of 6 SCRs/min, suggest a moderately high level of emotional arousal. In other words, she may have been affected by her emotion (both in the valence and arousal dimensions) at the time of interpreting, which then might lead to the false memory of her own interpretation and further omissions. This is not the only case in the study, and similar experiences have been observed in a few participants in the positive group (e.g., Participant 10). Nevertheless, it is still unclear how these two dimensions of emotion together affect memory accuracy, which may be worth exploring in future studies. The exploration however shall pay attention to manipulation of conditions in experiments. This is because a review study suggests that contradicting findings in literature may be related to varying stimuli (word, image), recall tests, and control of variables used in previous studies (Yin, Zhou and Li, 2024).

The stronger influence of positive emotion than negative emotion on false memory in this study could be related to motivation. Motivation plays a significant role in the formation of false memories, particularly in individuals experiencing positive emotions. Previous research found that positive emotions could lead to the formation of motivated positive false memories, which enhanced individuals' confidence in themselves by having false beliefs (delusion) or making up stories (confabulation) (Chew, Huang and Zhao, 2020). Furthermore, motivation can affect false memory formation in individuals experiencing positive emotions, with higher motivation linked to lower susceptibility to misinformation, particularly for negative events (Hess *et al.*, 2012). Consistent with the above studies, this study also noticed that student interpreters in positive emotions, who had more false memories about their interpretation, were generally more confident about their performance in interpreting than the other two groups. For example, an interpreter (Participant 29) expressed that when she was in excited, she did not care about mistakes and carried on as normal, even though she noticed that they had made a mistake. This was also supported by higher ratings by student interpreters in the positive condition about their performance in simultaneous interpreting than those by interpreters in the neutral and negative conditions (see Table 70), and that positive group made the greatest number of omissions related to executive control, among half of which are related to addressee orientation (see Table 52).

According to Setton (1999), the action addressee orientation is closely related to the interpreter's self-monitoring of the target speech. Based on what has been interpreted in the previous utterance, and what could be assumed, the interpreter may adopt strategies such as omission, generalisation, addition to reduce redundancy or increase richness of the target speech. Previous research found that individuals could use false memory as a strategy to protect their self-image or future choices (Saucet, 2019). Under positive emotion, individuals may be more inclined to believe in their desired outcome and thus make up things that does not exist. Just like the interpreter (Participant 19) in the above example, she was confident that she interpreted a part of the source speech while she actually didn't. The positive emotional state might have boosted her confidence, and the consequent false memory of interpretation (i.e., not omitting the part) might be formed to protect her interpretation of following utterances and maintain her confidence. It also adds some evidence to positive memory biases, where people tend to view their past experiences in a more positive way than how they actually occurred (Adler and Pansky, 2020). False memory might be used as a strategy (potentially unintentionally) by student interpreters in simultaneous interpreting due to their motivation for great performance. Motivation might have played a role in the formation of false memories, but as suggested by previous research, it is not a primary driver of false memory formation in individuals experiencing positive emotions (Brainerd *et al.*, 2008). Different positive emotional states, such as happiness and hope, may also result in varying effects (Kaplan *et al.*, 2016). The influence of motivation on memory recall may also be limited by specific conditions, e.g., one's cognitive load at the time of recall (Crowell and Schmeichel, 2016). Given the complexity of factors involved in false memory formation, more studies need to be conducted to investigate whether motivation is a primary driver and if different positive emotional states would result in different levels of formation of false memories.

In sum, the results of this study support earlier findings about the impact of positive emotions on the occurrence of false memory. This highlights the importance of self-reflection of student interpreters in daily practice so that they have a more non-biased evaluation of their own performance. It also calls for more empirical studies of false memory in varying emotional states in conference interpreting.

5.4 Impact of Emotion on Information Processing in SI

This project found that emotions may have a modulating impact on interpreters' information processing during SI. This impact was reflected in the processing of emotive information in the source language, where interpreters tend to avoid interpreting emotive content. Additionally, their speed of switching various tasks during interpreting seemed to be differentially affected by positive and negative emotions. This section discusses the findings with theoretical basis and empirical evidence for the impact of emotion on information processing.

5.4.1 Executive control during SI

From the analysis of student interpreters' target speeches and interview data, an unexpected, but interesting, finding was the discovery of potential emotional influences on student interpreters' executive control during simultaneous interpreting. Interpreters experiencing negative emotions omitted the least number of source information because of executive control, while those experiencing positive emotions omitted the most (see Table 52), indicating the potential enhancing influence of negative emotions and impairing influence of positive emotions on executive control.

In literature, there are competing voices about the complex relationship between negative emotions and executive control, with research indicating that negative emotions can both enhance and impair different aspects of executive functions. A few studies suggest that negative emotions (e.g., sadness or stress) impair cognitive inhibition, where people are less able to inhibit or suppress responses to stimuli that are irrelevant to the current task (Ding *et al.*, 2020; Shields, 2023). The finding from this study conflicts their views and adds support to the other school of thoughts. Other research indicates that negative emotion can benefit enhance executive control (especially performance in an inhibition task) by promoting analytic thinking without increasing cognitive load (Gabel and McAuley, 2022). This study also observed greater overall performance in student interpreters experiencing negative emotions, but the impact on cognitive load was not investigated specifically.

This overall enhancing effect of negative emotions on executive control may be related to interpreters' ability of emotion regulation. The distribution of levels of arousal across groups (Table 47) showed that interpreters experiencing negative emotions mostly had relatively low levels of arousal. Apart from the individuals' differential perception of the negative music, another possibility is that they have relatively high emotional regulation ability. Researchers from psychology found that emotion regulation is closely associated with executive functioning (Sudikoff *et al.*, 2014; Koay and Van Meter, 2023; Yang, 2023). Effective emotion regulation could facilitate executive functioning (e.g., inhibition and updating), and this effect is not subject to the specific content of function tasks (Mohammed, Kosonogov and Lyusin, 2022). A neuroimaging study also found that individuals with strong emotion regulation skills experienced less disruption in their working memory performance compared to those with weaker emotion regulation abilities (Kodak and Yıldırım, 2022). The observation from this study also adds support for this potential relationship.

It was observed in this study that student interpreters with high capability of emotion regulation could quickly jump out of strong emotions so that they were less affected. For example, the analysis of skin conductance responses of Participant 15 (from the Negative group) showed that she had great variations in skin conductance responses before and after listening to the negative music, which ranked the fourth highest in the Negative group. Her great bodily responses suggest that she probably experienced emotional fluctuations during that time. Furthermore, she expressed her sadness when she was asked about how she felt while listening to the music. She said: "I was very sad. I really was thinking about a sad story. I felt so sad.[9]" Similarly, great emotional changes were also found from her self-assessment of emotional states, which declined from score 5 of valence and score 6 of arousal (in Scale 3) before listening to music to score 2 of valence and score 6 of arousal (in Scale 4) after listening to music. The results of changes in skin conductance responses before and after listening to music, her description about sadness during interview and her self-assessment of emotional changes all suggest that she may have experienced great emotional changes. However, during the whole simultaneous interpreting, her skin conductance did not increase above the threshold of 5 SCRs/min, and her ratings of emotional state changed from score 2 of valence and score 6 of arousal (in Scale 4) before interpreting to score 7 of valence and score 7 of arousal (in Scale 5) after interpreting. The increase from 2 to 7 in valence during

[9] This is a direct English translation of the participant's description during interview. Her original words in Chinese are: 特别悲伤，我真是在想一个悲伤的故事，我真的好悲伤。

such a short time suggests that this participant can quickly regulate her emotions when in different tasks. Her performance was also one of the highest among all student interpreters. While negative emotion is generally believed to have a hindering effect on working memory performance (Yang, 2023), this study suggests that the effect may be mitigated by student interpreters' emotion regulation ability.

Regarding positive emotions, this study adds some evidence to the negative influence of positive emotions on executive control. A recent systematic review found no significant effects of positive emotions on working memory, cognitive flexibility and inhibition, suggesting that they do not necessarily improve individuals' cognitive performance (Lautenbach, 2024). In contrast, other researchers demonstrated that positive emotions enhanced working memory capacity and executive control, benefiting undergraduate students' performance in both verbal and spatial tasks (Storbeck and Maswood, 2016). The analysis of interpreters' target speeches showed that positive emotions may not be inducive to verbal and spatial tasks. While Storbeck and Maswood (2016)'s study examined students' performance in processing numbers in math tasks, simultaenous interpreting involves dual processing of visual-spatial and visual-verbal information. According to the cognitive resource footprint (Seeber, 2017), this dual processing may lead to a higher cognitive demand compared to that required in processing numbers alone. Exceeding the capacity can result in the occurrence of omissions and errors, as evidenced by many studies about the performance of interpreters in conference interpreting (Gile *et al.*, 2015; Wehrmeyer, 2022; Zlobina, 2022). In the model of simultaneous interpreting, executive control is closely related to mental model and involves the engagement of working memory, which is not unlimited (Setton, 1999). The impact of positive emotions on executive control may cause problems in other tasks that are related, such as speech production.

In the following example, a minor adverse impact of positive emotions was observed on interpreters' articulation of the target speech during simultaneous interpreting, but negative emotions did not appear to have a noticeable effect on it. Participant 26 from the Positive group omitted a full sentence "We master tools by using tools." This sentence was on the PowerPoint slides provided to the interpreter before the interpreting task, and the slides were displayed in the video of the source speech during interpreting. When asked about this sentence, she commented: "I didn't get to hear this sentence, but he clearly had it on the PPT, and I didn't have time to read it out."[10] Based on her comment, she did not hear the sentence but saw the sentence on the PowerPoint. This suggests that she received the source information from the visual input (i.e., words on the PowerPoint), rather than from the audio input (i.e., the speaker's voice output). However, she did not speak out the target sentence due to time constraints. According to Setton's model (1999), this means that positive emotions may have affected her speech production, but it is unclear which sub-process was affected, e.g., conceptualisation, formulation or articulation. By further looking at the video recording of her preparation before the interpreting task, it was found that the interpreter looked at the printed PowerPoint slides and spoke out loudly the interpretation of this sentence twice: "We learn to use tools by using tools. We master tools by using them."[11] After the first attempt of interpretation, she corrected the word choice and word order in the target sentence, and then she produced the second version of the target sentence. This process shows that the interpreter already completed the whole process of speech production: understanding the source information, finding the correct words, adjusting word order, phonological encoding and then articulating the sentence in the target language. With such preparation before the interpreting task, it should have been easier for the interpreter to repeat the process during interpreting compared with starting from scratch. However, she failed to speak out the target sentence.

The target sentence she prepared should have been temporarily stored in her working memory, but she did not retrieve it at the time of interpreting. This suggests that positive emotion may have affected her executive functions (e.g., working memory). Previous research indicates impairment of positive emotions in executive control by hindering proactive control (Chaillou *et al.*, 2018). Proactive control involves the dynamic adjustment of cognitive processes in anticipation of upcoming task demands, allowing individuals to proactively prepare and optimise their responses, improving overall performance on cognitive tasks (Stuphorn and Emeric, 2012). In response to

[10] Original words in Chinese: 这句话我没来得及听到，但是他明明在这个 Ppt 上有我也没有来得及念出来。

[11] Original words in Chinese: 我们，我们通过使用工具来学会使用工具。我们通过使用工具来掌握，掌握工具。

task demands, proactive control may be influenced by other factors, such as individuals' cognitive capacity and motivation, as well as specific context (Mäki-Marttunen, Hagen and Espeseth, 2019). In this example, the interpreter might be influenced by positive emotions, so she failed to anticipate the incoming of the source utterance that she had already prepared. In addition, previous research found that high-arousal positive emotions can impair working memory capacity, while low-arousal positive emotions can enhance it (Gokce *et al.*, 2021). When the interpreter was encountered this sentence, her skin conductance data showed a moderately high level of arousal at 7 SCR/min. Since the level of arousal is negatively associated with working memory capacity, her capacity might be hindered by her high-arousal positive emotional state at that time, thereby causing limited resources for her to speak out the target utterance.

In sum, this study found potential minor enhancing effect of negative emotions and hindering effect of positive emotions on executive functions in simultaneous interpreting. As suggested by previous research, the relationship between emotions and executive functions may however be modulated by the availability of cognitive resources and attention (Cohen and Henik, 2012). Individuals' emotional regulation ability, for instance, seems to modulate this emotion-executive relationship as well. It is therefore important to recognise that emotional influences on interpreters' performance may be dynamic depending on other influencing factors and the specific tasks on demand. The finding of this study may provide insights but cannot be generalised widely without further empirical experiments on cognitive performance. Further exploration is still necessary to test the impact of negative and positive emotions on executive control in interpreting.

5.4.2 Processing of emotive information in SL

This study also analysed student interpreters' interpretation of emotive parts of the source speech. While the source speech selected in the study is overall emotionally neutral, but it still contains a small number of emotive expressions, such as 'give up' (negative) and 'really cool' (positive). As expected, the results (see Table 49) show that interpreters' emotions seemed to have an impact on the processing of emotive information in the source speech, leading to the occurrence of omissions and errors. In particular, student interpreters under positive emotional states encountered more difficulties in interpreting emotive content that was mostly emotionally negative.

This finding is consistent with previous studies that found interpreters tended to omit emotive expressions to varying degrees or weaken their emotionality in target speeches in emotive situations (Butow *et al.*, 2011, 2013; Rosenberg *et al.*, 2011). Nevertheless, the observations were mostly in healthcare, particularly mental health settings, and little research reported similar results in conference interpreting and how the processing of emotive information would be affected if they were emotional before interpreting. The finding of this present study suggests that omitting of emotive information was also observed in student interpreters in simultaneous interpreting. In addition to that, it adds further evidence on the processing of emotive information in simultaneous interpreting: when the interpreters' emotional states do not match the emotionality of the source speech, emotive information is more likely to be omitted. This tendency may be attributed to several reasons.

One possible reason is that the information processing speed may be influenced by the emotional incongruency between the source and target languages. Some evidence suggests that emotionally congruent information (e.g. negative words in the source paired with negative words in the target) can speed up cognitive processing. For example, one study found that individuals process speech faster and more accurately when their own emotional state aligns with the emotion expressed in the speech (Havas et al., 2007). In other words, if a person is feeling happy and hear sad content from a speech, s/he may process such sad content less quickly and accurately. In this sense, the more occurrence of omissions of emotive content by the Positive group than other groups may be related to incongruence between their positive emotional state and the emotionally negative content in the original speech. Having said that, this does not mean that individuals in a negative emotional state can all process information faster and more accurately. Moreover, a recent study demonstrated that interpreters exhibit increased emotional responding when processing negatively-valenced content, regardless of the direction of interpretation, suggesting that emotional content may be processed with greater sensitivity (Korpal and Jasielska, 2019). This greater sensitivity may elevate the incongruence, further slowing down the processing speed of negatively-valenced content and therefore causing more omissions.

Furthermore, negative emotional expressions may trigger interpreters' avoidance responses to negative content. "Avoidance refers to any behaviour that allows an individual to minimize exposure to stimuli or situations that are unpleasant, distressing, or threatening" (Ball and Gunaydin, 2022, p. 978). And in the context of interpreting, the avoidance may be manifested as omitting any content that is unpleasant, distressing or threatening. The decision making of avoidance actions are influenced by individuals' evaluation of the emotionality of sensory stimuli, and negatively-valenced stimuli can trigger avoidance and other defensive actions (Saraiva, Schüür and Bestmann, 2013). This is particularly the case when individuals are in a positive emotional state. Researchers from experimental psychology found that expressions that expressed negative emotions like anger and sadness promoted avoidance reactions when contrasted with happiness, but triggered approach reactions when paired with other negative emotions (Paulus and Wentura, 2016). In this study, interpreters experiencing positive emotions omitted the largest number of emotive contents, and this may be related the conflict emotions they encountered, which facilitated their avoidance responses to emotive content. In this sense, omission may be adopted as a strategy in simultaneous interpreting.

Research found that individuals' responses to emotional information under positive or negative mood was driven by their expectations on what they thought should be proper responses in that given context (White, Liebman and Stone, 2018). In conference interpreting, interpreters often struggle to convey the full emotional weight of a speaker's message due to social norms (Bülow-Møller, 2003). The norms here not only include professional norms but also cultural norms in emotion expression. "A conference interpreter has the duty to be completely neutral", said a professional interpreter from the International Association of Conference Interpreters (Angelelli, 2004). The norm of neutrality in conference interpreting, where interpreters are expected to maintain emotional detachment to ensure accurate and impartial translation, may affect interpreters' approach to emotive content in general. To conform with professional expectations, interpreters often have to suppress or downplay their own emotions in order to portray more suitable emotions that align with the speaker's intent (i.e., engaging in emotional labour), which can sometimes result in conflict emotions (Ayan, 2021). Such conflict emotions, as mentioned above, may further trigger avoidance responses to emotive content, resulting in omissions.

Interpreters' tendency to avoid interpreting emotive content may also be related to cultural differences in emotional expression. Culture profoundly influences how individuals experience and express their emotions (Liddell and Williams, 2019). Many evidences from cultural studies found that people from individualistic cultures, such as Western Europe, tend to be more comfortable expressing emotions, whereas people from collectivistic cultures, such as East Asia, are more inclined to suppress emotions (Murata, Moser and Kitayama, 2013; Hirano and Ishii, 2024). The tendency of suppression was found to be higher in people from cultures that valued social order (Matsumoto, Yoo, Nakagawa, *et al.*, 2008). Chinese culture emphasizes the importance of maintaining harmonious relationships in society and emotional control, so emotional expression or forbearance is commonly adopted as a regulation strategy to maintain social harmony (Chiang, 2012; Su *et al.*, 2015). This cultural norm may indirectly influence how Chinese interpreters processed emotive content, leading to omissions of emotive content.

Another observation worth mentioning is that even when interpreters' emotions are aligned with the source speech's, avoidance behaviour may still occur. And this avoidance behaviour may be more influenced by individual factors such as motivation. There was one case in the Negative group where the student interpreter (Participant 3) said "The music is sad. I almost cried when thinking about that sad story" during the interview and still struggled to interpret emotionally negative content. For example, when interpreting "you're completely useless; you, you, you're, you're, you're not talented; give up; you're a waste of time; and she was very very depressed;" Participant 3 omitted a large part of the source speech (underlined part), which has a negative valence. When interpreting this part, his skin conductance level jumped to 8 SCRs/min, compared with 6 SCRs/min when he was interpreting the sentence before this part. This sudden increase indicates that he might have experienced strong emotional fluctuations in a short time. After interpreting this emotive part, his skin conductance level quickly declined to 7 SCRs/min and then 6 SCRs/min. This quick decline in skin conductance suggests that the emotive part was very likely to be the cause of the sudden increase in skin conductance, and that the interpreter has a great ability of emotion regulation to adjust himself quickly when he encountered an emotional event. The circumplex model of affect plotted based on his ratings of emotional words also shows that he has fine emotional granularity, suggesting a high level of emotional regulation.

If as expected, the interpreter should have been able to process that negative information better and faster, since he was in a negative emotional state that was actually consistent with the negatively-valenced source speech. Unexpectedly, he ended up omitting the emotive content. When asked about his interpretation of this part during the interview, he said: “I feel that when I encounter this kind of thing, I tend to weaken such overly emotional stuff or emotive adjectives … I can’t express the speaker's feelings very freely or directly, so I just tend to weaken such emotion. I don’t know why either.”[12] He also confirmed during the interview that he heard the emotive part (that was omitted) but still chose to leave it out of the target speech. The intentional omission reflects the avoidance behaviour, where he appeared to avoid dealing with emotionally negative information. His explanation “I can’t express the speaker’s feelings very freely or directly” indicates that he himself wanted to express the speaker’s emotions, but his own avoidance motives may have been stronger than his desire to express emotions, ultimately leading him to choose not to translate the emotive content. According to Solomon’s processing model, the goal or intended action of the perceiver is a primary driver in perceptual processing (Solomon, 2010). In this case, the avoidance motivation (as consequence from negative emotion) seemed to hinder the top-down processing of negatively-valenced auditory input, causing the omissions. Of course, cultural and professional norms may also contribute to his decision making. Additionally, a previous study about interpreting found that the interpreter failed to adopt strategies to manage negative emotions caused by disappointment or criticism (Çoban and Telci, 2016). The content that the interpreter chose not to interpret in this study happened to be related to criticism, so this may also contribute to his decision making.

[12] [Chinese: …我觉得我遇到这种东西的时候，我可能倾向于弱化这些太带有情感色彩，或者说这种带有情感色彩的形容词…我没有办法很自如的去或者说怎么说能够很直接的把讲者的感情给传达出来，就我倾向于去弱化这种情感，我也不知道为什么。]

In sum, this study found that student interpreters appeared to be aware of the emotions conveyed from the speaker and their own emotions when they were interpreting. Some interpreters would evaluate the emotive content and then make a conscious decision on how to translate it. Their approaches may be influenced by several factors, including the emotion perceived from the source speech by the interpreter, emotional congruency between the source speech and the interpreter's emotional state, cultural and professional norms, as well as interpreters' personal motivation. Even when student interpreters have a great ability of emotion regulation, in the face of emotionally negative contents in the source speech, they may still deliberately adopt omitting as a strategy to avoid or minimize the impact of negative emotions on their performance. The findings contribute new evidence about interpreters' processing of emotive information, and more exploration is encouraged to reveal the complex process in future studies.

5.5 Extension to Setton's model of SI

From the analysis of interpreters' interview, physiological and speech data, this study found that several key processes during simultaneous interpreting might have been affected by negative and positive emotions through various mechanisms. Positive and negative emotions also seemed to have exerted varying effects. This section seeks to contribute to the understanding about the relationship between emotion and simultaneous interpreting based on Setton's model of simultaneous interpreting (1999).

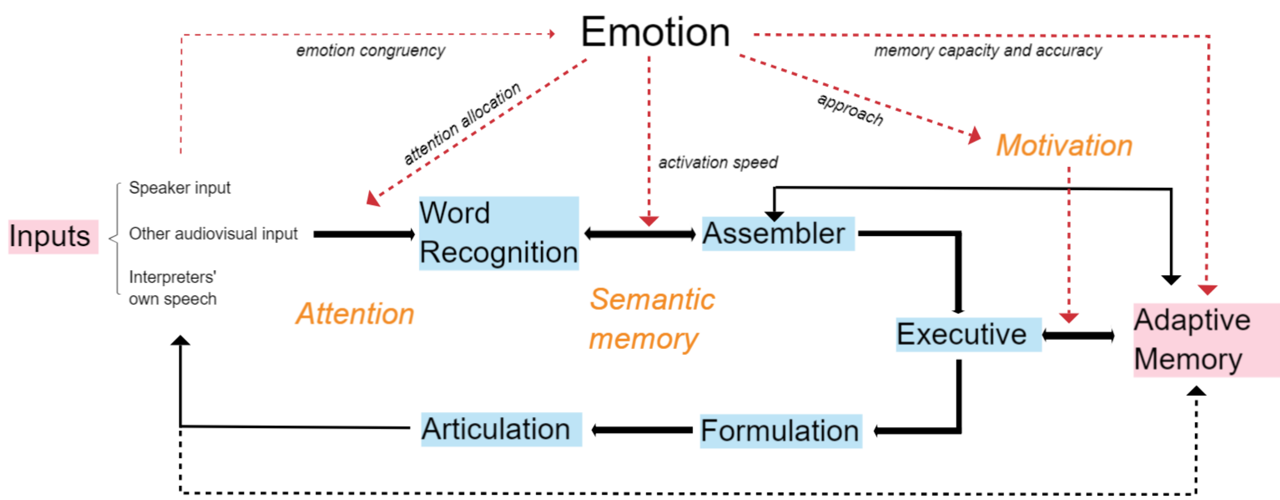


Figure 32. Extended model of SI and Emotion

The figure above shows an extended model of SI and emotion, mapping connections between key constructs that may contribute the influence of emotions on interpreters' performance in SI. The five blue shapes are key subprocesses from Setton's model of SI, including Word Recognition, the Assembler, the Executive, Formulation and Articulation (Setton, 1999). There are also two pink shapes in the figure, including three types of inputs (speaker's input, other audiovisual input and interpreter's own speech) and the adaptive memory. These subprocesses and core components are closely connected, and the direction of processing flow is indicated with black arrows in the same way as in Setton's model of SI. The elements that this study has contributed to are words highlighted in orange and connections between emotion and subprocesses or components (in red dash lines).

As discussed in previous Section 5.2, positive emotions seem to have a negative effect on student interpreters' allocation of attention to various sensory inputs, while negative emotions did not show a particular impact on attention management. Interpreters in positive emotions tended to prioritise visual inputs (e.g., PowerPoint slides and the glossary) over auditory inputs (e.g., the speaker's speech) when both inputs were presented to them, causing issues in Word Recognition. Because they focused on processing the content from visual materials, they often failed to hear the incoming utterances in the source language, causing a large number of omissions.

After words in the source language were received and recognised in Word Recognition, they are mapped to words in the target language in the Assembler. This process involves the retrieval of lexicon and knowledge from semantic memory, which was found to be facilitated by both negative and positive emotions. As discussed in Subsection 5.3.1, negative and positive emotions seemed to facilitate semantic processing in simultaneous interpreting by promoting faster activation in semantic memory. Such a facilitatory effect may be diminished if the source utterances serve a referential function, and the concepts in the SL and the TL are distantly associated.

Motivation is another factor that seems to contribute to the emotional influences on not only executive control but also the accuracy of adaptive (working) memory. This influence is also modulated by the emotional congruency between the interpreter's emotional state and the emotionality of the source speech perceived by the interpreter. The levels of congruency may affect the interpreter's approach to semantic processing, particularly the processing of emotive content in the source speech. As discussed in Subsection 5.4.2, incongruency can lead to avoidance motivation, where the interpreter decided not to interpret the emotive content, resulting in omissions in the target speech. Executive functioning may also be influenced by false memories in the working memory, where motivation seemed to play a role. (see Subsection 5.3.2), Positive emotions could lead to interpreters' overconfidence in themselves and facilitate the formation of motivated positive false memories about their interpretation. This kind of inaccurate self-monitoring could further affect interpreters' decision making in subsequent interpretation.

This extended model attempts to present the connections between key constructs and subprocesses in SI. While not included in the figure above, individual differences in emotion perception and expression, as well as cultural and profession norms should also be considered when exploring the relationship between emotion and interpreting. It should be noted that each subprocess in simultaneous interpreting is not isolated from others. The influence of emotion on one subprocess may inevitably have some influence on other subprocesses, and such a cumulative effect is what makes emotion management very challenging during simultaneous interpreting.

Chapter 6. Conclusions

6.1 Overview

Using a mix-method approach, this research project has investigated the impact of positive and negative emotions on the performance of student interpreters in simultaneous interpreting. Their emotions were evaluated using a combination of the self-assessment scale and measurement of physiological responses (i.e., skin conductance), while the performance in simultaneous interpreting was evaluated by analysing the occurrence of omissions, errors, and incompletions in target speeches.

Using positive and negative classical music excerpts are stimuli, this study found that student interpreters' emotions were significantly affected by music, and the effects were different between positive and negative emotional stimuli. This answered the first research question, which examines the potential effects of positive and negative emotional stimuli. Specifically, positive music had a stronger stimulating effect on emotional arousal, while negative music had a stronger stimulating effect on valence. Individual differences were observed in interpreters' responses to music. According to Barrett's theory of constructed emotion, such individual differences are likely to be related to their different past experience about emotions and various sensory inputs. Knowledge about emotion, which was evaluated by analysing their emotional granularity rating scores, may also contributes to the differences in perception of the emotionality of the source speech.

The second research question seeks to investigate emotional influences on interpreters' performance. As expected, the impact of emotional stimuli on interpreters' emotions further exerted varying impact on their performance in terms of omissions, errors, and incompletions. In general, positive emotions was not conducive to the accuracy of interpretation while negative emotions facilitated interpreting. The impact of positive and negative emotions also appeared to vary with the functions of utterances in the source speech. Interpreters under positive emotions made significantly more referential omissions and conative errors, but fewer incompletions, while those under negative emotions made fewer omissions but more incompletions and significantly more conative errors.

To answer the third research question, which looks at potential contributing factors to the above emotional influence, findings in this thesis were examined in comparison to existing evidence in literature from not only interpreting studies but also neurological and psychological research. According to the processing model of SI (Setton, 1999) and the model of perceptual processing (Solomon, 2010), emotional influences could be mainly attributed to the impact of emotion on attention, memory, and information processing. The impact also varied between negative and positive emotions. Negative emotions might promote overall focus on interpreting, attention allocation to sensory inputs, and lexicon retrieval during SI. Positive emotions, on the other hand, may lead to poorer processing of sensory inputs, slower lexicon retrieval, false memories about speech records, and avoidance approach to interpreting emotionally incongruent content in SI.

This chapter presents the theoretical and practical significance of major findings of this study (Section 6.2), points out research limitations (Section 6.3), offers recommendations for future research in related areas (Section 6.4) and concludes with final remarks on the outlook of emotion in interpreting studies (Section 6.5).

6.2 Contributions

This interdisciplinary study has obtained rich data about student interpreters' performance in simultaneous interpreting under positive and negative emotions. The findings derived from data add new knowledge to the area, offer a new approach to the study of emotion in the context of interpreting, and shed light on interpreter training and emotional support to interpreters in the interpreting industry.

6.2.1 Theoretical contribution

This thesis has made significant theoretical contributions to the existing body of knowledge in the field. The issue of emotional challenges has attracted attention in recent years, but the actual impact of such challenges on interpreters' performance has been a relatively under-explored area in interpreting studies, particularly conference interpreting. Most of the existing research has focused on the detrimental effects of negative emotions (e.g., anxiety and trauma) on interpreters' mental health or the relationship between emotional intelligence and language performance. However, this thesis has focused on the impact of positive and negative emotions on student interpreters' performance in simultaneous interpreting. Not only were their target speeches analysed in detail, their perception and experiences of emotions were also investigated.

The findings of this study add support to the theory of constructed emotion, which posits that emotion is shaped by making sense of physical changes through categorisation based on prior knowledge about emotions (Barrett, 2014). In this study, student interpreters with less knowledge about emotion words were found to have significantly different views about the emotionality and difficulty of the source speech, which may further affect their performance. This highlights the importance of education on emotions, opening a new avenue for further education and research. In addition, this study contributes further evidence to the model of perceptual processing, which believes that meaning is constructed through the dynamic integration of bottom-up and top-down processes (Solomon, 2010). The processing of multi-modal sensory inputs in simultaneous interpreting was found influenced by higher-level cognitive processes, such as executive control and adaptive memory. Moreover, visual inputs tended to attract more attention than auditory inputs when interpreters were in positive emotions. This suggests that the Colavita visual dominance effect, i.e., the tendency to respond more often or strongly to a visual stimulus than to an auditory stimulus presented at the same time (Colavita, 1974), may also occur in simultaneous interpreting and could be another area to be explored in future.

The exploration of emotional influences on interpreters' performance in simultaneous interpreting was based on Setton's model of simultaneous interpreting (1999). The study found that several key subprocesses may have been impacted by negative and positive emotions, including Word Recognition, the Assembler, and the Executive. Negative emotion is often perceived as disadvantageous to performance, but findings of this study suggest that a low level of negative emotional stimulation may generally help student perform better in simultaneous interpreting. Positive emotions were surprisingly not conducive to interpretation. These may be related to potential key influencing factors, such as motivation, attention and semantic memory. The connections between these factors and the key subprocesses are explained in greater detail in Section 5.5. These new factors and connections add further details to Setton's model to allow a deeper understanding of the underlying mechanisms through which emotions influence the interpreting process. The extended model can further lay a foundation and point out directions for future research that is interested in investigating the complex relationship between emotion and interpreting. It is encouraged that future researchers could conduct experiments to further investigate the impact of emotion on each of these factors to obtain a more comprehensive understanding about the influencing mechanisms and how interpreters' performance could be improved with the efficient management of their emotions.

6.2.2 Methodological contribution

The methodological contribution of this thesis lies in its innovative approach to the study of simultaneous interpreting, which leverages the strengths of both psychological and linguistic perspectives. Emotion has been studied extensively in the field of psychology, with various schools of thoughts and approaches developed to investigating individual's emotion. In the field of interpreting, pioneering research has adopted physiological measurements and self-reports to understanding interpreters' emotion. The investigation focused more on manipulating the emotionality of source speech or social aspects of emotion, but the influence of negative and positive emotions on interpreters' performance is still unclear.

To obtain a deeper understanding of emotional states, this study adopted the method of emotion induction, which has been a long tradition in the field of psychology. Classical music was used as stimuli for inducing emotional responses in participants, and the music pieces have been tested effective in emotion induction in literature and in this study. Another neutral stimulus that is commonly used in psychological experiments is fixation cross, and it was also used in the control group for comparison. The duration of induction was also chosen first based on literature and then tested in several pre-tests. Unlike previous studies that examined interpreters' emotional responses to emotive speeches, this study investigated their performance in interpreting a relatively neutral speech after they were exposed to emotional stimuli. Future studies may adopt the emotion induction method as tested in this study to extend the exploration of the role of emotion in the interpreting process. This could be done by replicating previous studies but adding the emotion induction part to the new design. In this way, the results could be compared with previous studies, adding more knowledge to existing findings with a layer of emotion. Having said that, it should be careful with material section and participant recruitment. These may be not replicated fully given time difference, so the comparability of results should be taken into account in the design of such studies.

In addition to emotion induction, this study also used a combination of physiological measurement (i.e., skin conductance) and self-assessment scale (i.e., the Self-Assessment Manikin) for the measurement of emotions. These methods have been tested extensively in psychology and provide objective and subject data for triangulation. The Self-Assessment Manikin scale has excellent validity and reliability as demonstrated by many psychological studies, but it is rarely used in interpreting studies. This study found that the scale can be easily understood and used by student interpreters, and it could be a new useful tool for subsequent researchers to measure interpreters' changes in emotional states in future. The methodological approach adopted in this study also highlights the importance of integrating quantitative and qualitative data in research design. In-depth interviews adopted in this study offered valuable insights into interpreters' emotional experiences and challenges faced during interpreting. Their descriptions about how they felt at the experiment helped the researcher link data and understand the rationales for their target speeches. The study of emotional perception through emotional granularity also opens a new avenue for understanding individual differences in emotional regulation in interpreting.

To date, this thesis is the first that combined emotion induction, physiological measurement, self-assessment of emotion, interview and emotional granularity in the study of simultaneous interpreting. This combination was not a random choice but carefully tested by navigating the complexities of working across disciplinary boundaries and practical limitations (e.g., booth environment). It is hoped that the methodological approach adopted in this study could encourage and inspire more interdisciplinary studies about interpreters' emotion in the future, so as to advance the field with further understanding of the emotional aspect of interpreting.

6.2.3 Pedagogical contribution

Interpreter training programs play a crucial role in cultivating professionals who can effectively facilitate communication in diverse settings. However, existing interpreter training programmes often fall short in preparing students to cope with the complex dynamics of emotive encounters. This study found that student interpreters tended to omit emotive content and often did not know how to deal with their emotional experiences during interpreting. Training programs may place a stronger emphasis on developing interpreters' awareness of the emotional challenges they may face in real life, such as varying expectations of clients on their role, sensitivity in dealing with emotive topics, and how they may better respond to clients' emotive narratives. Such guidance could facilitate their self-practice during training and help them better adapt to professional interpreting after graduation.

Another implication for interpreter training is using timed preparation as a way of improving students' endurance to high-arousal activities. In this study, the 10-min timed preparation has been shown to induce high levels of emotional stimulation in student interpreters. This method could be used to simulate emotionally challenging situations in classroom, which reduces the risk of putting students in highly emotive real-life scenarios but can still help students become more familiar with emotional experiences. By regularly engaging in these timed tasks, student interpreters can gradually build up their endurance to emotional stimulations and capacity of managing their emotions, which are crucial for maintaining high-quality interpreting in emotional situations. This can, in turn, facilitate their overall learning and practice, as they will be better equipped to handle the cognitive and psychological demands of interpreting tasks, particularly simultaneous interpreting. By incorporating this type of timed preparation into interpreter training, programs can better prepare students for the realities they will face in the field. However, the duration of preparation is not suggested to be very long to avoid burnout or impact on their confidence.

Furthermore, emotionally negative music can be a valuable tool to improve students' concentration on the interpreting task and overall performance. The negative music piece used in this study has been found to have a positive impact on student interpreters' overall performance. By exposing students to the negative stimulus before an interpreting task, they can quickly focus on their emotions and practice regulating their emotions, which can facilitate their subsequent interpreting and help them build the adaptability needed to thrive in emotionally challenging scenarios in future practice. Incorporating this tool into interpreter training programs can also promote learning engagement as this is a new and 'relaxed' activity compared with traditional teaching methods. Having said that, it must be noted that this approach should be implemented thoughtfully and with appropriate support for student wellbeing. While the music except has been tested in this study and literature, the intensity and duration of exposure should be carefully considered to avoid causing undue distress. The level of arousal induced by the stimulus should be low. Other music pieces or other types of emotional stimuli (such as images and videos) may not be suitable in classroom unless thoroughly evaluated for appropriateness.

Another key area for improvement in interpreter training is the development of strategies for attention management. This study found that student interpreters under positive emotions were easily distracted by reference materials during simultaneous interpreting, such as the PowerPoint presentation and the glossary, resulting in a large number of omissions and errors. This issue is often overlooked by interpreter training programmes, which could be improved in future. More training about how to effectively use reference materials and how to allocate attention more strategically could be beneficial in improving students' performance. In classroom, it may be useful to start with interpreting without any other resources and then move on to using one reference material or more. This way can help develop their attentional control techniques in selectively focusing on the most relevant information while filtering out unnecessary distractions.

In addition, the study found that students' emotional granularity, i.e., their ability to differentiate between different emotions, significantly affected their perception of the emotionality and difficulty of the source speech. This could further affect the strategies the adopt in dealing with the speech or their overall confidence in interpretation. Emotional granularity is closely related to an individual's conceptual knowledge about emotion, which can be improved through targeted training. For example, educators may introduce different emotive expressions in interpreters' working languages to help them understand the differences between emotions and store these lexicon combinations in their long-term memory. Special attention is recommended to differentiate emotional states in both valence and arousal dimension, so that interpreters can better perceive the emotionality and difficulty of the source speech, as well as their own emotions. This enhanced understanding can then translate to improved identification of emotions in the source speech and themselves, ultimately supporting their emotional management during interpreting.

Self-reflection is a crucial component of improving students' language and interpreting skills in training. In this study, student interpreters found the de-briefing session about their performance very useful in helping them recognising their strengths and weakness in interpreting. In future training, the skin conductance measurement device may be offered to students who wish to observe their mistakes they make when in an emotionally aroused state. This would allow them to identify areas for targeted improvements, thereby improving future performance. It can also help them understand the characteristics of their emotional fluctuations and develop emotional regulation strategies that are more suitable to them. Nevertheless, sufficient training would be required to students so that they use the device safely and efficiently.

In sum, targeted exercises to build emotional resilience, strategies for managing attention, and a deeper understanding of emotions can all contribute to improving students' capacity and skills for dealing with emotive situations in future.

6.2.4 Practical contribution for the industry

Existing research has largely focused on the role of interpreters in emotional situations, particularly in medical settings. Interpreters in medical (particularly mental health) settings are highly susceptible to emotional issues, as they are often exposed to highly emotive narratives and interactions with various stakeholders, such as patients, clinicians, and carers. In contrast, conference interpreting is often considered more 'neutral' and less prone to emotive situations, so the impact of emotions on interpreters is often overlooked. While not directly exposed to the same level of trauma, conference interpreters may still face emotional challenges. Just like many other workers in other industries, interpreters also have personal lives and concerns that can influence their professional work.

This study found that when interpreters were emotional, their performance was still affected when interpreting an emotionally neutral source speech, highlighting the need to address emotional support for interpreters in formal settings. Despite the norm of neutrality in practice, conference interpreters may still benefit from the same kind of emotional support and training that is recommended for interpreters in other settings (e.g., mental health). While the interpreting industry has begun acknowledging the importance of emotional management for interpreters, the focus has been on how to deal with post-interpreting trauma or other mental health issues. Rather than waiting for problems to arise, a more preventative approach to well-being, ideally in collaboration with mental health services, may provide stronger support to interpreters. To improve the overall quality of interpreting services, the industry should proactively offer support about emotional management or more generally self-care strategies, throughout an interpreter's career trajectory—from interpreter training in classroom to professional development opportunities.

Professional interpreter associations may invite academic researchers to highlight the impact of emotions on interpreting performance to enhance interpreters' understanding about the role of emotion in interpreting and the cognitive processes involved. Additionally, they could establish support groups within their existing local interpreter networks, enabling members to share coping strategies, self-care techniques, and experiences with each other. Interpreting service providers could also invite mental health professionals to offer emotional management training webinars or workshops for interpreters to help them establish skills for identifying, accepting, and expressing their feelings. Researchers may continue research in related areas to further our understanding about the influencing mechanism of emotions in interpreters' performance in conference interpreting and how certain coping strategies would benefit emotional regulation. To integrate psychological support, a comprehensive resource library may also be established to enable professionals, students, and academics across sectors to access a wide range of emotional management resources, from training programs to practical self-care strategies. Such a repository of resources could empower interpreters to proactively cultivate their emotional well-being throughout the various stages of their careers, from learning to professional development.

Achieving the above suggested solutions require long-term, collaborative efforts across the industry. However, implementing this type of proactive emotional support can ultimately help interpreters sustain their careers under pressure and maintain their overall well-being over the course of their professional lives. By addressing the emotional challenges interpreters face, the industry can empower them to better manage the emotional demands of their work and cultivate healthier careers.

6.3 Limitations

Despite great efforts made in the design and delivery of this research project, there are still some limitations of this thesis, particularly under the influence of the Covid-19 situation.

6.3.1 Participants

Due to limited time, thirty student interpreters participated the formal experiments of this study. The sample size was not very large, which may limit the generalisability of findings to wide scenarios. Most of the participants in this study did not have experience in the industry. However, professional experience may influence how the interpreters regulate their emotions in SI, therefore generating different results. Due to difficulties in participant recruitment in lockdowns, the research did not recruit professional interpreters as participants. Their participation however could be included in future research to compare the differences between student and professional interpreters. Recruiting a larger group of student interpreters across universities and language pairs would help to gain a broader picture of the impact of emotions on student interpreters' performance, which may be more widely applicable beyond the specific context of this study.

6.3.2 Emotional stimuli

Classical music excerpts were used in this study as emotional stimuli, which could be adopted in future empirical studies that may consider intentional emotion or mood control. These music pieces have been tested in literature and in this study, which are both effective in inducing emotions in student interpreters, as evidenced by the scale rating results, physiological data, and interview data. The stimulation of negative and positive music was strong in the first 100s for Chinese student interpreters. In future, if researchers aim to use the same music excerpts, it is suggested to perform tasks within this time frame to induce strong stimulation. Furthermore, the findings of this thesis suggest that the emotional experience induced by music is highly subjective and influenced by individual differences in their personal memories, bodily responses, and knowledge about emotions. These individual differences can lead to a complex mixture of emotions being experienced and highlight the need for further research to better understand the relationship between music, emotions, and personal experiences. Future research may also consider other types of emotional stimuli, such as film clips. This original design of the formal experiment considered the used of film clips, which are very strong stimuli for evoking both negative and positive emotions. However, accessible film clips that have been tested effective for inducing negative and positive emotions on Chinese participants were very limited at the time of research. Moreover, films contain many inputs from multiple modalities, which may increase difficulties for variable control in experiments. Subsequent studies may consider the adoption of film clips or a combination of multiple types of emotional stimuli for stronger emotional induction. In addition, real-life interventions may also yield interesting results, such as introducing planned events that induce emotions before interpreting or observing interpreters' emotions in real-life emotional scenarios.

6.3.3 Physiological measurement

In this study, participants' self-reports were complimented with the measurement of skin conductance. It is worth noting that interpreters' body movements may lead to inaccuracies in the counting of the number of peaks of skin conductance. Based on the observation of participants' behaviours during experiments, many student interpreters had hand movements while speaking. While clip-on electrodes were used in this study to reduce the chance of falling off, big hand movements may cause noises, which may be classified as a local peak in calculation. Having said that, the calculation of skin conductance per minute was not affect as the system only counted those responses when the predetermined threshold (0.01us) was met, as adopted in this study. For future research, it is suggested to use mean skin conductance per minute, rather than the number of peaks as the main indicator of arousal in future studies. In addition to the measurement of skin conductance, future studies may also consider incorporating other measures, such as heart-rating monitoring, EEG, face reader or eye-tracking, to obtain a more comprehensive understanding about the participant's physiological states.

6.3.4 Self-reports

One methodological limitation of the study concerns the use of retrospective interviews to explore participants' explanations for making omissions, errors, and incompletions, as well as their emotional experiences during the experiment. These elements are inherently subjective, and retrospective self-report remains one of the few feasible approaches to gain insight into interpreters' internal reasoning and emotional states. Nevertheless, participants were sometimes unable to recall specific causes or give detailed explanations. To mitigate these issues, interviews were conducted immediately after the task using a semi-structured format and supplemented by follow-up questions based on researcher observations recorded in real time. These prompts targeted specific moments in performance but were phrased in an open and non-leading manner. The protocol was refined through pre-tests and the pilot study, and the researcher had prior training in interpreter performance assessment.

As an exploratory study, the design prioritised depth over simplicity to capture emotional influences on interpreters' performance. Future research may consider simplify the procedure to reduce participant burden and improve recall. In particular, shortening the SI task from 15 minutes to 2–3 minutes could support clearer retrospective reporting. Additionally, standardised cognitive tasks (e.g., the reading span task and the Eriksen Flanker task) could be incorporated under different emotion induction conditions. This would allow for a more objective assessment of how emotional states may affect interpreters' performance and may help to further explain the occurrence of omissions and errors beyond self-report data.

Despite these limitations, the study was designed with careful thinking through several phases of testing. The results and findings contribute valuable insights into the impact of positive and negative emotions on the performance of student interpreters in simultaneous interpreting. Future studies are suggested to replicate or further improve the study design with larger samples, stronger emotional stimuli, and more comprehensive measurement tools.

6.4 Future Work

In light of the above limitations, this thesis identified a few areas that merit further exploration by future researchers, such as replicating the study in other modes or settings of interpreting and exploring interpreters' emotion regulation.

6.4.1 Interpreting settings

Experiments in this study were conducted in interpreting booths for the consideration of variable control and under the restrictions of social distancing. Future studies may consider replicating this study in in-person conferences. Real-life conferences include more factors that may influence interpreters' emotions, such as the behaviour of audience, the setting of the conference venue, etc. In addition, this study was designed to investigate emotional influences on interpreters in simultaneous interpreting, researchers may also explore how interpreters would perform under emotional influences in other settings or modes of interpreting, such as healthcare interpreting, legal interpreting, and consecutive interpreting in government interpreting. As mentioned in literature, previous researchers have made great efforts in presenting interpreters' emotional encounters (e.g., in mental health interpreting). Further exploration could add evidence to the impact of emotion on interpreters' performance in these settings. This may be challenging, given the complexity of real-life settings, so it is recommended to conduct small-scale experiments in the lab to investigate influencing factors, in order to prepare evidence for experiments in real-life scenarios.

6.4.2 Emotion regulation

This study found that student interpreters' performance was affected by their emotions, and the hindering effect of positive emotions was particularly prominent. What was not investigated but could be worth exploring is how interpreters would regulate their emotions in such scenarios. Some evidence about emotion regulation starts to emerge in the field of interpreting studies in recent years, but mostly focuses on social factors. It may be intriguing to see more empirical studies about the mechanism of emotion regulation in interpreting from a more psychological or neurological perspective. Emotional granularity, as identified in this study, can be a new angle for exploring individual differences in emotion regulation and designing classroom materials for emotion management training in interpreting programmes.

6.5 Final Remarks

As an essential function of language, emotion plays a key role in human communication. Interpreters, as communication facilitators, need to manage their emotions perceived from various stakeholders, such as the professional, the audience and others. This thesis highlights the importance of interpreters' emotions and supports the notion of interpreters as emotional labour, where they were found to suppress their emotions (particularly negative emotions) to maintain performance during interpreting. Without proper training on emotional management and emotional support to student interpreters, their emotional experiences may affect their attention allocation, semantic retrieval, and information processing speed, further leading to omissions and errors in their target speeches. Acknowledging the significance of emotion and its impact on the process of simultaneous interpreting can inform both interpreter training and professional practice. Student interpreters can be better prepared with strategies for identifying and responding to emotional stimuli when they encounter emotionally challenging situations in real life. It would also raise the awareness of the industry to offer emotional support to professional interpreters to improve their mental resilience.

Amid the rise of artificial intelligence, it is essential that we recognize the need of guidance on emotional management for interpreters and develop a deeper understanding about the interpreting process through the lens of emotion. Compared to artificial intelligence-based machine interpreting, one key quality that make human interpreters stands out is emotion, and it is this very human quality that can elevate the art of interpreting to new heights. We possess the unique capacity to perceive, process, and respond to emotional cues based on context, which can greatly enhance the quality of communication. With this layer of understanding, interpreters can become true ambassadors of cross-cultural communication, bridging not only linguistic and cultural divides, but also emotional ones. To say the right words at the right time is the true mark of a skilled interpreter, and one that merits further scholarly attention and practical application.

In the years to come, the exploration of interpreters' emotions may become a key area of focus for advancing the field of interpreting studies as many studies have emphasised in the past. This thesis has laid the groundwork for this critical area of research, and it is my hope that it will inspire future explorations that shed light on human emotions in interpreting.

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Appendices

Appendix 1. Participant Information Sheet

Title of Study:
Influence of Changes in Interpreters' Emotional States on Their Performance in Simultaneous Interpreting

Newcastle University

PARTICIPANT INFORMATION SHEET

Dear Participant,

You are invited to participate in a research study conducted by Cen CONG, a PhD student at Newcastle University under the supervision of Dr Ya-Yun Chen and Dr Jade Biyu Du. Before you decide to participate, please read the following information carefully.

What is the purpose of the study?
The study aims to investigate the relationship between interpreters' emotions and their performance in simultaneous interpreting (SI) to obtain insights into the relationship between emotions and interpreting performance and hence inform interpreter training.

Why have I been invited?
You are invited because you are a student enrolled in a translation and/or interpreting programme at a postgraduate level and have received formal training in simultaneous interpreting.

Do I have to participate?
Participation in this project is completely voluntary. You are free to withdraw from the study at any time without penalty, and you don't need to give a reason for doing so.

What will happen next if I want to take part?
If you want to take part in this research project, you will be asked to indicate your interest by filling an online registration form and you will be contacted via email for arranging a convenient time and date for you to take part in the experiment.

What measures will be taken for the protection against the coronavirus?
Each session will only have 1 participant. Surfaces and equipment will be cleaned thoroughly with disinfecting wipes before and after each session. The researcher has been fully vaccinated and will remain wearing a mask throughout the session. Upon arrival, you will receive a protection kit, including an individually packed medical 3-layer face mask and two individually wrapped antimicrobial hand wipes. You will be asked to wear a mask and sanitise your hands with the hand wipe provided before entering the experimental room. Surface wipes and hand sanitisers will also be available inside and outside the booth. A new pen will also be placed in the booth for hygiene considerations. You are free to take it away, otherwise, it will be disposed of after each session. The researcher will give instructions via Zoom to reduce direct contact with you, unless it is necessary to enter the booth (such as attaching finger clips, fixing technical issues, and controlling electronic devices). When attaching electrodes, the researcher will wear disposable medical gloves to protect you from direct skin contact.

What will I be asked to do on the day of experiment?
Each experimental session is expected to last around 1.5-2 hours. Before starting the session, you will be given the opportunity to read the information sheet again and ask questions. If you decide to take part, you will be asked to sign two identical copies of the consent form, and both copies will also be signed by the researcher. One signed copy will be given to the participant, and the other one will be retained by the researcher.
After giving consent, you will be asked to enter an interpreting booth and check the functionality of interpreting equipment (e.g., microphone, headset, and switchboard). Next, two clips will be put on the fingertips of the index and middle fingers of your non-dominant hand, which are connected to a device to measure the activity of your sweat glands. Next, you will be asked to complete a set of tasks by following instructions displayed on the screen of a tablet on the desk, which involves looking at a cross (8 minutes in total), reading a glossary and PowerPoint slides (10 minutes), listening to music (6 minutes), interpreting a speech (around 15 minutes) simultaneously from English to Chinese, and rating how you feel with a scale (less than 5 minutes in total). After completing the tasks on the tablet, the researcher will enter the booth and remove the finger clips. You will then be interviewed by the researcher, which takes around 30 minutes. After the interview, you will be asked to rate the similarity each two

Page 1 of 2

different word from a set of words, which takes around 10 minutes. After that, the researcher will ask for your opinions about the experiment. A glossary, a stack of A4 plain paper sheets and a new pen will be available in the interpreting booth to facilitate notetaking. Please leave the glossary and notes in the booth after the session, but you are free to take the pen away. The session will be recorded in video either via Zoom or with an external recording device.

What are the possible benefits of taking part in this research project?
Your participation will provide valuable information to help us understand the potential influence of non-linguistic factors on interpreters' performance in simultaneously interpreting, which can provide a reference to interpreter training and future studies in related areas. In addition, you will receive individual feedback about your interpreting performance and a £5 Gift Card at the end of the experimental session as a thank you for taking part. You will also be invited to discuss interpreting strategies in a group after all the experiments are finished.

What are the possible disadvantages and risks of taking part?
You may experience emotional fluctuation during the experiment, but this is not expected to last for a long time (i.e., an hour) or cause any long-term psychological harm. Finger clips and the device connected to them are safe to use. However, minor physical sensations may result from the use of clips in rare cases, where you may feel tiny electrical currents in your hand. In most cases, the currents are unnoticeable, and no discomfort was reported during pre-testing. Any other disadvantages or risks are not expected to be caused. You are free to withdraw from the study at any time. This study was approved by Newcastle University's Ethics Committee.

Will my taking part in this project be kept confidential?
Your confidentiality and anonymity as a participant in this study will be secured. Subsequent uses of data generated by this experiment will protect the anonymity of all individuals. Any information about you will be anonymised with a unique code and will be kept strictly confidential. The researcher will not identify you by name in any report using information obtained from this experiment.

What will happen to my information?
Digital data will be stored in Microsoft OneDrive cloud storage with password protection. Physical materials will be scanned and securely stored in a locker in a secure and locked office. If access to the office is not possible due to COVID-19 measures, materials will be stored securely in a secure area where it can be accessed only by the researcher for analysis. Data generated from the experiment will be analysed by the researcher, and the results will be used for research purpose only. Video recordings will be transcribed and analysed by the researcher, which may be quoted in the thesis or publication. Data will be securely archived for 10 years upon the publication of research and will not be shared via a research data repository for future reuse without your consent. After this time, data will be disposed of in a confidential manner.

What will happen to the results of the research study?
Following the completion of the study, a brief report of the results of the study will be available to participants on request. The findings from this project will be written up in the researcher's doctoral thesis and may also be submitted for publication. You will not be identified by name in any report or publication.

Who do I contact if I have questions or complaint about the project?
If you have questions about your participation in the project, please contact the researcher at c.cong2@newcastle.ac.uk. If you wish to raise a concern or complaint about the project, please contact the School of Modern Languages at +44 (0)1912083496. Any complaint or concern will be treated in confidence and fully investigated. You will be informed of the outcome.

Thank you for your time and interest in this research.
Yours sincerely,
Cen CONG

PhD Candidate in PhD Translating and Interpreting
Project supervisors: Dr Yalta Ya-Yun Chen and Dr Jade Biyu Du
School of Modern Languages
Newcastle University

Appendix 2. Consent Form

NEWCASTLE UNIVERSITY
School of Modern Languages

Title of Study: Influence of Changes in Interpreters' Emotional States on Their Performance in Simultaneous Interpreting

Group:___

Participant Number: ___

CONSENT FORM

Thank you for reading the information sheet. If you have any questions arising from this, ask the researcher before you decide whether to take part. If you would like to participate, please complete and sign the form below to confirm that you agree with each statement.

I confirm that I have read and understood the information sheet for the above research study and have had the opportunity to ask questions.

I understand that my participation is voluntary, and that I am free to withdraw from the project at any time, without penalty, and without needing to give a reason.

I understand that my responses will be kept strictly confidential. I understand that my name will not be linked with the research materials, and will not be identified or identifiable in the report or reports that result from the research.

I agree for this experiment to be audio and video-recorded. I understand that the audio and video recordings made of this experiment will be transcribed by the researcher and be used only for analysis. Any extracts from the experiment, from which I would not be personally identified, may be used in any subsequent studies. I understand that no other use will be made of the recording without my written permission, and that no one except the research team will be allowed access to the original recording.

I agree that my anonymised data will be kept for future research purposes such as publications related to this study after the completion of the study. I agree for my anonymised data to be shared via a research data repository for research purposes, from which I would not be personally identified.

I agree to take part in this study.

____________________	____/____/______	__________________
Printed Name of Participant	Date	Signature of Participant
____________________	____/____/______	__________________
Printed Name of Researcher	Date	Signature of Researcher

One copy to the participant and one to the researcher.

Appendix 3. Glossary

Date: ________________ Group: _______ Participant number: _________

Glossary

Note: The translation provided here is for reference only.

English	Simplified Chinese	Traditional Chinese
hypnopaedia	睡眠学习法	睡眠教學法
modelling	模仿	模仿
wing suit	翼装	飛鼠裝
comprehensible input	可理解性输入	可理解性輸入
physiological	生理的	生理的
psycho-physiological state	心理生理状态	心理生理狀態
Alpha brain state	阿尔法状态	阿爾法狀態
Roger Bannister	罗杰•班尼斯特	羅傑•班尼斯特
Stephen Krashen	史蒂芬·克拉申	史蒂芬·克拉申

Appendix 4. Rating Scale Descriptions

Title of Study:
Influence of Changes in Interpreters' Emotional States on Their Performance in Simultaneous Interpreting

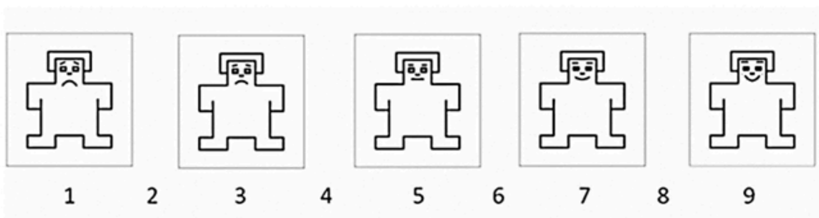
Newcastle University

Rating Scale Descriptions

Emotional valence describes the extent to which an emotion is positive or negative, and arousal indicates the intensity of emotion.

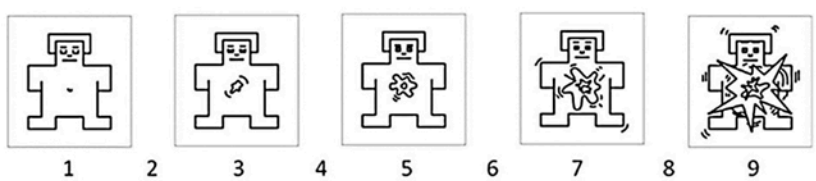
In this experiment, you will be asked to perform valence and arousal ratings on a 9-point scale at five time points, and instructions will be given on the tablet screen at the time of rating. To assist with your rating, please find below an example of a simplified version of the rating scale.

Emotional valence (Negative vs. Positive)



The first picture shows a person who is clearly distressed—relevant experiences could include panic, irritation, disgust, despair, defeat, or crisis. The last pictures shows an individual who is obviously elated—relevant experiences could include fun, delight, happiness, relaxation, satisfaction, or repose. The remaining pictures depict intermediate states.

Arousal (Low vs. High)



The first pictures shows an individual who is very calm, almost sleeping—relevant states could include relaxation, tranquility, idleness, meditation, boredom, or laziness. The last picture shows an individual who is bursting with arousal—relevant states could include excitation, euphoria, excitement, rage, agitation, or anger.

If you have any questions, please let me know. Thank you!

Appendix 5. Emotional Granularity Rating Form

Group: _______ Participant number: ________ Date: ________________

Rating Form

On a scale from **1 to 7**, please rate the similarity of each two different words from the 1st row and the 1st column.
1 = no similarity; 7 = extremely similar.

	pleased	nervous	still	fearful	disappointed	excited	alert	calm	unhappy	lively	idle	aroused	relaxed	cheerful	dulled	bored
dulled																
pleased																
calm																
cheerful																
bored																
disappointed																
excited																
lively																
nervous																
alert																
fearful																
unhappy																
idle																
relaxed																
aroused																
still																

**Note: Areas that do not require ratings are greyed out.*

Appendix 6. Transcript of the Source Speech

People at the back, can you hear me clearly?

OK, good.

Have you ever held a question in mind for so long that it becomes part of how you think?

Maybe even part of who you are as a person? Well, I've had a question in my mind for many, many years and that is: How can you speed up learning?

Now, this is an interesting question because if you speed up learning, you can spend less time at school.

And if you learn really fast, you probably wouldn't have to go to school at all.

Now, when I was young, school was sort of OK but...err…I found quite often that school got in the way of learning, so I had this question in mind: How do you learn faster?

And this began when I was very, very young.

When I was 11 years old, I wrote a letter to researchers in the Soviet Union, asking about hypnopaedia. This is sleep-learning, where you get a tape recorder, you put it beside your bed and it turns on in the middle of the night when you're sleeping, and you're supposed to be learning from this.

Uh, good idea, unfortunately it doesn't work.

But, hypnopaedia did open the doors to research in other areas, and we've had incredible discoveries about learning that began with that first question.

I went on from there to become passionate about psychology and I have been involved in psychology in many different ways for the rest of my life up until this point.

In 1981, I took myself to China and I decided that I was going to be native level in Chinese inside two years.

Now, you need to understand that in 1981, everybody thought Chinese was really, really difficult and that a Westerner could study for 10 years or more and never really get very good at it.

And I also went in with a different idea which was: taking all of the conclusions from psychological research up to that point and applying them to the learning process.

What was really cool was that in six months I was fluent in, in Mandarin Chinese and it took a little bit longer to get up to native.

But I looked around and I saw all of these people from different countries struggling terribly with Chinese. I saw Chinese people struggling terribly to learn English and other languages, and so my question got refined down to: How can you help a normal adult learn a new language quickly, easily, and effectively?

Now this is a really, really important question in today's world.

We have massive challenges with environment. We have massive challenges with social dislocation,

with wars, all sorts of things going on. And if we can't communicate, we're really going to have difficulty solving these problems.

So, we need to be able to speak each other's languages. This is really, really important.

The question then is: How do you do that?

Well, it's actually really easy.

You look around for people who can already do it. You look for situations where it's already working. And then you identify the principles and apply them. It's called modelling, and I've been looking at language learning and modelling language learning for about 15 to 20 years now.

And my conclusion, my observation from this is that any adult can learn a second language to fluency inside six months.

Now when I say this, most people think I'm crazy, this is not possible. So, let me remind everybody of the history of human progress. It's all about expanding our limits.

In 1950, everybody believed that running one mile in four minutes was impossible, and then Roger Bannister did it in 1956. And from there it's got shorter and shorter.

100 years ago, everybody believed that heavy stuff doesn't fly. Except it does, and we all know this.

How does heavy stuff fly? We reorganise the material using principles that we have learned from observing nature, birds, in this case.

And today we've gone even further…(you)...We've gone even further, so you can fly a car. You can buy one of these for a couple 100.000 US dollars. We now have cars in the world that fly.

And there's a different way to fly which we've learned from squirrels. So, all you need to do is copy what a flying squirrel does. Build a suit called a wing suit, and off you go. You can fly like a squirrel.

Now most people, a lot of people, I wouldn't say everybody, but a lot of people think they can't draw. However, there are some key principles, five principles, that you can apply to learning to draw and you can actually learn to draw in five days.

So, if you draw like this, you learn these principles for five days and apply them. And after five days, you can draw something like this. Now I know this is true because that was my first drawing. And after five days of a-applying these principles, that was what I was able to do.

And I looked at this and I went: "Wow, so that's how I look like when I'm concentrating so intensely

that my brain is exploding." So, anybody can learn to draw in five days.

And in the same way, with the same logic, anybody can learn a second language in six months. How? There are five principles and seven actions. There may be a few more, but these are absolutely core.

And before I get into those, I just want to talk about two myths. I want to dispel two myths. The first is that you need talent.

Let me tell you about Zoe. Zoe came from Australia, went to Holland, was trying to learn Dutch, struggling extremely, extremely... a great deal. And finally, you know, people were saying: "You're completely useless," "you, you, you're, you're, you're not talented," "give up," "you're a waste of time". And she was very, very depressed. And then she came across these five principles. She moved to Brazil and she applied them. And in six months she was fluent in Portuguese. So, talent doesn't matter.

People also think that immersion in a new country is the way to learn a language. But look around Hong Kong, look at all the westerners who've been here for 10 years, who don't speak a word of Chinese. Look at all the Chinese living in America, Britain, Australia, Canada, have been there 10, 20 years and they don't speak any English.

Immersion per se does not work. Why? Because a drowning man cannot learn to swim.

When you don't speak a language, you're like a baby. And if you drop yourself into a context which is all adults talking about stuff over your head, you won't learn.

So, what are the five principles that you need to pay attention to?

First, the four words: attention, meaning, relevance and memory. And these interc-interconnect in very, very important ways, especially when you're talking about learning.

Come with me on a journey through a forest. You go on a walk through a forest, and you see something like this... (well, some) marks on a tree. Maybe you pay attention, maybe you don't.

You go another 50 metres, and you see this... You should be paying attention.

Another 50 metres, if you haven't been paying attention, you see this...

And at this point, you're paying attention. And you've just learned that this... is important. It's relevant because it means this…

And anything that is related, any information related to your survival is stuff that you're gonna pay attention to, and therefore you're gonna remember it.

If it's related to your personal goals, then you're gonna pay attention to it. If it's relevant, you're gonna remember it.

So, the first rule, first principle for learning a language is focus on language content that is relevant to you, which brings us to tools.

We master tools by using tools and we learn tools the fastest when they are relevant to us.

So, let me share a story. A keyboard is a tool. Typing Chinese a certain way, there are methods for this. That's a tool.

I had a colleague many years ago who went to night school; Tuesday night, Thursday night; Two hours each time, practicing at home. She spent nine months, and she did not learn to type Chinese.

And one night we had a crisis. We had 48 hours to deliver a training manual in Chinese. And she got the job, and I can guarantee you in 48 hours, she learned to type Chinese because it was relevant. It was meaningful. It was important. She was using a tool to create value.

So, the second principle for learning a language is to use your language as a tool to communicate right from day one. As a kid does.

When I first arrived in China, (I) didn't speak a word of Chinese, and on my second week, I got to take a train ride overnight. I spent eight hours sitting in the dining car talking to one of the guards on the train. He took an interest in me for some reason, and we just chatted all night in Chinese. And he was drawing pictures and making movements with his hands and facial expressions. And piece by piece, by piece, I understood more and more.

But what was really cool, was two weeks later, when people were talking Chinese around me, I was understanding some of this, and I hadn't even made any effort to learn that.

What had happened, I'd absorbed it that night on the train, which brings us to the third principle.

When you first understand the message, then you will acquire the language unconsciously.

And this is really, really well documented now.

It's something called comprehensible input.

There's 20 or 30 years of research on this. Stephen Krashen, a leader in the field, has published all sorts of these different studies, and this is just from one of them.

The, the purple bars show the scores on different tests for language. Green and the-the purple people were people who had learned by grammar and formal study. The green ones are the ones who learned by comprehensible input.

So, comprehension works. Comprehension is key, and language learning is not about accumulating lots of knowledge. In many, many ways, it's about physiological training.

A woman I know from Taiwan did great in English at school. She got A grades all the way through, went through college, A grades, went to the US and found she couldn't understand what people were saying. And people starting ask, started asking her: "Are you deaf?" And she was. English deaf.

Because we have filters in our brain that filter in the sounds that we are familiar with and they filter out the sounds of languages that we're not. And if you can't hear it, you won't understand it. If you can't understand it, you're not going to learn it. So, you actually have to be able to hear these sounds.

And you, there are ways to do that, but it's physiological training. Speaking takes muscle. You've got 43 muscles in your face. You have to coordinate those in a way that you make sounds that other people will understand. If you've ever done a new sport for a couple of days, and you know how your body feels? Hurts? If your face is hurting, you're doing it right.

And the final principle is state. Psycho-physiological state.

If you're sad, angry, worried, upset, you're not going to learn. Period. If you're happy, relaxed, in an Alpha brain state, curious, you're going to learn really quickly. And very specifically, you need to be tolerant of ambiguity. If you're one of those people who needs to understand 100 percent every word you're hearing, you will go nuts because you'll be incredibly upset all the time, because you're not perfect. If you're comfortable with getting some, not getting some, just paying attention to what you do understand, you're going to be fine, you’ll be relaxed, and you'll be learning quickly.

So, based on those five principles, what are the seven actions that you take?

Number one: Listen a lot.

I call it brain soaking. You put yourself in a context where you're hearing tons and tons and tons of a language, and it doesn't matter if you understand it or not. You're listening to the rhythms; you're listening to patterns that repeat; you're listening to things that stand out. 泡脑子. So, just soak your brain in this.

The second action is: you, you get the meaning first, even before you get the words.

You go: "Well how do I do that? I don't know the words!" Well, you understand what these different postures mean.

Human communication is body language in many, many ways, so much body language. From body language you can understand a lot of communication. Therefore, you're understanding, you're acquiring through comprehensible input. And you can also use patterns that you already know.

If you're a Chinese speaker of Mandarin and Cantonese and you go to Vietnam, you will understand 60 percent of what they say to you in daily conversation, because Vietnamese is about 30 percent Mandarin, 30 percent Cantonese.

The third action: Start mixing.

You probably have never thought of this, but if you've got 10 verbs, 10 nouns and 10 adjectives, you can say 1000 different things.

Right. Language is a creative process. What do babies do? OK, "me", "bath", "now". OK, that's how they communicate. So, start mixing, get creative, have fun with it. It doesn't have to be perfect, just has to work.

And when you're doing this, you focus on the core. What does that mean?

Well, (with) every language (it's) high-frequency content. In English, 1000 words covers 85 percent of anything you're ever going to say in daily communication. 3000 words gives you 98 percent of anything you're going to say in daily conversation. You got 3000 words; you're speaking the language. The rest is icing on the cake.

And when you're just beginning with a new language, start with your toolbox. Week number one, in your new language you say things like: "How do you say that?" "I don't understand," "repeat that please," "what does that mean?" all in your target language. You're using it as a tool, making it useful to you. It's relevant to learn other things about the language.

By week two, you should be saying things like: "me," "this," "you," "that," "give," you know, "hot," simple pronouns, simple nouns, simple verbs, simple adjectives, communicating like a baby.

And by the third or fourth week, you're getting into what I call "glue words." "Although," "but," "therefore," these are logical transformers that tie bits of a language together, allowing you to make more complex meaning. At that point you're talking. And when you're doing that, you should get yourself a language parent.

If you look at how children and parents interact, you'll understand what this means. When a child is speaking, it'll be using simple words, simple combinations, sometimes quite strange, sometimes very strange pronunciation. Other people from outside the family don't understand it. But the parents do. And so, the kid has a safe environment, gets confidence.

The parents talk to the children with body language, and with simple language, they know the child understands. So, you have a comprehensible input environment that's safe. We know it works; otherwise, none of you would speak your mother tongue.

So, you get yourself a language parent, who's somebody interested in you as a person, who will communicate with you essentially as an equal, but pay attention to help you understand the message.

There are four rules of a language parent. Spouses by the way are not very good at this, OK?

But the four rules are:

First of all, they will work hard to understand what you mean even when you're way off beat.

Secondly, they will never correct your mistakes.

Thirdly, they will feed back their understanding of what you are saying so that you can respond appropriately and get that feedback, and then they will use words that you know.

The sixth thing you have to do, is copy the face.

You got to get the muscles working right, so you can sound in a way that people will understand you.

There's a couple of things you do.

One is that you hear how it feels, and feel how it sounds, which means you have a feedback loop operating in your face. But ideally, if you can look at a native speaker and just observe how they use their face, let your unconscious mind absorb the rules, then you're going to be able to pick it up. And if you can't get a native speaker to look at, you can use stuff like this...

Sing, song, king, stung, hung.

And the final idea here, the final action you need to take is something that I call "direct connect". What does this mean? Well, most people learning a second language sort of take the mother tongue words and the target words and go over them again and again in their mind to try and remember them. Really inefficient.

What you need to do is realise that everything you know is an image inside your mind. It's feelings. If you talk about fire, you can smell the smoke; you can hear the crackling; you can see the flames. So, what you do, is you go into that imagery and all of that memory and you come out with another pathway.

So I call it " (one) same box, different path". You come out of that pathway and you build it over time. You become more and more skilled at just connecting the new sounds to those images that you already have, into that internal representation. And over time you even become naturally good at that process, that becomes unconscious.

So, there are five principles that you need to work with, seven actions. If you do any of them, you're gonna improve. And remember these are things under your control as the learner. Do them all, you're going to be fluent in a second language in six months.

Thank you.

Appendix 7. Key Interview Questions

Date: ___ /___ /_____

Group: ____ Participant number: _____

Outline of Interview Questions

1. Emotion induction (pre-SI experience)
   a) How did you feel when listening to the music? *(only to the experimental group)*
   b) What did you have in mind when listening to the music (or looking at the cross)?
   c) Did you feel any changes in your heart rate/breathing/body temperature when listening to the music? *(only to the experimental group)*
   d) How familiar were you with the music? *(only to the experimental group)*
2. Interpreting
   a) How did you feel while interpreting the speech?
   b) What do you think about your SI performance?
   c) On a scale of 1–10, how would you rate your own performance? (1=extremely poor; 10= extremely good)
   d) Do you recall any omissions/errors during the interpreting task?
   e) Could you explain why you did that?
   f) Do you remember if the speaker said anything around [segment]?
3. Influencing factors
   a) What factors do you think might have influenced your interpreting performance?
   b) How familiar were you with the speech/topic of the speech?
   c) How did you find the speaker's speech rate/accent/and length of speech?
   d) On a scale of 1-10, what do you think of the overall difficulty of this speech? (1=extremely easy; 10=extremely difficult)
   e) What do you think about the emotionality of the speech? (using the SAM scale)