Understanding Grit in an Organisational Context:
The Concept of Grit and its Role as a Predictor of
Work-related Stress and Employee Performance

by

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Declaration

This thesis and the accompanying publications have not previously been submitted by the candidate for a degree in this or any other university.

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Abstract

In recent years, non-cognitive personality factors have received increasing attention due to studies that suggested that they could be highly important in employee selection and development processes. Substantial research and practical reasoning suggests that the ability to persevere and be passionate about one's long-term goals despite challenges and setbacks is considered a key factor of success in today's society. This thesis focuses on grit, a non-cognitive personality trait grit that has been defined as a combination of perseverance and passion for long term goals.

Building on inconclusive preliminary results that indicated that grit might be a crucial factor for employee performance and the experience of work-related stress, this thesis reports on research that aimed to explore the applicability of grit in the workplace. The research used a cross-sectional research design and empirically tested the predictive validity of grit on individual performance and its relationship to PsyCap, resilience and work-related stress in a stratified sample of the UK government's Companies House Basic Company Data. To provide a holistic insight into the impact of grit on job performance, the three dimensions of task performance, organisational citizenship behaviour and innovative performance were assessed. A survey method was applied to a cross sectional sample of 2089 employees to provide generalisable results across UK workers.

The findings of this research suggest that despite issues in its current conceptualisation, grit is a distinctive construct compared to resilience and PsyCap and impacts individual outcomes in the organisational context. Furthermore, findings suggest that grit is a significant predictor of job performance and work-related stress across the research sample. The findings have significant implications for theory by showing that grit is a unique personality characteristic that could enhance current HRM processes to increase employee performance and reduce work-related stress.

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Table of Contents

List of Tables

List of Figures

Abbreviations

AVE	Average Variance Extracted
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CMIN	Chi-Square Index
CMIN/DF	Relative Chi-Square Index
CR	Construct Reliability
CWP	Counterproductive Work Behaviour
EmpRes	Employee Resilience
HPWS	High Performance Work Systems
HRM	Human resource Management
IQ	Intelligence Quotient
NCA	Necessary Condition Analysis
OCB	Organisational Citizenship Behaviour
OP	Organisational Performance
PsyCap	Psychological Capital
RMSEA	Root Mean Square Error of Approximation
SEM	Structural Equation Modelling
SNS	Social Network Site
TD	Talent Development
TLI	Tucker-Lewis Index
TM	Talent Management
χ^2	Chi-Square Statistic

Chapter 1 Introduction

Substantial research and practical reasoning suggest that the ability to persevere and be passionate about one's long-term goals despite challenges and setbacks is considered a key factor of success in today's society (Duckworth, 2016; Kraut, 2018). Combining these skills, the non-cognitive personality trait known as grit has recently been identified as a valid and meaningful predictor of individual performance and success in various settings, such as schools, universities, sports, or military, and in a variety of samples including students, pupils, athletes, teachers, entrepreneurs, and military cadets (Credé *et al.*, 2017).

Grit is a non-cognitive personality trait that Duckworth *et al.* (2007, p. 1087) have defined as "perseverance and passion for long-term goals". Alongside their collaborators, the authors have proposed that grit might be a better predictor of performance than traditional cognitive measures, such as IQ (Duckworth, 2016). Others (e.g. Meriac *et al.*, 2015) have argued that grittier individuals are less likely to give up on their goals and are able to maintain high efforts despite setbacks and challenges, while experiencing lower levels of stress.

In recent years, an increasing number of studies have suggested that such non-cognitive personality traits and attributes are potential determinants of desirable outcomes inside and outside the workplace, such as good mental-health, happiness or optimal performance (Tett and Burnett, 2003; Luthans *et al.*, 2006b; Schmitt, 2012; Judge *et al.*, 2013; Kelly *et al.*, 2014). More importantly, they have been shown to be responsive to interventions, and thus, show characteristics that suggest it can be developed through training and development. Such findings are particularly interesting for organisations to potentially inform their human resource management (HRM) policies and practices (Cherniss, 2000; Waite and Richardson, 2004; Luthans *et al.*, 2006a; Luthans *et al.*, 2008b; Nelis *et al.*, 2009).

Despite substantial work on the role of grit in education, military and sports that promotes grit as a valid and meaningful predictor of performance, retention and success (Duckworth *et al.*, 2007; Duckworth and Quinn, 2009), less attention has been paid to the potential positive effects of grit in the business context. Only a few recent studies have indicated that grit might be an equally important factor for desirable outcomes in the workplace (Elam, 2015; Haist, 2015; Meriac *et al.*, 2015; Wolfe and Patel, 2016; Ion *et al.*, 2017).

Concurrent to the interest in grit, increased attention has been given to the idea that modern business must shift from the current, short-term model of thinking towards a cross-departmental, long-term mind-set in order to be successful (Barton and Wiseman, 2014). The

authors argued that, in particular, HRM practices, such as talent management (TM), recruitment and personnel development, need to be developed to satisfy organisational requirements. Organisations strive to increase their organisational performance (OP) by using a range of practices, such as outsourcing, the adjustment of HRM practices, the introduction of high performance work systems (HPWS), and personnel and talent development systems (Arthur, 1994; Huselid, 1995; Becker and Gerhart, 1996; Elmuti and Kathawala, 2000; Elmuti, 2003; Evans and Davis, 2005; Hailey *et al.*, 2005; Li *et al.*, 2006; Subramony, 2009). Previous research on the importance of the human factor for organisation has concluded that these practices are necessary because they help to identify employees' needs. Furthermore, through implementation of these practices, individual skills can be developed with the aim to reduce work-related stress and increase individual and organisational performance and enable long-term success.

An issue of increasing concern for individuals and organisations is work-related stress, which has been identified as a by-product of the demands associated with performance and economic success in the 20th and 21st centuries. Work-related stress has been a major area of scientific research for several decades, and has been found to be an overarching and widespread issue in modern society. Moreover, the attention on it has intensified recently as a result of a focus on mental health and well-being inside and outside the workplace (Kortum *et al.*, 2010; Nieuwenhuijsen *et al.*, 2010; Harvey *et al.*, 2017). Work-related stress has been shown to have significant negative effects on individuals, organisations and society through long-term absenteeism, rising numbers of burnout and depression (Harvey *et al.*, 2017; Hassard *et al.*, 2018; Lunau *et al.*, 2018).

Previous research studying the effects and the role of certain non-cognitive personality factors has found that these factors can positively impact the experience of work-related stress and increase job performance simultaniously. Moreover, recent studies suggest that individuals who scored higher in grit, PsyCap or resilience also experienced lower levels of stress at work (Grant and Langan-Fox, 2007; Avey *et al.*, 2011b; Eskreis-Winkler *et al.*, 2014; Meriac *et al.*, 2015; Ion *et al.*, 2017). With regards to previous studies that demonstrated a high impact of grit on individual performance, retention and persistent effort, grit could be an important factor to have a positive impact on the performance and well-being of the workforce (Haist, 2015; Jordan *et al.*, 2019b). However, the relationship between grit, job performance and stress remains largely underexplored, with a limited number of studies having explored the effects of grit on different outcomes in the workplace, findings being inconclusive and not providing empirical evidence of these relationships across a representative sample of workers. In this respect, there

are significant gaps in the theoretical understanding and empirical use of grit in terms of findings (contradictory evidence) as well as methodology (non-representative samples) in the business context.

1.1 Rationale and Contributions of this Research

The objective of this research is to explore the conceptualisation of grit in the business context, responding to previously raised criticism and to explore its effects on job performance and work-related stress (Haist, 2015; Credé *et al.*, 2017). In line with this aim, this research has theoretical, empirical and practical aims and contributions. Theoretically, this study aims to provide a deeper understanding of the applicability and importance of grit in business, providing evidence for the impact of grit on performance and work-related stress across industries and occupations. The research gives insight into its predictive validity for three dimensions of job performance: task performance, extra role performance (in this thesis defined as organisational citizenship behaviour, OCB) and innovative performance. In terms of theoretical contribution, this research extends knowledge that explains the potential stress-reducing effects of grit on the experience of work-related challenge and hindrance stress. Another theoretical contribution is offered to the disciplines of positive and occupational psychology and organisational behaviour by extending the framework of grit to the business context.

Empirically, this research aims to respond to recent criticism of grit measurement by engaging critically with the current structural and measurement higher-order model of grit. Structural equation modelling is used to test the current conceptualisation and to explore alternative models to the proposed second-order structure. The tested alternative models include a first-order conceptualisation of grit, as well as the incorporation of the two conceptually similar psychological constructs of Psychological Capital (hereafter referred to as PsyCap) and resilience. This provides empirical evidence for the distinctive and unique nature of grit that has not been previously tested to such an extent. Structural equation modelling (SEM) helps to reflect on the preciseness of the Short Grit Scale (hereafter Grit-S) in the business context and provides insight into the potential unique contribution that grit offers in predicting individual outcomes in the workplace beyond traditional personality concepts.

Finally, in practical terms, this research aims to provide further insight into the effects of grit on performance and stress in the workplace in a representative sample of UK workers. Recent studies have recommended the inclusion of grit into the organisational context and HR systems, such as employee selection and leadership development (Elam, 2015; Stoltz, 2015; Clark, 2016; Peleașă, 2018; Caza and Posner, 2019). However, there is a lack of empirical

evidence to justify such recommendations. This research contributes guidance useful to organizations, in particular HRM and management, when considering the implementation of policies and practices that aim to foster grit in order to increase performance and reduce levels of work-related stress. Furthermore, evaluating the potential predictive validity of grit beyond the two established measures of PsyCap and resilience would help to determine if further research in the development of this personality trait is useful in the organisational context, or if it is indeed only an "old wine in new bottles phenomenon" (Credé *et al.*, 2017, p. 14).

1.2 Structure of this Thesis

This section provides a brief summary of the structure and the content of the individual chapters. Overall, the research aims to respond to identified research gaps in this field of study. It provides a basis for further research and practical development of grit inside and outside the organisational context. The thesis is divided into six chapters.

Chapter 2 provides a review of previous literature and discusses the theoretical development of the research hypotheses. The first section introduces the non-cognitive personality trait grit, providing a brief summary of the origins of research in grit and reviewing recent literature that explored grit in various contexts. A critical examination of the promoted importance of the construct and an overview of its reported effects on different individual outcomes is also provided. Additionally, recent controversies and debates on grit with a focus on its implications for organisational outcomes and conceptual issues are outlined and explained. A focus lies on recent criticism of the structural and measurement model of grit, leading towards research questions one and two. It includes a brief introduction of a retransformed conceptualisation of grit that is referred to as a Person-Centred Model of grit. This model of grit describes individuals only as gritty if they score high in perseverance and consistency simultaneously. The subsequent chapter sections discuss the introduced issues in grit research and explain the development of the theoretical guidelines for the identified research gaps that are concerned with the following topics: the current conceptualisation of grit, grit and its relationships to other personality traits, grit and individual performance in the workplace, and grit and work-related stress.

Section 2.3 provides a comprehensive overview of the contemporary state of knowledge in personality research. Key personality traits in organisational research are introduced, namely the Big Five personality traits, PsyCap and resilience. PsyCap and resilience are constructs that were developed in the late 1990s early 2000s and were shown to be predictors for various organisational outcomes, such as higher individual performance, retention and lower levels of

work-related stress. Previous findings on the impact of personality on individual outcomes in the workplace are discussed and set in context with the new concept of grit. This part theoretically explores the relationship between grit and the two, conceptually similar, personality traits of PsyCap and resilience. The conceptual, structural and operational relationship between grit, resilience and PsyCap is evaluated. Research question three that reflects upon the relationship between thé three characteristics is developed.

The subsequent section introduces the nature of individual performance, that is a key indicator for effectiveness in organisations. The multifaceted nature of performance is evaluated, defining the three dimensions, task performance, extra-role performance and innovative performance. Moreover, the theoretical link between grit and individual performance in the business context is developed and five research hypotheses are developed that aim to test the effects of grit on the three measures of job performance. Additionally, the incremental predictive validty of grit for job performance beyond the estbalished personality measures of PsyCap and resilience is theoretically developed. It also presents the conceptual model for this thesis (see Figure 2-2).

The final section of Chapter 2 evaluates the link between grit and the experience of work-related stress. Work-related stress is one of the major causes of psychological health problems, such as burnout or depression, which has been shown to have significant negative impacts on individuals, organisations and society. The current literature on work-related stress and its impact on different outcomes on the individual level are discussed. Antecedents of stress and currently applied prevention methods are evaluated and a link to grit is established. Based on these theoretical foundations, the research objectives are used to develop the six research hypotheses that are outlined throughout the theoretical development in this section. These include the theorising of grit as a sufficient condition for work-related challenge and hindrance stress, its incremental predictive validity beyond PsyCap and resilience and the theory that it is not only a sufficient but also a necessary condition for work-related stress.

Chapter 3 describes the methodological approach that has been adopted for this research. The first part provides an overview of general philosophical assumptions in empirical research in the social sciences, reviewing the existing research paradigms and justifying the decision to choose positivism as the main research philosophy for this research. The second section of this chapter describes the methodological research approach in more detail. A systematic description of the sampling method is provided, and an outline of the final study sample given. In the next section, the measurement tools used to assess the independent and dependent variables in this research are introduced and explained in detail. Following this, the

research process, data collection and data analysis procedures are described, followed by the ethical considerations relevant to this study.

Chapter 4 is divided into three main sections. The first section provides an outline of the demographic characteristics of the sample. They are set within the context of the characteristics found in the UK working population, suggesting that this research is based on a representative sample of UK workers. These characteristics include the distribution of gender, age, education, work-sector, department, position, experience, in-role experience, and senior management experience. Lastly, this section provides an overview of the descriptive results and basic bivariate correlations between the demographic, independent and dependent variables.

The second section of Chapter 4 provides an overview of the results that have been found when testing the three research questions of this study. Structural equation models are run to test the current structural and measurement model of grit, assessing the model's reliability and validity. The findings of the confirmatory factor analysis are presented, including measures of validity, reliability, measurement indices and factor loadings. Moreover, this part of the research explores the relationships between grit, PsyCap and resilience. It provides the findings of the CFA analyses, testing alternative models of grit including these two factors.

Section three presents the findings of the hypothesis testing of the thesis. The predictive validity of grit for all dimensions of job performance and work-related stress is analysed and the results of simple and hierarchical linear regressions are provided. Moreover, the findings of the regression analyses are presented that tested the incremental predictive validity of grit beyond PsyCap and resilience for job performance and work-related stress. Subsequently, the results of the necessary condition analyses are described; these were run to test if grit is not only a sufficient but more a necessary condition for high levels of performance and low levels of work-related stress. Lastly, the Person-Centred Model of grit is tested using necessary condition analysis.

Chapter 5 provides a detailed discussion of the statistical findings in relation to the research hypotheses and in the context of previous research in grit and HRM. The structure of this chapter mirrors previous chapters by first discussing the findings of the research question testing that evaluated the applicability of the grit construct to the business context and the usability of the Grit-S Scale in the organisational context. Thereafter, the findings of the CFA are discussed, which analysed the conceptual distinctiveness of grit in relation to PsyCap and resilience. In a next step, the findings of the hypothesis testing between grit, PsyCap, resilience, and job performance are discussed. The subsequent section discusses the statistical results of

the predictive validity of grit for work-related stress above and beyond PsyCap and resilience, and its potential condition as a necessary factor for reducing the experience of stress at work.

Chapter 6 summarises the results of this research and evaluates its contributions to the development of theoretical knowledge and understanding in the area of personality traits, grit and HRM. In addition, the implications for practice are evaluated, stressing the potential importance of grit for organisations and particularly HRM. Recommendations for practitioners in business environments and further development potentials of HRM practices are reviewed. Thereafter, recommendations for future research are discussed in light of limitations of this research.

Chapter 2 Conceptual Development

2.1 Introduction

There is increasing popularity of grit and other non-cognitive personally traits in the academic literature, evidenced by the rising number of publications in this field over the past decade. In line with development in discussions about organisational competitiveness and sustainability, research has focused on deepening current understanding of the impact of personality on individual outcomes in organisational settings. This chapter reviews and critically evaluates the literature that provides the theoretical framework of this thesis. It provides the foundation for the conceptual model that is developed based on the conceptual development reported in this thesis. The three main areas of this thesis broadly cover the following themes: the current conceptualisation of grit, grit and its relationships to other personality traits, grit and individual performance in the workplace, and grit and work-related stress.

This chapter is divided into five main sections. After this introduction, Section two reviews the nature of grit, examining the short history of the personality trait and offering a critical examination of its importance. It starts with a short discussion of the conceptualisation of grit as a higher-order construct. It continues by reviewing the currently applied operationalisations of grit, namely the Grit-S and the Grit-O Scales. This part aims to critically evaluate the concept of grit and explore its applicability to the business environment, presenting and discussing the reported effects of grit on different individual outcomes. Lastly, current debates in grit research are discussed, including the concpetual issues and the development of an alternative Person-Centred Model of grit.

Section three is built upon the previous section. It reviews the key literature on personality traits and evaluates important constructs such as the Big Five, resilience and PsyCap. Also, its links to HRM and organisational factors are discussed. An emphasis is placed on the critical analysis of the relationships and conceptual distinctiveness between grit and the two personality traits PsyCap and resilience.

In Section four individual performance in the workplace is examined and the potential contribution that grit can offer to enhance individual performance and eventually increase effectiveness is theorised. Additonally, it evaluates the contribution of grit for previously discussed outcomes in comparison to PsyCap and resilience. Also, a discussion of grit as an additional and potentially better predictor of job performance takes place.

Section five analyses the key literature on work-related stress, its antecedents, consequences and current organisational interventions. It introduces the challenge-hindrance model of stress and its implications for the experience of work-related stress in the workplace. It reviews previous studies that found connections between grit and stress and further develops this understanding to the business context by analysing the theoretical impact of grit on work-related stress. Finally, it theorises the incremental predictive validity of grit for work-related stress beyond PsyCap and resilience.

2.2 The Nature of Grit

An increasing number of scholars (Heckman and Rubinstein, 2001; Brunello and Schlotter; Newman *et al.*, 2014; Khine and Areepattamannil, 2016) have claimed that non-cognitive personality traits are able to predict different outcomes such as overall life satisfaction, happiness and subjective well-being not only outside but also inside the workplace. They found that personality affected outcomes such as training success or performance and even beyond traditional cognitive measures. In works exploring the impact and existence of non-cognitive personality traits, grit received an outstanding amount of attention across disciplines and contexts.

Grit is a psychological non-cognitive personality trait defined as "perseverance and passion for long term goals" (Duckworth *et al.*, 2007, p. 1087) and several studies have reported it is showing a strong predictive validity for performance, future success and retention of individuals in a variety of settings (Duckworth *et al.*, 2007; Duckworth and Quinn, 2009; Kelly *et al.*, 2014; Credé *et al.*, 2017; Alan *et al.*, 2019a). It has been suggested that grit might be a better predictor of performance and success than traditional cognitive measures such as IQ, making it an appealing concept for businesses and further research (Duckworth *et al.*, 2007; Eskreis-Winkler *et al.*, 2014; Kelly *et al.*, 2014).

2.2.1 Emergence and Importance

Duckworth describes the discovery of grit as the answer to the question of " [why] some individuals accomplish more than others of equal intelligence" (Duckworth *et al.*, 2007, p. 1087). More than a century ago, in 1907, John Williams asked the question of why some people with similar cognitive abilities perform at different levels. No conclusive answer has been provided so far. In particular, it is not clear why some individuals excel when others with comparable backgrounds do not. Duckworth and colleagues argued that there must be at least

one personal characteristic that explains individual success or accomplishments, above and beyond basic education, individual circumstances and the impact of the external environment (Duckworth *et al.*, 2007).

Coming from the discipline of positive psychology, Duckworth and Seligman (2006) conducted a study in which they showed that self-discipline was a better predictor of academic performance than intelligence. Their findings promoted the idea that self-discipline can be a positive characteristic that drives achievement and success. However, the authors argued that self-discipline alone is not enough, and equally important is a certain level of interest in the subject. In subsequent research, Duckworth *et al.* (2007), described this positive characteristic as "working strenuously toward challenges, maintaining effort and interest [or passion] over years despite failure, adversity, and plateaus in progress" (p. 1087), or having grit. Duckworth argued that beyond previously identified personality traits that have been found to be crucial for specific disciplines or careers, grit is a characteristic that impacts individual success independent of the domain.

There is a large volume of published studies describing a wide variety of personality characteristics that have been identified and researched. These personality characteristics can be divided into two different categories. First, there are personality factors that are considered to be stable over time and not responsive to short-term changes in internal and external circumstances; these are called traits or trait-like characteristics. The second set of factors are described as states or state-like characteristics and these include feelings or behaviours that are temporary and not stable over a longer period of time, and are often affected by environmental causes, such as mood that changes in a specific situation (Chaplin *et al.*, 1988). The main focus of past and current research has been the exploration of the impact and meaning of traits or trait-like personality characteristics on individual behaviour (Fleeson, 2001).

Following their first studies, Duckworth *et al.* promoted grit as an essential personality trait that drives individuals towards high performance, achievements and success (Credé, 2018; Jordan *et al.*, 2019b). In their studies, Duckworth and colleagues found evidence that grit is a stable construct that does not change due to contextual differences. This was confirmed in further studies that looked at the effects of grit on different variables at different points of time (Duckworth *et al.*, 2007; Duckworth and Quinn, 2009). Also, in their meta-analysis Credé *et al.* (2017) stated that, despite some criticisms noted by the author and evaluated below. grit should be considered a trait-like characteristic. This is also closely connected to the long-term focus that is an innate part of grit and enables gritty individuals to work towards long-term objectives that do not change. This is a crucial part of its definition and places grit already by

definition in the trait stream of personality characterisics.In further work, in has been argued that since it is responsive to interventions with the aim to increase the level of grit, it should be considered a trait-like characteristic that is generally stable but can be developed over time (Bashant, 2014; Geist, 2016; Alan *et al.*, 2019a). Nonetheless, in comparison to states or state-like constructs grit has not been shown to fluctuate between different points of time and thus, does not resemble the key characteristics that would classify it as a state or state-like personality concept. Therefore, this thesis views grit as a trait-like personality characteristic that is stable across time but can be developed by specifically designed interventions and training.

Since Duckworth and colleagues published their early academic study on grit in 2007, it has received significant attention in the academic community and the public. Strong media presence to disseminate their work included a TED talk with more than 18 million views, the publication of a book (Duckworth, 2016) and different radio, TV and social media broadcasts. As a result of claiming to have the answer to a question that was asked more than a 100 years ago, grit attracted a lot of attention. However, this attention was not restricted to the public and the policy developing community, and research on grit ensued across various disciplines. This is manifested in the large number of citations of this particular study. At the beginning of this research (21/01/2016), Google Scholar reported 1304 citations for the first paper on grit. In the final stages of this research in October 2019, Google Scholar reported 4013 citations and the Web of Science Core Collection showed 1125 citations for Duckworth's article (16/10/2019). Furthermore, research examinig the nature, impact, outcomes, and antecedents of grit is currently being conducted around the globe,

One reason for the popularity of grit might be the demand in the western world to develop individuals and identify ways to enhance their performance and success. Grit could be considered a potential solution as it is claimed to be a developable and important trait linked to achievement. Moreover, the promotion of grit was not only fuelled by academic research findings, but was framed by the media as an essential and crucial characteristic of children and adults for various outcomes, such as higher performacne and long-term success (Gray, 2016).

2.2.2 Outcomes of Grit

Even if grit is a relatively new concept in the psychological literature, various research projects and findings on grit have been published in the past decade. The high level of publicity that grit received across disciplines, practitioners and the public is a result of the reported positive effects it has on individual outcomes and the claim that it predicts these outcomes better and beyond traditionally applied measures, such as IQ and other personality factors.

The majority of studies that has discussed and explored the concept of grit was conducted in the educational/academic area. Of particular interest to these studies was the impact of grit on academic achievement and performance. A shared finding across these studies is that individuals who scored higher in grit, also scored significantly higher in performance measures. Research reported moderate to high correlations between grit and outcome measurements that included grade point average scores for pupils (Eskreis-Winkler *et al.*, 2014), undergraduate (Batres, 2011) and PhD students (Cross, 2014), the level of education completed, earnings after schooling (e.g. Duckworth and Quinn, 2009; Díaz *et al.*, 2012; Cross, 2014; Ivcevic and Brackett, 2014; Kelly *et al.*, 2014; Bowman *et al.*, 2015; Olson, 2015), and higher grades in military education programs (Maddi *et al.*, 2012). All studies reported a statistically significant predictive validity of grit for such desirable educational outcomes. For some outcomes, such as academic achievement and earnings after schooling, grit was found to be a better predictor than IQ, board scores and conscientiousness (Duckworth *et al.*, 2007; Duckworth and Quinn, 2009; Díaz *et al.*).

In various samples of school children (Ivcevic and Brackett, 2014; Usher *et al.*, 2019), cadets in military academies (Eskreis-Winkler *et al.*, 2014; Kelly *et al.*, 2014) and professional teachers (Bashant, 2014; Robertson-Kraft and Duckworth, 2014), a positive relationship between grit and retention was shown (Maddi *et al.*, 2012; Duckworth, 2016). Researchers reported that individuals scoring higher in grit were more likely to retain on their tasks over a longer period of time (Chang, 2014; Ivcevic and Brackett, 2014; Bazelais *et al.*, 2016; Datu *et al.*, 2016). Furthermore, research highlighted that grittier individuals are more likely to maintain their effort despite setbacks and are less likely to give up their goals (Duckworth and Quinn, 2009; Duckworth, 2016).

More recently, several researchers have extended the understanding of grit and its wide applicability by conducting studies that evaluate the effects of grit on individual outcomes in the area of recreational, semi-professional and professional sports. Findings have included positive relationships with sport achievement (Elumaro, 2016), increased sport-specific engagement (Martin *et al.*, 2015; Larkin *et al.*, 2016) and generally an increased sporting performance (Moles *et al.*, 2017). Larkin *et al.* (2016) revealed that youth soccer players that scored higher in grit spend significantly more time in sport-specific activities such as training, play and indirect involvement. Similarly, Tedesqui and Young (2018) revealed that grit was a better predictor than conscientiousness and self-control for different criteria that are related to sport expertise development. Equally important was the finding that commitment was predicted by a negative relationship of grit to thoughts of quitting the sport. Similar findings were reported

by Reed *et al.* (2013); Reed (2014); Vakil (2014) on the positive effect of grit on exercise behaviour. The authors found that individuals who are scoring higher in grit are more likely to spend more time exercising at a higher intensity.

Research into grit has also extended into social, health and well-being domains (Maddi *et al.*, 2012). Guerrero *et al.* (2016) found that individuals scoring higher in grit were less likely to engage in negative social risk behaviours, such as gambling and substance abuse. Other important findings (see Table 2-1) in adult samples were the negative relationship of grit with depression (*r* -.40) and the positive correlations with happiness (Singh and Jha, 2008), gratitude (Kleiman *et al.*, 2013) and overall life satisfaction (Singh and Jha, 2008; Bowman *et al.*, 2015; Martin *et al.*, 2015). Eskreis-Winkler *et al.* (2014) even reported a predictive validity of grit for duration of marriage, revealing that men with higher levels of grit were more likely to stay married compared to men with lower levels of grit.

Overall, these findings suggest that grit is a factor applicable beyond other traditional predictors of positive outcomes and across a variety of settings. Eskreis-Winkler *et al.* (2014) concluded that grit might be a "domain-general individual difference which influences commitment to diverse life goals over time" (p. 1). The authors argued that grit might not only be able to enhance individual life prospects, but that it could ultimately positively affect health and well-being. Overall, as shown in Table 2-1, various statistically significant relationships were reported for desirable outcomes in individual personal lives; positive effects were shown on gratitude (Kleiman *et al.*, 2013; Zhang *et al.*, 2018a), life satisfaction (Singh and Jha, 2008; Clark and Malecki, 2019), happiness (Singh and Jha, 2008; Batres, 2011) and a negative relationship to depression (Musumari *et al.*, 2018; Datu *et al.*, 2019).

Table 2-1 Correlations of Grit to Outcomes Outside the Workplace.

Correlate	N	R_{obs}	p	SD_p
Gratitude	1.415	0.24	.30	.09
Life satisfaction	2.266	0.25	.30	.08
Happiness	726	0.22	.30	.00
Depression	3.865	-0.40	-.48	.10

Source: Credé *et al.* (2017)

The idea of grit as a positive resource for individual health and well-being was picked up by a limited number of subsequent studies that evaluated the impact of grit as a positive resource on various manifestations of health and well-being impairments in different samples.

Notably, Salles *et al.* (2014) and Ceschi *et al.* (2016) reported that individuals who scored higher in grit generally showed lower levels of all three different burnout indicators captured by the Maslach Burnout Inventory: emotional exhaustion, depersonalization, and personal accomplishment (Maslach *et al.*, 1996). Moreover, Lee (2017) and O'Neal *et al.* (2016) reported a stress-reducing effect of grit on various measures of stress in small samples of college and associate degree students. More recently, researchers started to evaluate the potential positive effects that grit might have that could help to reduce the level of stress experienced in highly demanding workplaces (Wong *et al.*, 2018). Similarly, Halliday *et al.* (2017) provided basic evidence that there is a negative relationship between grit and all three burnout indicators in a sample of British doctors. However, contrary to previous studies, the authors reported that grit and stress were not statistically significantly correlated in their sample of physicians. One of the main issues is that the small sample (N = 17) means that the data are not representative due to sample size and homogeneity.

2.2.3 Conceptual Structure of Grit

In their first exploration of grit in 2007, Duckworth and colleagues conceptualized the construct and defined it as a dispositional personality trait like characteristic that is fairly stable, but can be developed through interventions and specific training (Duckworth and Quinn, 2009). This idea of grit being subject to change is a distinctive feature compared to several other well-known personality traits. Moreover, the authors argued that the uniqueness of grit lies in its emphasis on the long-term feature that is not represented in any other personality trait currently discussed (Duckworth and Quinn, 2009; Chang, 2014).

After testing for psychometric properties, Duckworth *et al.* (2007) conceptualised grit as a higher-order construct consisting of the two interrelated but distinct first-order dimensions: perseverance of effort and consistency of interest (hereafter referred to as perseverance and consistency). This higher-order structure (see Figure 2-1) was confirmed in a study conducted by Duckworth and Quinn (2009) that revealed a high internal consistency and a strong positive correlation between the two dimensions ($r = .59$, $p <. 001$). In the case of grit, the higher- or second-order construct is represented by the two first-order dimensions of perseverance and consistency (Bagozzi and Heatherton, 1994). These two dimensions are directly measured by four items each in the Grit-S Scale, and by five items each in the Original Grit Scale (Duckworth and Quinn, 2009). Individuals respond to the items on a five-point Likert-scale that goes from 1 = 'Not like me at all' to 5 = 'Very much like me' (Duckworth *et al.*, 2007) The overall grit score of an individual is calculated by summing up all scores from the eight items and dividing

them by eight (Duckworth and Quinn, 2009). Thus, high levels of grit can be reached by scoring high in both dimensions, or even by scoring high in one dimension and moderately in the second. Moderate grit levels can be reached even if the individual scores low in one dimension, which has been one of the key criticisms in recent studies (Credé *et al.*, 2017; Credé, 2018).

Figure 2-1 Second-Order Model of Grit
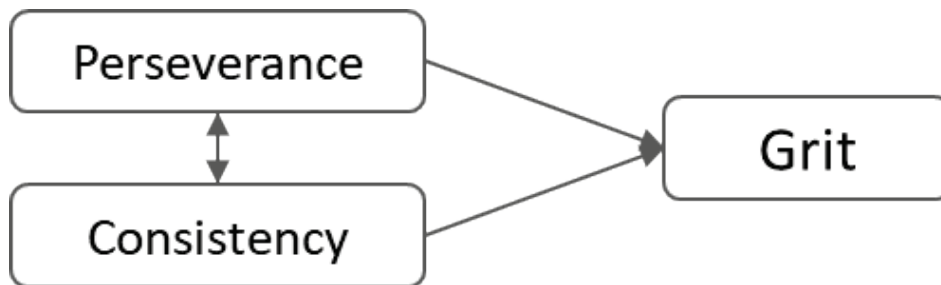
According to Duckworth et al.'s (2007) definition, perseverance of effort describes the extent to which individuals exert stamina and effort towards their goals despite challenges and setbacks. Consistency of interest refers to the individuals' tendency to keep a high level of interest over a long period of time and to maintain and follow goals despite plateaus. Even if current research in grit uses the term consistency for the second dimension of grit, in their original paper, Duckworth and colleagues talked about passion and consistency interchangeably. Passion was defined by Vallerand (2008, p. 1) as "… a strong inclination toward an activity that people like, find important, and in which they invest time and energy" (p. 1).

Duckworth *et al.* (2007, p. 1090) described grit as a higher-order construct based on a confirmatory factor analysis (CFA) with 773 observations reporting a comparative fit index of .83 and root-mean square error of approximation .11. These findings were confirmed by Duckworth and Quinn (2009) for the shorter eight-item Grit-S Scale ("$\chi 2(19, N = 1,554) = 188.52, p <.001, RMSEA = .076$ (90% *CI* = .066–.086), *CFI* = .96", p. 168). The authors reported no issues or concerns regarding the validity measures of this construct. This, however, has been criticised recently by several authors, arguing that content validity and construct validity, the two aspects of validity of the current grit measures, seem questionable (Credé *et al.*, 2017; Jachimowicz *et al.*, 2018; Jordan *et al.*, 2019a). Construct validity is defined as "representing the correspondence between a construct (conceptual definition of a variable) and the operational procedure to measure or manipulate that construct" (Schwab, 1980, p. 5). Both scales, Grit-S and Grit-O, claim to reflect perseverance and consistency as the two key dimensions to assess the level of grit. Following Cronbach and Meehl's (1955) guidelines, both scales have shown consistently acceptable internal consistency levels (between *r* = .70 and

r = .85). However, previously reported model fits were generally poor or, at best, acceptable (Duckworth *et al.*, 2007; Duckworth and Quinn, 2009; Credé *et al.*, 2017; Wyszyńska *et al.*, 2017). Even if the Grit-S measure generally fits the model better than the Grit-O, the model fit indices are only marginally better and not to be considered good.

Moreover, its reported content validity indices have only recently been questioned. Content validity is defined as "the degree to which elements of an assessment instrument are relevant to and representative of the targeted construct for a particular assessment purpose" (Haynes *et al.*, 1995, p. 238). In their recent meta-analysis, Credé *et al.* (2017) specifically questioned the proposed higher-order model of grit. The authors criticize that previous studies accepted the higher-order model without questioning it or properly assessing its model-fit through the use of accurate assessment methods. Thus, there is a lack of understanding of whether grit is accurately measured by the two currently promoted dimensions and if it is applicable to the business context. Credé (2018, p. 607) argued that even if the CFA showed an overall acceptable fit of the construct, "the fit of this model will always be identical to the fit of the most plausible alternative model in which the perseverance and passion are simply kept as separate albeit correlated variables" (Credé, 2018). This means that even though a few recent studies empirically tested the structure of grit, they relied on similar, non-plausible assumptions in running their CFA analyses and thus, did not provide sufficient evidence for the accuracy of the model (Datu *et al.*, 2015; Ion *et al.*, 2017; Wyszyńska *et al.*, 2017; Vazsonyi *et al.*, 2019).

So far, no study has responded to the criticisms that have been raised by Credé *et al.* (2017) and Credé (2018). Credé *et al.* (2017) suggested to use a latent class analysis or even a Necessary Condition Analysis is yet to be tested. This thesis responds to this criticism by re-evaluating the model structure of grit. The aim is to answer the question of whether it can be described as a higher-order construct that combines the two dimensions, perseverance and consistency or if these dimensions should be examined individually. Considering previous findings and the majority of studies adopting the traditional conceptualisation that is based on extensive psychometric evaluation (Duckworth *et al.*, 2007; Duckworth and Quinn, 2009; Wyszyńska *et al.*, 2017) the first research question of this study asks whether the currently applied higher-order model of grit is a suitable conceptualisation of grit in general, and in particular for the business context.

> ***Research Question 1:*** *Is the two-factor structure of perseverance and consistency an appropriate way to conceptualise grit in the business context?*

Recent papers (Duckworth and Quinn, 2009; Credé, 2018; Weisskirch, 2018; Jordan *et al.*, 2019b) have attempted to refine the current conceptualisation of grit, but have have failed to provide an alternative conceptual structure of grit. However, given that the empirical evaluation and confirmation of the structural model and conceptualisation of a construct is imperative before adopting such a concept in following research, a more in-depth evaluation is necessary to address its lack of clarity, as well as to justify its implementation in theory and practice (Hair *et al.*, 2018).

2.2.4 Measurement of Grit

The conceptual and structural model are not the only indicators for the acceptance of a new empirical construct, which is why the measurement model requires to be tested empirically as well. The measurement model is the operationalisation used to assess the concept of interest (Kline, 2011; Hair *et al.*, 2018). The measurement tools currently deployed to assess the level of grit - the Original Grit Scale and the Short Grit Scale - have been criticised in recent years (Credé *et al.*, 2017; Credé, 2018; Credé, 2019; Jordan *et al.*, 2019b). Therefore, the first part of this research evaluates the structural and measurement model of grit to provide justification for its adoption and ability to measure the individual level of grit at the workplace.

There are currently two main operationalisations that are used to measure the individual level of grit: the Original Grit Scale (Duckworth *et al.*, 2007) and the short Grit-S Scale (Duckworth and Quinn, 2009). Both inventories are self-reported measures that assess the two facets of grit: perseverance of effort and consistency of interest. They report separate scores for the subscales which are summed up to the overall grit score. However, even if separate scores are obtained, in most cases only the overall score is reported, as shown by a recent systematic literature review by Credé *et al.* (2017). A reason for this could be that Duckworth *et al.* (2007) suggested that the two factors would yield a higher predictive validity if combined, which was further strengthened by Duckworth and Quinn (2009), who presented the findings of a second CFA that supported the previous higher-order model of grit (Figure 2-1). Providing findings only for an overall grit score and not reporting the dimensions individually could be problematic because, as discussed in the previous section, there is lack of clarity in terms of the two dimensions of grit and whether they appropriately represent grit as originally defined. It could be argued that the operationalisation that emerged from this conceptualisation could be flawed in the extent that the overall grit score does not truly represent an individual's level of grit. The adoption of the current grit measures by subsequent studies resulted in criticism, which has

argued that the model might be flawed and not sufficiently represented by an overall grit score (Credé, 2018; Jachimowicz *et al.*, 2018; Jordan *et al.*, 2019b).

Duckworth *et al.* (2007) Original Grit Scale (Grit-O) is a self-reporting measure that met their core criteria of characteristics to describe high achieving individuals who was not suitably offered by existing scales and was a robust representation of grit as a unique construct. The scale development process started with 27 items that were derived from exploratory interviews that described specific behavioural and attitudinal characteristics of high-achieving individuals from different fields (Duckworth et al., 2007). Items were developed representing two dimensions, one described the characteristics of sustained effort and the second captured the consistency of interest over a longer period of time. After running an exploratory factor analysis (EFA) on the remaining 17 items, the researchers dropped five items that revealed loadings below .40. The EFA was run on with 773 observations ("comparative fit index = .83 and root-mean square error of approximation = .11" p. 1090) and reported a loading of the remaining 12 items onto two different factors that are correlated (r = .45): perseverance of effort and consistency of interest. As a result, the Grit-O consists of 12 items, six items for each dimension.

The scale has been tested across four different study samples reporting that grit accounted for 4 % of the observed variance in different success outcomes, such as Grade Point Average (GPA) or Scholastic Aptitude Test scores, which are considered comparable or slightly better than traditional measures (Duckworth *et al.*, 2007; Chamorro-Premuzic and Furnham, 2008). As such, the scale showed appropriate internal consistencies, acceptable concurrent and a good predictive validity and was used in their subsequent studies.

However, the Grit-O Scale has been revised in order to increase the quality of the psychometric properties. In their study, Duckworth and Quinn (2009) reduced the total number of items to 8 and developed the Short Grit Scale (Grit-S), following a confirmatory factor analysis (CFA) that revealed a better predictive power (χ^2(19, *N* = 1,554) = 188.52, *p* <.001, RMSEA = .076 (90% *CI* = .066–.086), *CFI* = .96, p. 168). It included the four items with the highest factor loadings of the Grit-O for each dimension. The revised shorter version consists of eight items (four items measuring each dimension). Overall, the Grit-S Scale showed a better internal consistency, test–retest stability and predictive validity than the Grit-O. This has been confirmed in subsequent studies (Cronbach's alpha ranging from .73 to .85 Duckworth *et al.*, 2011; Strayhorn, 2013; Eskreis-Winkler *et al.*, 2014; Von Culin *et al.*, 2014), and is at present the most commonly applied scale for assessing grit levels (see Appendix A).

One of the main issues debated in recent publications is the operationalisation of the two dimensions: consistency and perseverance. While initial research claimed to provide support for both dimensions in terms of content, construct, discriminant, and criterion validity. Content validity generally refers to the entire representation of the full content domain of the intended measured criterion. This also requires minimal deficiencies or so-called contamination of other constructs in reflecting the full content domain (MacKenzie *et al.*, 2011). Even if Duckworth *et al.* (2007) adopted a methodological approach to ensure the inclusion of all the important factors that correspond to the content domain of grit, an increasing number of publications raised concerns. One issue repeatedly raised is the lack of a measurement for the content domain in both measurement tools (Credé *et al.*, 2017; Credé, 2018; Jachimowicz *et al.*, 2018). Jordan *et al.* (2018) argued that in the currently applied operationalisation of grit, passion fails to be reflected in any respect. The authors argue that attentional control is the main variable measured and that consistency of interest mainly reflects the pure absence of long-term goals instead of measuring identity and affective components as it is done in contemporary research on individual passion. However, Duckworth argued that consistent interest over a longer period of time towards a certain goal is synonymous with commonly understood passion and therefore is sufficiently reflected in the two measures Grit-S and Grit-O (Duckworth, 2016).

However, not only the passion domain received criticism by Jordan *et al.* (2019b), who argued that the current conceptualisations lack the assessment of goals, goal setting and goal or action plan adoption, which should be considered crucial parts of achieving long-term goals. Again, this is somewhat surprising as Duckworth (2016) asserted that individuals who score higher in grit develop goal hierarchies depending on individual passion. Moreover, lower level goals are adapted or adjusted successfully in order to reach overarching passion-driven satisfaction and achievement. By adjusting and developing such a complex goal-hierarchy, Duckworth argues that gritty individuals develop a flexibility that makes them superior by overcoming shortfalls and drawbacks in comparison to individuals scoring lower on grit (Duckworth and Quinn, 2009). However, the only item in both grit scales that assesses goals - 'I often set a goal but later choose to pursue a different one' - does not include either of the two aforementioned strengths: passion-driven goal setting or goal-adaptation.

Such issues with the content validity necessarily result in a reduced level of construct validity. In recent work, Jachimowicz *et al.* (2018) and Vazsonyi *et al.* (2019) reported two different but important issues with the factor structure that is applied in current operationalisations of grit. Vazsonyi *et al.* (2019) argued that the claimed two-factor structure is largely a result of the item wording in the measurement tool. While all perseverance of effort

items are worded positively, all consistency items are worded negatively. Therefore, the authors claim that the two-factor structure developed only because of the presence of the so-called 'artifactors', as described by Marsh (1996). In this case, artifacts describe the unintentional bias that results because of the wording of the items within the chosen scale. This often occurs due to the application of positively and negatively worded items in these scales (Schmitt and Stuits, 1985). Previous research showed that "the information encoded in the response to a positively worded item may be different than the information provided by the response to a negatively worded item" (Credé *et al.*, 2009, p. 249). These differentially worded items can in turn load onto different factors, which creates 'artifactors' that could be measuring the same but are recognized as separate. Jachimowicz *et al.* (2018) provided initial evidence that this wording creates the two-factor structure. In their study they reworded all items in both scales. First, they worded all items in a positive manner, and second, all items were worded negatively. They then tested these on two samples. In both studies the authors found that the shared variance was higher than the average variance extracted, which indicates that both factors do measure only one dimension. According to Jachimowicz *et al.* (2018), these dimensions only measure perseverance of effort, arguing that consistency or even passion are not assessed at all. Thus, the construct validity of the current Grit measures require further evaluation.

Of those studies that reported findings for the individual grit dimensions, some provided evidence that perseverance is correlated to achievement, engagement and motivation in academia (Eskreis-Winkler *et al.*, 2014; Arouty, 2015; Bowman *et al.*, 2015). Conversely, consistency is not associated with certain measures of high academic performance or well-being measures (Bowman *et al.*, 2015; Datu *et al.*, 2016). Jordan *et al.* (2019b) argued that such inconsistencies might be a result of the artefact-based item wording of the grit scale, and not because of conflicting mechanisms of the two sub-dimensions. However, the recommended amended Grit-S-P scale that was developed by Jachimowicz *et al.* (2018), which measures only perseverance and not passion, has received equally strong criticism upon publication (Credé, 2019; Guo *et al.*, 2019) due to statistical and reasoning issues. Therefore, it has not been considered an alternative operationalisation of grit in this study.

There is currently little common ground among researchers about the conceptual and operational structure of grit. Despite criticism on the different validity indices and data fit in the current conceptualisation and operationalisation of grit, previous research has shown the usability of the two grit measures in a variety of environments and settings (Duckworth *et al.*, 2007; Duckworth and Quinn, 2009). Moreover, the grit scales have been successfully applied to reveal strong relationships to individual outcomes in different contexts. While most studies

explored grit in the academic context, several works have examined its impact in science, sports, or military environments (e.g. Duckworth *et al.*, 2007; Duckworth and Quinn, 2009; Duckworth *et al.*, 2011; Maddi *et al.*, 2013; Eskreis-Winkler *et al.*, 2014; Kelly *et al.*, 2014; Bowman *et al.*, 2015; Larkin *et al.*, 2016). None of those previous works has raised concerns about the operationalisation of grit in their studies. More so, except for the construct developed by Jachimowicz *et al.* (2018), no alternative operationalisation has been provided. Additionally, the Grit-O and the Grit-S Scales have been translated into different languages, such as Chinese (Li *et al.*, 2018), Spanish (Arco-Tirado *et al.*, 2018), and German (Fleckenstein *et al.*, 2014), to accomondate a variety of different contexts in their analysis. None of those researchers has observed or raised concerns about the content domains of the measure.

Therefore, this thesis adopts the Grit-S Scale to assess the individual level of grit. Nevertheless, to respond to previous criticism that argued that further evaluation of the existing scales is needed to ensure the usefulness of the scales across all contexts, the Grit-S Scale will be evaluated critically in the first part of the thesis. This is particularly important when looking at the relatively unexplored field of grit in business. As discussed in Section 2.4, organisations are looking for ways to improve organisational and individual performance in the workplace. Moreover, they are searching for novel ways to reduce hours of absenteeism, increase retention and decrease the level of work-related stress (Wainwright and Calnan, 2002). Recent findings on grit suggest that this personality trait could provide solutions for these issues (Ceschi *et al.*, 2016; Wong *et al.*, 2018). This is backed up by research in a variety of other personality traits, which has argued that it is often necessary to refine existing scales when measuring constructs in different contexts; only then are these scales able to represent the factor in a specific setting correctly (Fletcher and Sarkar, 2013). However, a few previous studies applied the Grit-S Scale in the business context and did not report conceptual issues in measuring grit (Elam, 2015; Meriac *et al.*, 2015). This could suggest that the current conceptualisation and operationalisation is applicable to this new context. However, this previous research used only small and homogeneous samples and as such, did not produce generalizable results.

Building up on the foundations of previous research on grit, this thesis aims to explore the validity and preciseness of grit and the Grit-S Scale in the business context. The issues previously described require a further evaluation of the scale in order to provide valid insights into the effects of grit on outcomes in the business context. This informed the development of the second research question:

> ***Research Question 2:*** *Is the Grit-S Scale a psychometrically sound measurement tool to assess grit in the business context?*

21

2.2.5 Current Debates in Grit Research

There are various issues that are currently debated in grit research across different disciplines. One of these key debates is the lack of a deeper understanding of grit and its impact in the work-context, but generally raises questions about the current conceptualisation of grit as a second-order construct.

Only very recently, researchers started to investigate the effects of grit in the business context (Ion *et al.*, 2017; Jordan *et al.*, 2018; Jordan *et al.*, 2019b). A small number of studies suggested that grit might be an important predictor for desirable work-related outcomes. However, as stated above, the current understanding of grit and its impact on employees and organisations is still in its infancy. Jordan *et al.* (2019b) argue that grit could be of high interest particularly for HRM, considering the observed effects on individual performance in other settings. This is backed up by primary evidence that reported positive effects of grit on workplace performance (Maddi *et al.*, 2012; Dugan *et al.*, 2019) and retention (Eskreis-Winkler *et al.*, 2014; Robertson-Kraft and Duckworth, 2014). Based on these findings, Jordan *et al.* (2019b) argue, that, as a personality trait, grit might be a valuable tool that organisations could implement into current practices. Furthermore, Jordan *et al.* (2019b) provide a review of grit and a hypothetical evaluation of its potential implications for HRM. The authors conclude their review with a strong indication that HRM and business could benefit from the application and integration of this personality trait. However, they also emphasise the need to re-evaluate and potentially revise the current conceptualisation of grit to incorporate those features that it claims to be comprised of, namely: passion, perseverance and long-term goal setting. This would be necessary to advance processes in recruitment and selection, training and development, and performance management and evaluation (Elam, 2015). Therefore, in a first instance, the conceptual and measurement model of grit are evaluated before exploring its effects on individual outcomes in the business context.

Another discussion in grit research is based on a recent meta-analysis by Credé (2018) who argued that the current conceptualisation of grit is flawed in that any individual who scores high in either of the two dimensions and low in the other is still considered to exhibit a medium level of grit. However, Credé *et al.* (2017) argued that grit would predict performance and other outcomes better if the dimensions would be considered separately. This has been emphasised by Guo *et al.* (2019) and is reflected upon in research questions RQ1 and RQ2 in this thesis, which aim to test the structural and measurement model of grit. Credé (2018) suggested that it might be worth considering an alternative conceptualisation of grit in which high grit is represented by the simultaneous combination of a high level of perseverance and a high level

of passion. The authors refer to this approach as the person-centred approach and argue that in this conceptualisation, grit would not exist on a high to low level continuum but rather that a person with a high level of one dimension and a low level in the other is not described as having a medium grit score. This would classify a person into either having grit or not having grit, instead of having different levels of grit. This model would also represent the concept of grit more logically along the lines of the traditional definition provided by Duckworth *et al.* (2007) as consistency 'and' perseverance for long-term goals. However, this Person-Centred Model of grit has not been tested before. Credé (2018) to test this conceptualistion of grit by using a cluster analysis approach to evaluate if it might be a better conceptualisation of grit to predict outcomes across different domains of study, and in the case of this study the business context.

However, the current level of knowledge about the impact of grit on work-related outcomes requires generally further examination before conclusions and suggestions for businesses can be drawn. This is due to the lack of consistency across previous studies in this context and the evidence provided about the impact of grit on different measures of job performance. More importantly, there are discussions about a potential dark side of grit that might hinder the willingness to spot alternative solutions to problems and support others on their journey towards long-term goals (Zakrzewski, 2014; Lucas *et al.*, 2015; Morin, 2016). Therefore, the second part of this research as discussed in Section 2.4 explores the impact of grit on individual performance in the workplace.

A third debate in grit research relates to its potential beneficial effects in tackling stress and health and well-being. Several studies have shown that individuals who score higher in grit are less likely to suffer from depression (Musumari *et al.*, 2018), burnout (Halliday *et al.*, 2017), high levels of stress (O'Neal *et al.*, 2016; Lee, 2017; Wong *et al.*, 2018) and are more likely to experience higher levels of psychological well-being (Datu *et al.*, 2016; Jin and Kim, 2017). However, the overarching effects on the experience of work-related stress are not explored in greater depth. Even if there is initial evidence that grit could be a beneficial factor in the workplace to help reduce the experience of work stress, this has not been explored across a wider worker population. Given the rising number in work-related stress cases and its negative effects on individual health and well-being, this research aims to provide further insight into the relationship between grit and work-related stress (Section 2.4.4).

A fourth discussion in current grit research presents a general discussion in the field of positive OB about new personality traits. Hackman (2009) argues that current research focuses too much on the development of new concepts and ideas, which eventually results in a decreased quality in the research methodology and a lack of concept reliability and validity.

Moreover, it has been argued that often, new traits are simply assessing the same constructs with new labels (Fogarty and Perera, 2016; Pfattheicher *et al.*, 2017). For instance, this issue has been raised in previous research on grit and conscientiousness as well as in relation with other concepts. The main criticism pertains to the distinctiveness and uniqueness of grit as a personality trait. There is lack of clarity of how grit might be related to similar personality characteristics, such as the Big Five, resilience or PsyCap (Perkins-Gough, 2013; Duckworth and Gross, 2014; Ivcevic and Brackett, 2014; Haist, 2015). Particularly, the definitions of the two personality traits (PsyCap and resilience) are very similar in their terminology and description of the characteristics considered as innate in those individuals who are scoring higher in the constructs. As such, to be meaningful for research and practice, grit would need to be a construct that possesses unique positive characteristics in predicting individual outcomes inside and outside the workplace. If not, it could be described as merely another personality trait that follows the old wine in new bottles approach and thus, becoming empirically redundant (Credé *et al.*, 2017; Ion *et al.*, 2017; Pfattheicher *et al.*, 2017; Credé, 2018). Focusing on this concern, a part of this research explores the relationship between grit, PsyCap and resilience, and their unique predictive validity for individual outcomes in the business context.

The coming sections provide an overview of the most commonly researched personality traits and their relationships to individual, organisational and societal outcomes and their conceptual relationships to grit.

2.3 Grit and Personality

This section provides first a short overview of the term 'personality' and its historical roots. This is followed by the introduction of the most commonly discussed and utilized personality traits, the Big Five. Subsequently, a short evaluation of previous research findings in grit and related personality characteristics is provided, which is followed by a more detailed discussion of the two traits, PsyCap and resilience. Following this, the relationships between these three concepts are theoretically elaborated. In the final parts of this section, the research hypothesis that guide this past of the thesis are formulated and its conceptual model is introduced.

Since its first publication, grit has been presented as a unique and distinct psychological construct that has a positive impact on individual performance, achievement and success (Duckworth *et al.*, 2007; Duckworth, 2016). In recent years, researchers have tested the relationship between grit and different personality traits that have been shown to be related to similar individual outcomes (Poropat, 2009; Arouty, 2015; Credé *et al.*, 2017; Oshio *et al.*, 2018; Luthans *et al.*, 2019). Researchers that tested the current conceptualisation of grit using

both, the Grit-S and the Grit-O Scale reported links to various personality traits that seem to be conceptually related and questioned the discriminant validity of grit. Discriminant validity is established if "a test does not correlate too highly with measures from which it is supposed to differ" (Campbell, 1960, p. 548). There is currently no consensus of grit and its discriminant validity; in particular, the conceptual distinction between grit and PsyCap and resilience remains unclear. Given current debates about the higher-order model and the challenged claim that grit is a unique personality trait, this study aims to shed further light onto the relationship between grit, resilience and PsyCap. Therefore, the third research question of this thesis is: *Is grit a distinctive construct to the personality characteristics PsyCap and resilience?* Additionally, this study aims to test the incremental validity of grit in predicting work-related performance and stress beyond these two traits as shown in the conceptual model presented in Section 2.4.2 on Page 51.

2.3.1 The Nature of Personality

The history of personality traces back to ancient Greece, where philosophers debated about the differences of personalities and individual characteristics that are shared by all human beings (McAdams, 1997). In science, first descriptions of personality can be traced to about a century ago, when Carl Jung developed the first theory of the basic personality types that are still found in one of the most commonly applied personality trait measures, the Myers-Briggs type indicator (Pittenger, 2005). In the 1940s, Raymond Cattell set the basis for a deeper evaluation of personality by studying factor-analytic peer ratings of students and questionnaires and thus, using more objective measures to systematically evaluate individual differences (Digman, 1990). As such, the Big Five personality dimensions were described for the first time by Ernest Tupes and Raymond Christal (1961) in their work for the US Airforce. They analysed earlier work and described the five personality characteristics of Surgency, Agreeableness, Dependability, Emotional Stability and Culture to be the ones that explain the observations reported. This set the basis for an increasing interest in the research of personality and particularly its importance for society and organisations. Goldberg (1981) refined this basic framework into the five dimensions that are most commonly referred to nowadays to describe the so-called Big Five personality traits: Extraversion, Agreeableness, Conscientiousness, Neuroticism and Openness. However, even until the early 2000s, there was no consensus among researchers about the explicit traits that form the Big Five personality dimensions, leaving scope for confusion and misinterpretations (Digman, 1990).

The name Big Five is derived from the underlying assumption that these personality factors are considered to be the most important and most commonly referenced characteristics used to describe the individual personality of human beings (John *et al.*, 2008). However, even if the Big Five are the most popular and dominant personality characteristics in research, there is evidence of a wider range of personality characteristics that are crucial for societal, organisational and individual outcomes, .such as performance, well-being, and success. Such characteristics include resilience, PsyCap and, as discussed in Section 2.2, grit. Evidence has shown that these personality characteristics have statistically significant effects on various outcomes, beyond the traditional Big Five (Choi and Lee, 2014; Butz *et al.*, 2018; Oshio *et al.*, 2018). Nowadays, personality is a well-established field of research not only in Psychology but across the whole of the social sciences. Even in the natural sciences, research is conducted that explores specific biochemistry and chemical reactions in the brain and its influence on individual differences in personality (Canli, 2006; Ryman *et al.*, 2011; Wei *et al.*, 2014).

2.3.1.1 Personality Characteristics

Even if some of the big five personality traits had been researched and classified since the early 1940s, the big five personality traits were collectively introduced in research by Tupes and Christal (1961). Nowadays, there is general agreement that the big five personality traits are: Extraversion, Agreeableness, Conscientiousness, Neuroticism and Openness (Costa and McCrae, 1980; John and Srivastava, 1999; John *et al.*, 2008; McCabe and Fleeson, 2012). The last dimension, conscientiousness, has been described as a reflection of dependability. It describes individual characteristics, such as being careful, responsible and acting in socially acceptable ways (Barrick and Mount, 1991; John and Srivastava, 1999). In previous studies, conscientiousness was found to be one of the best predictors of positive outcomes inside and outside the workplace (Jackson and Roberts, 2017).

Aside from the Big Five personality characteristics, there is a great deal of literature that has defined and explored a large variety of different personality traits over the past century. While there is empirical evidence for some of these, the vast majority of the constructs are empirically similar to each other and thus, redundant or not well explored (Pfattheicher *et al.*, 2017). In addition, there are two characteristics that are more commonly discussed within and outside the research community in relation to individual outcomes at the workplace: PsyCap and resilience. The coming sub-sections discuss the Big Five personality traits, PsyCap, and resilience. These three constructs were selected given the extensive established range of literature that has previously discussed them, the existing evidence of their empirical

distinctiveness (e.g. Major *et al.*, 2006; Choi and Lee, 2014; Oshio *et al.*, 2018), and their conceptual similarity to grit. The following sections focus explicitly on findings of the Big Five that are linked to business related outcomes.

2.3.1.2 Grit and other Personality Traits

Relationships between grit and other trait and state variables have been examined in order to develop a deeper understanding of the grit concept as a distinct theoretical framework in empirical research. Grit has been found to be correlated to various constructs (see Table 2-2), such as self-control (Duckworth *et al.*, 2007; Duckworth and Gross, 2014), conscientiousness (Duckworth *et al.*, 2007; Reed *et al.*, 2013; Ivcevic and Brackett, 2014), positive affect (Singh and Jha, 2008; Strayhorn, 2013), mental toughness (Credé *et al.*, 2017), and personal stability (Blalock *et al.*, 2015; Credé *et al.*, 2017). Moreover, grit showed low to moderate relationships with three Big Five dimensions: agreeableness, openness and extraversion (Duckworth and Quinn, 2009; Duckworth *et al.*, 2011; Hill *et al.*, 2016). However, it has been argued that the correlations between these constructs are not high enough in order to criticise the discriminant validity of grit.

Table 2-2 Overview of Correlations between Grit and other Psychological Concepts.

Correlate	*N*	*R*	*p*	*SD*
Self-control	2.615	.59	.72	0.05
Conscientiousness	18.826	.66	.84	0.07
Positive affect	670	.38	.46	0.03
Mental toughness	3.817	.37	.46	0.08
Emotional stability	14.501	.33	.41	0.04
Agreeableness	14.395	.25	.33	0.07
Openness	14.585	.15	.19	0.14
Extraversion	14.395	.19	.23	0.09

Source: Credé et al. (2017, p. 58).

However, several authors found strong correlations between grit and various dimensions of conscientiousness, for example self-control. This is why Credé *et al.* (2017) suggested – in line with other scholars (e.g. MacCann and Roberts, 2010) – that grit should be considered as a aspect of conscientiousness. Schmidt *et al.* (2018) added to this discussion that grit is theoretically and conceptually similar to the proactive dimension of conscientiousness and thus

"represents yet another contribution to the common problem of redundant labelling of constructs in personality psychology" (p. 717). The high similarty between grit and conscientiousness has already been acknowledged by Duckworth *et al.* (2007) who reported a high correlation with different facets of conscientiousness ($r = 0.77, p < 0.001$). They explained that the uniqueness of grit lies in stamina and long-term effort that is not reflected in conscientiousness stating that "Grit overlaps with achievement aspects of conscientiousness but differs in its emphasis on long-term stamina rather than short-term intensity" (Duckworth *et al.*, 2007, p. 1089). These conceptual overlaps can be considered an issue when evaluating the discriminant validity of grit and might hinder its ability to offer more meaningful insights (Credé, 2018; Jordan *et al.*, 2019b).

However, even if grit could be considered to represent one facet of conscientiousness, it would still bring unique content in the form of long-term orientation and consistency of strong interest that are not captured in any of the previously identified six dimensions of conscientiousness (Roberts *et al.*, 2014). Credé *et al.* (2017) concluded that the main relationship between these two constructs is found between the dimension of perseverance and conscientiousness. In turn, this emphasizes the importance of the dimension of consistency of interest for predicting various outcomes. This is also in line with Duckworth's argumentation that the unique contribution of grit is the combination of perseverance with the emotional attachment and the long-term focus of gritty individuals. Moreover, previous research (Roberts *et al.*, 2014) has argued that the conceptualisation of conscientiousness is not as clear as it has been claimed to be because the dimensions of conscientiousness can be confusing so more research is needed to identify what conscientiousness is. Therefore, as it is important to evaluate the relationship of grit with the dominant Big Five that has been done before, it is equally important to further explore its relationship and incremental validity beyond other important personality characteristics.

2.3.2 Personality and Relationships to Business Related Outcomes

The idea of personality on a more scientific basis was established about a century ago, and researchers started to search philosophically and scientifically for factors that are connected to the performance of individuals. The interest in this topic did not mitigate and more research is still taking place. The traditional point of view assumed that mainly cognitive abilities, such as intelligence, are the key for individual performance and a successful workforce. However, over the past twenty years, several publications have challenged this long-established opinion. In their study, Avis *et al.* (2002) showed that personality traits are similarly important as cognitive

intelligence for predicting individual performance. In recent years, there has been an increasing amount of literature suggesting that non-cognitive traits and personality attributes could be even more important for individual success and performance than conventionally measured cognitive abilities (Tett and Burnett, 2003; Luthans *et al.*, 2006b; Schmitt, 2012; Judge *et al.*, 2013; Kelly *et al.*, 2014). Historically, these have been used to predict individual performance and other desirable outcomes in the workplace (Hunter, 1986).

Furthermore, it has been highlighted that such non-cognitive factors increase the ability to predict business-related outcomes (e.g. training success and job performance) better than the traditional cognitive measure of IQ (Schmidt and Hunter, 1998; Newman *et al.*, 2014). These findings led to debates about the usefulness of applying traditional IQ tests in order to predict academic and occupational performance across industries and levels of education and employment. Subsequently, academics expanded their research and introduced and promoted additional facets of cognitive ability, such as emotional intelligence (Zeidner *et al.*, 2004) and other potential predictors of business-related outcomes (Chamorro-Premuzic and Furnham, 2008).

Practical and theoretical research attention into personality traits was further increased when a range of studies showed that several personality traits are responsive to interventions and thus, can change over time in a desired direction (Luthar and Cicchetti, 2000; Hudson and Fraley, 2015; Roberts *et al.*, 2017). This sparked particular interest in organisational settings, as employers and consultancies are looking for ways to develop the skills and abilities of their employees in a variety of ways. Therefore, the next section provides an overview of personality traits and their impact on specific organisational outcomes.

The Big Five have been researched extensively in the business environment, providing evidence of the strong impact these personality dimensions have on a range of business-related outcomes, such as job performance (Barrick and Mount, 1991; Hurtz and Donovan, 2000), career success (Judge and Kammeyer-Mueller, 2007), job satisfaction (Judge *et al.*, 2002), turnover and absenteeism (Swider and Zimmerman, 2010). However, most findings vary across samples, industries and dimensions. While only two individual dimensions of the Big-Five, namely neuroticism and extraversion, were generalizable across all studies in the meta-analysis conducted by Judge *et al.* (2002), the set of the five dimensions provided the strongest overall correlation with job satisfaction. However, differences in the predictive validity of personality were found between different occupations; for example, Zhao *et al.* (2010) reported a strong predictive validity of personality for entrepreneurial performance excluding agreeableness that had a negative correlation. Therefore it can be said that except from agreeableness, the four

dimensions of the Big Five (conscientiousness, openness, extraversion and neuroticism) are essential for the long-term success of entrepreneurs (Barrick *et al.*, 2001). However, these are not the only personality characteristics that have been found to be important for such outcomes. Another well-researched personality trait is the so-called proactive personality. Crant and Bateman (2000) define individuals with a proactive personality as people who "effect environmental change; they identify opportunities and act on them, show initiative, and persevere until they bring about meaningful change" (Crant and Bateman, 2000, p. 65). Major *et al.* (2006) concluded that proactive personality is a distinct personality characteristic to the Big Five and adds value to the prediction of career success (Seibert *et al.*, 1999) and job performance (Fuller Jr and Marler, 2009).

Over the past two decades an increasing amount of literature has been published, exploring and promoting further non-cognitive personality traits - traits that "are weakly correlated with measures of intelligence" (Brunello and Schlotter, 2011, p. 3) - such as resilience (Fletcher and Sarkar, 2013), or higher-order constructs such as PsyCap (Gucciardi *et al.*, 2015; Luthans *et al.*, 2015). Extensive research has provided statistical evidence that these traits are linked to outcomes such as job performance, job satisfaction, absenteeism, and turnover (Abbas and Raja, 2015; Siu *et al.*, 2015; Seville, 2018). Nevertheless, these constructs are diverse and rarely used in current HR practices because of their conceptual complexity, inconsistent definitions, or time-consuming assessments (Luthar *et al.*, 2000a; Harrop *et al.*, 2006; Avey *et al.*, 2011b; Clough and Strycharczyk, 2012).

Another important set of findings was the relationship between different personality characteristics and the experience of work-related stress and burnout levels in employees. Various studies showed that the Big Five personality traits are closely related to burnout levels of individuals, working in different industries and work environments (Alarcon *et al.*, 2009; Swider and Zimmerman, 2010). However, both the Big Five and other personality traits such as PsyCap and resilience were shown to be valid predictors of work-related stress (McCraty and Atkinson, 2012; Min *et al.*, 2015). Considering the discussion in Section 2.5.2 on the relationship between grit and stress, the question could be raised of whether the reported effects are unrelated to effects by these other personality traits. This would need to be established in order to emphasise the importance of grit beyond other personality constructs. In light of debates concerning work-life balance, health and well-being at work and increasing numbers of burnout and absenteeism, these findings and questions are of key importance for organisations (McManus *et al.*, 2004).

2.3.3 Personality and Current Issues in HRM

Considering relationships and positive effects of personality traits on business related outcomes, such as the positive effects of PsyCap and resilience on task and innovative performance (Seville, 2018) and negative effect on job-stress (Abbas and Raja, 2015), it is not surprising that organisations discovered personality as a way to increase their competitive advantage (Judge *et al.*, 2013; Cooper *et al.*, 2014). Particularly HRD and recruitment and selection departments are engaging with the question how personality can be used and developed in order to increase individual performance (Penney *et al.*, 2011). The main interest was based on the question whether individuals who are scoring higher in specific traits are increasing not only individual but also departmental and organisational performance (Diekmann and König, 2015). As a result of a range of positive findings that claimed clear and causal relationships between personality and performance on different levels, personnel selection processes were adjusted accordingly and personality testing was introduced into most of the Fortune 500 companies in the US and also in several organisations across Europe (Diekmann and König, 2015).

Overall, it could be argued that a significant amount of evidence is available to suggest a relationship between a range of personality characteristics and desirable and undesirable outcomes in the workplace. Given these findings and the need of firms to respond to increasing issues, such as absenteeism due to work-related stress or increased competition for suitable employees as a response of globalisation, there is a requirement to explore alternatives to develop the workforce. This is particularly interesting as there is an ongoing debate in personality research that criticises the current practices in this field of study. Hackman (2009) has argued that newly introduced and conceptualised constructs in empirical research lack critical examination in comparison with possibly similar constructs, which results in common conceptual biases and poor construct validities.

Many concepts are called old wines in new bottles as they are seen to simply rename and combine different well-established concepts, a practice that often results in confusing definitions and highly complex higher-order models, as it was the case for mental toughness (Moran, 2004; Hackman, 2009). Discussions about grit and its conceptual uniqueness are not limited to conscientiousness, but also include other psychological personality traits such as resilience and PsyCap. The conceptual similarities between these three constructs is the reason why more research is needed in order to evaluate if grit is indeed a unique personality characteristic. This has been questioned in previous studies because Researchers on grit use a very similar terminology in describing grit as a trait that enables individuals to pursue through

difficult times despite challenges and setbacks and work optimistically towards long term-goals (Perkins-Gough, 2013; Sparks, 2014; Credé *et al.*, 2017). However, whereas various studies have focused on the theoretical and empirical relationship between grit and the Big Five factors, limited research has evaluated the relationship between grit, PsyCap and resilience, despite the theoretical conceptual overlaps. Therefore, this research aims to explore the distinct nature of grit in comparison to the established measures of PsyCap and resilience. Such a distinction is crucial in order to establish whether grit is a unique characteristic and not simply old wine in new bottles. Moreover, if it is established that grit is indeed a distinct characteristic, it is essential to evaluate if grit not only provides predictive validity for individual outcomes at the workplace, but incremental predictive validity beyond PsyCap and resilience. Only then will grit be considered an interesting concept for HRM and TD programs to develop a stronger and healthier workforce.

2.3.4 The Nature of Psychological Capital

Psychological Capital is a concept in positive psychology that was first mentioned and identified by Luthans and colleagues (Luthans, 2002; Luthans and Youssef, 2004; Luthans *et al.*, 2007b). They defined PsyCap as an "individual's positive psychological state of development", characterized by the psychological resources of efficacy, hope, optimism, and resilience (Luthans *et al.*, 2007b, p. 3). In combination, the four positive psychological concepts form the multidimensional second-order construct of PsyCap (Luthans *et al.*, 2007a). The authors provided a set of criteria for this concept, suggesting that it needs to be grounded in theory and research, being assessed by valid measures and be a state-like characteristic. Thus, PsyCap possesses the potential to be developed over time through specific interventions and practices (Luthans *et al.*, 2008b; Luthans, 2012).

Self-efficacy is a central aspect of PsyCap; it is a construct based on Bandura's social cognitive theory and describes an individual's self-confidence in believing that they can achieve high levels of performance by mobilizing their existing cognitive resources, motivation and courses of action (Bandura, 1994; Stajkovic and Luthans, 1998). Bandura (1994) proposed that the advantage of high self-efficacy compared to low self-efficacy is that the individual has stronger beliefs in their own ability to be in control of success and in directing outcomes even when facing difficult challenges. Another dimension of PsyCap is hope, an individual positive and motivational state of mind that is based on the two components, agency and pathways (Snyder *et al.*, 1996). Agency is understood as goal-directed energy that describes an individuals' motivation to succeed in a specific task in a certain context. Pathway thoughts refer

to the ways or routes which could be taken to achieve or accomplish desired goals and tasks as well as an individual's perceived ability to produce these paths (Snyder, 2000). Luthans (Luthans *et al.*, 2008a; Luthans *et al.*, 2008b) showed that individuals with higher levels of hope developed higher goal-directed energies and showed a higher likelihood to exhibit the capacities that are needed to develop alternative ways and thus achieve their set goals.

Optimism a third dimension of PsyCap is described as an individual's reaction to occurring problems by means of expecting a positive outcome based on confidence and high personal abilities (Scheier and Carver, 1992; Chang, 2001; Seligman, 2011). Individuals who are high in optimism generally show higher or more positive expectations on events and challenges. This has a motivating effect and helps them to pursue their goals and overcome difficult and challenging situations (Seligman, 1998; Carver *et al.*, 2010). This is closely linked with the fourth and last dimension, resilience. It is defined as an individual's ability to bounce back from negative events or experiences by continuous adaption to stressful events or challenges (Connor and Davidson, 2003a; Tugade and Fredrickson, 2004).

While there are various definitions of resilience, as further explored in Section 2.3.6, resilience as part of PsyCap is considered as a trait-like personality characteristic that can be developed and that is not entirely stable over time. This means that individuals can develop their level of resilience by training or coping in difficult times (Luthans *et al.*, 2015).

Since the first study that discussed the concept of PsyCap was published in 2002, a rapid growth in publications led to a critical and overarching evaluation of the concept, investigating its relationships to different job-related behaviours, attitudes and individual performance measures (Avey *et al.*, 2011a; Dawkins *et al.*, 2013; Dawkins *et al.*, 2015; Luthans *et al.*, 2015). In recent years, studies started to examine the impact of PsyCap at individual, team and organisational levels in a variety of sectors, such as military and sports, and in diverse samples that included students and children, volunteers, healthcare professionals, unemployed and individuals working in high-risk organisations such as emergency services or the oil and gas industry (Luthans *et al.*, 2006b; Youssef and Luthans, 2007; Demerath *et al.*, 2008; Luthans *et al.*, 2008a; Luo and Hao, 2010; Walumbwa *et al.*, 2011; Eid *et al.*, 2012; McKenny *et al.*, 2013; Ratten, 2015). Based on this amount of research, PsyCap has been promoted to organisations, mainly in the US, as a beneficial factor that could be used in HRM processes to reduce problems, such as work-related stress, absenteeism or low levels of performance, among others (Luthans *et al.*, 2007b; Gruman, 2013; Luthans *et al.*, 2015).

Various individual and organizational strategies have been identified to develop PsyCap in the working context. Individually, it has been suggested that core-self evaluations, a proactive personality or self-esteem are beneficial for the development of positive individual PsyCap (Avey, 2014). Workplace support has been shown to facilitate the development of individual PsyCap, and it can be derived from supervisors or peer workers as part of buddy up or mentor systems that are used to support new hired employees (Nigah *et al.*, 2012; Liu, 2013). It was also shown that transformational, ethical or empowering leadership can result in higher follower PsyCap which, in turn, increases individual performance. Authoritarian leadership, however, revealed a negative effect on the level of PsyCap (Gooty *et al.*, 2009; Karakitapoglu Aygun *et al.*, 2018).

As described above, various factors have been identified in previous literature that are directly influenced by PsyCap at the individual level. A large and growing body of literature on PsyCap pays attention to the correlation between PsyCap and individual attitudes at work, focusing on its impact on desirable employee attitudes. Two of these desirable attitudes in the workplace, namely job satisfaction and organisational commitment, revealed high correlations to PsyCap in several studies (Luthans and Jensen, 2005; Larson and Luthans, 2006; Luthans *et al.*, 2007a; Luthans *et al.*, 2007b; Youssef and Luthans, 2007; Luthans *et al.*, 2008a; Luthans *et al.*, 2008c; McMurray *et al.*, 2010; Simons and Buitendach, 2013). Luthans *et al.* (2007b) explained this relationship as being a result of the positive expectations, individuals scoring high in PsyCap possess towards future outcomes and a generally greater belief in their abilities. This serves as a motivator for these individuals to show greater effort and performance in their jobs and leads to a higher commitment and increased job-satisfaction. Furthermore, several studies reported a positive relationship between PsyCap and staying intentions and a positive influence of PsyCap on employees' commitment towards their organizations' goals (Luthans and Jensen, 2005; Avey *et al.*, 2009; Avey *et al.*, 2010b; Siu *et al.*, 2015).

In addition to the desirable behaviours, growing research examined the impact of PsyCap on so-called undesirable employee attitudes in the workplace. Several studies (Luthans and Jensen, 2005; Avey *et al.*, 2008b; Avey *et al.*, 2009; Avey *et al.*, 2010b) reported negative relationships between PsyCap and turnover intentions or cynicism against change. These studies found that individuals who are scoring higher in PsyCap are more open towards changing environments and processes in their organisations. PsyCap has also been found to have an impact on a range of individual employee behaviours. Of particular interest are the associations between PsyCap and positive behaviours in the workplace, such as organisational citizenship behaviour; Avey *et al.* (2008b) attributed this relationship to the higher experiential

probability of positive emotions of individuals who score high in PsyCap. This relationship has been confirmed by other studies across different samples (Avey *et al.*, 2008a; Gooty *et al.*, 2009; Avey *et al.*, 2010b; Norman *et al.*, 2010); for example, Avey *et al.* (2008b) reported a positive relationship between PsyCap and individual engagement at work. Research also found that individuals with higher PsyCap scores are less likely to engage in counterproductive or deviant behaviour at work (Avey *et al.*, 2008a; Avey *et al.*, 2008b; Norman *et al.*, 2010). Moreover, negative relationships between PsyCap and negatively associated behaviours at work, such as absenteeism and job search behaviour, were reported in further studies (Avey *et al.*, 2006; Avey *et al.*, 2009; Chen and Lim, 2012).

The literature on PsyCap has highlighted a positive impact of PsyCap on the quality of employees' personal and work life (Nguyen and Nguyen, 2012; Baron *et al.*, 2013). Several studies examined the influence of PsyCap on well-being over time and reported positive outcomes for this linkage for different measures of psychological well-being in and outside of work situations (Cole *et al.*, 2009; Avey *et al.*, 2010a; Culbertson *et al.*, 2010; Luthans *et al.*, 2013). Notably, Luthans *et al.* (2013) found that PsyCap increases well-being and further also relates to objective health outcomes and satisfaction with one's individual health; Cheung *et al.* (2011) reported negative relationships to the two burnout indicators, emotional exhaustion and depersonalisation and Park *et al.* (2017) demonstrated that the relationship between empowering leadership and well-being and job-engagement was mediated by PsyCap.

Other factors that have been positively linked to PsyCap are the constructs of thriving and self-development at work (Patterson *et al.*, 2014), happiness and health (Diener *et al.*, 2009; Avey *et al.*, 2010a; Bakker and Oerlemans, 2011; Begley and Davidson, 2012; Sheldon *et al.*, 2012; Luthans *et al.*, 2013; Youssef and Luthans, 2013), and competence and growth (Gooty *et al.*, 2009). In addition, several studies revealed negative relationships to negative measures, such as work-related distress or anxiety (Avey *et al.*, 2009; Baron *et al.*, 2013). In their recent study, Abbas and Raja (2015) reported a significantly reduced experience of work-related stress among employees that scored higher in PsyCap in a diverse sample outside the US. Similarly, Min *et al.* (2015) demonstrated that PsyCap is not only negatively related to work-related stressors and symptoms of burnout, but that PsyCap plays a vital role for individuals to sustain in adverse work conditions.

In reference to the links that have been described to different levels and measures of performance, the theoretical foundation for this relationship can be drawn from the Psychological Resource Theory (Hobfoll, 2002). It describes that individuals who possess more internal resources that are elementary to pursue goals score higher in PsyCap and perform

higher than those with less resources and lower scoring in PsyCap (Luthans *et al.*, 2007b; Luthans *et al.*, 2008c). Various empirical studies that have examined the impact of PsyCap on individual performance in different contexts support this theoretical assumption (Luthans *et al.*, 2005; Luthans *et al.*, 2007a; Luthans *et al.*, 2008c; Avey *et al.*, 2010c; Luthans *et al.*, 2010; Avey *et al.*, 2011b; Peterson *et al.*, 2011; Sun *et al.*, 2012). The authors found empirical evidence that individuals scoring higher in PsyCap performed better in their jobs than those scoring lower in PsyCap. Further, Avey *et al.* (2010c) reported positive relationships between PsyCap and individual financial and as manager-rated performance in employees working in the financial service industry. Even though the majority of these studies were conducted in US-based organisations, similar relationships have been found in non-US based samples (such as in China, Vietnam, Australia, Portugal and the Netherlands) (Luthans *et al.*, 2005; Luthans *et al.*, 2008a; Luo and Hao, 2010; McMurray *et al.*, 2010; Rego *et al.*, 2010; Cheung *et al.*, 2011; Demerouti *et al.*, 2011; Nguyen and Nguyen, 2012). Luthans *et al.* (2007a) reported a positive relationship between PsyCap and individual performance that accounted for higher performance levels more than personality or core self-evaluations. Moreover, positive correlations of PsyCap with the performance measures of creative and innovative performance have been demonstrated (Luthans *et al.*, 2011; Sweetman *et al.*, 2011; Rego *et al.*, 2012; Karakitapoglu Aygun *et al.*, 2018).

Even though PsyCap has been conceptualised in the past as a second-order construct comprising the four aforementioned dimensions, there is no consensus about whether other constructs, such as individual well-being, humour or gratitude, should be included as well (Luthans *et al.*, 2007b; Luthans *et al.*, 2008c). However, Dawkins *et al.* (2013) raised concerns about the inclusion of more components without adequate theoretical justification. They argued that this would lead to conceptual confusions about the definition and understanding of the construct of PsyCap similar to the case of resilience (Luthar *et al.*, 2000b; Luthar *et al.*, 2006; Windle, 2011) or mental toughness (Crust, 2008; Gucciardi *et al.*, 2008; Gucciardi *et al.*, 2015). Nevertheless, there remains a lack of clarity regarding the relationship of PsyCap to other personality characteristics, such as grit.

2.3.5 Grit and PsyCap

PsyCap consists of the four non-cognitive psychological resources of hope, resilience, efficacy, and optimism (Luthans and Youssef, 2004) and is arguably theoretically and conceptually related to grit. Credé *et al.* (2017) reported independent relationships of grit to hope, generalized self-efficacy, resilience, and optimism; interestingly, the correlations between the sub

dimensions of PsyCap and grit were inconsistent and varied across the four dimensions (r_{hope} = .33, n = 2.378; r_{opt} = -.04, n = 2.059; r_{res} = .08, n = 480; $r_{\text{self-eff}}$= .36, n = 1.908). Nevertheless, until 2019, no published work was found that specifically explored or reported correlations between the two personality traits. However, a recent study by Luthans *et al.* (2019) analysed the mediating role of PsyCap in the grit - academic performance relationship. The authors argued that the underlying behavioural processes of grit and PsyCap are fundamentally similar and that resilience and perseverance share a conceptual ground. Moreover, they empirically suggested that attitudes and behaviours that are represented in grit are manifested in PsyCap as well. Nevertheless, Luthans *et al.* (2019) also argued that despite conceptual similarities, grit focuses on stable long-term ambitions which distinguishes it from PsyCap in that it is closer related to more proximate outcomes, such as studying for a specific module or program (Luthans *et al.*, 2012; Luthans *et al.*, 2019). Nonetheless, Luthans *et al.* (2019) used a specific conceptualisation of PsyCap - academic PsyCap - and conducted their study on a small sample (n - 176) of students. Academic PsyCap is conceptualised as a state-like rather than a trait-like personality characteristic and thus, the findings are not representative for the generally applied and acknowledged conceptualisation of PsyCap.

No further published studies explored the relationship between the two concepts. Even more importantly, to the author's knowledge, no study appears to have explored the conceptual model of the two models and compared potential issues regarding shared variance and other psychometric properties. Therefore, further evaluations are necessary as there is still a lack of understanding of the discriminant validity of grit in relation to the concept of PsyCap. This, however, is an important step in order to evaluate the distinctive features of grit and distinguish it empirically and theoretically from PsyCap. However, it has been argued that grit might not only be conceptually more closely related to PsyCap, but also to resilience (Perkins-Gough, 2013; Arouty, 2015; Stoffel and Cain, 2017).

2.3.6 The Nature of Resilience

At some point in life, every individual, team or organisation is confronted with some form of crisis or adverse life event. This might be an environmental crisis or a societal disaster, such as the financial crisis in 2008 or the global pandemic of 2020, or a personal crisis. What they all have in common is the need to be able to recover from this event in order to survive (Seville, 2018). In the competitive, changing, uncertain world of the 21$^{\text{st}}$ century, this ability is essential so it is unsurprising that research in resilience has attracted increasing interest in a variety of domains.

Resilience evolved from the material sciences, disseminating across psychology, including sociology and cognitive neuroscience, before it was finally adopted by business studies (Haskett *et al.*, 2006; Fletcher and Sarkar, 2013). Resilience as defined in the early stages of research in psychology and other fields in social sciences can be described as the individual ability to recover quickly from difficult and negative conditions. The word 'resilience' is drawn from the Latin word 'resilire' and translates as "to leap back" (Connor and Davidson, 2003b). As it is used in past and current psychology research, resilience refers to the set of abilities and skills needed to bounce back from negative emotional and psychological experiences and adapt in a flexible way to changing environments and demands of stressful and disruptive events (Block and Block, 1980; Lazarus, 1993; Block and Kremen, 1996; Connor and Davidson, 2003a; Masten and Obradović, 2006). One of the most used definitions of resilience describes it as "a dynamic process encompassing positive adaptation within the context of significant adversity" (Luthar *et al.*, 2000a, p. 543). Even though the extensive research on resilience conducted over the past 40 years developed a strong and diverse literature base, it created a major issue for the conceptual understanding of this psychological construct (Meredith *et al.*, 2011). In a literature review of resilience, Meredith and colleagues identified over 104 definitions that had been offered by previous researchers, resulting in differing theoretical assumptions and empirical findings and led to a variety of different conclusions and construct definitions. This, in turn, created confusion about the nature of resilience in general (Cohn *et al.*, 2009; Karaırmak, 2010; Herrman *et al.*, 2011; Karreman and Vingerhoets, 2012; Liu *et al.*, 2012).

In general, there are three major distinguished perspectives of resilience that can be found in current literature: trait-orientation, outcome-orientation and process-orientation. This distinction played a crucial role in Duckworth's argumentation that grit cannot be compared to resilience as a definitive concept (Perkins-Gough, 2013). Moreover, even if all definitions describe resilience as a trait that enables individuals to withstand difficult and challenging times, they do so with different characteristics that make it more difficult to compare it conceptually to grit. The first perspective operationalises resilience as a stable and fixed personality trait that is responsible for the bouncing back reaction after a stressful event (Block and Block, 1980; Ong *et al.*, 2006). It has been suggested that this perspective comprises protective factors including resourcefulness or a strong character that allows to respond to external demands. The second outcome-perspective, describes resilience as a behavioural or functional outcome that can be used by individuals to recover from adverse events (Masten, 2001; Harvey and Delfabbro, 2004). The third perspective defines resilience as a dynamic process that shows developable reactions that depend on surrounding interacting factors and influence the individual (Dyer and McGuinness, 1996; Luthar *et al.*, 2000a; Luthans, 2002;

Waite and Richardson, 2004; Fergus and Zimmerman, 2005). This third definition and interpretation of resilience is used to assess resilience as part of PsyCap; Richardson (2002) added that individuals exceed their previous level of the proactive component of resilience by successfully adapting to repeated exposure to stressors, change and adversity. Further studies have supported this assumption arguing that an improvement of resilience is also possible through learning new coping strategies, which in turn improve the flexibility and stability of individuals when exposed to stressors and change (Tugade *et al.*, 2004; Youssef and Luthans, 2007; Avey *et al.*, 2009; Lengnick-Hall *et al.*, 2011). Thus, the process-orientation of resilience suggests that it is a personality characteristic that responds to external changes and develops over time.

The debates about the definition and nature of resilience need to be discussed in order to set theoretical boundaries and approaches for further empirical research in resilience (Fletcher and Sarkar, 2013). At the same time, the reported discrepancies in the definition and conceptualisation of resilience reduce the generalisability and comparability of research findings and make it challenging to find appropriate operationalisations for the purpose of measurement (Davydov *et al.*, 2010). Based on the extensive list of varying definitions, conceptualisations and operationalisations of resilience, this literature review only focuses on the two key conceptualisations and findings of psychological resilience. These are first, the traditional definition of resilience as a dynamic process, and second, the comparatively new area of organisational and employee resilience. In combination, these represent the conceptualisation of psychological resilience that is applied in this thesis (Hu *et al.*, 2015). This is because of mainly three reasons. First, resilience as a dynamic process is the most commonly adopted conceptualisation of resilience in recent research. Moreover, this conceptualisation has been adopted by various organisations to be implemented into organisational or HRM processes with the aim of developing a stronger and more resilient workforce through interventions and training (Abbott *et al.*, 2009; Pidgeon *et al.*, 2014; Robertson *et al.*, 2015). This makes it also more comparable to grit, as it has been suggested that grit might be responsive to interventions and subject to change (Geist, 2016; Alan *et al.*, 2019a). Second, PsyCap, the personality trait which is conceptually closely related to grit adopts resilience as a dynamic process as the third of its four dimensions (Youssef and Luthans, 2007). As such, relying on a similar conceptualisation is advisable to avoid confusion and increase comparability. Third, in the past five years, researchers have shown that the reliability and validity of resilience in the workplace is better captured when the scale is adapted to the specific context (Bardoel *et al.*, 2014; Näswall *et al.*, 2015; Britt *et al.*, 2016; Tonkin *et al.*, 2018). Considering that this study evaluates resilience in the working context and that the employee resilience conceptualisation is also

based on the dynamic process perspective, this research adopts the dynamic process perspective of employee resilience.

2.3.6.1 Organisational Resilience

Research on resilience evolved during the past two decades and has been adapted to a range of different subjects outside of material or psychological sciences. In business and organisational contexts, it is referred to as organizational resilience and described as the ability of an organisation to "…survive, and potentially even thrive, in times of crisis" (Seville *et al.*, 2008, p. 2). The idea of organisational resilience is derived from the traditional conceptualisation of individual resilience, however, accumulated to the organisational level. This means that a resilient organisation becomes resilient by employing resilient individuals and developing an organisational structure that possesses the ability to respond to crisis and challenges (Mallak, 1998; Bhamra *et al.*, 2011).

In these terms, organisational resilience is not understood as a physical resistance of buildings or machinery against natural disasters, but as a less visible and manifested process at the organisational level. It is closely connected to a culture that responds to individual and organisational discontinuities or crises; issues encountered by an organisation include financial crises, industrial accidents or staffing problems (Seville *et al.*, 2008; Crichton *et al.*, 2009; Stephenson *et al.*, 2010; Burnard and Bhamra, 2011). Moreover, it includes the development of enhanced organisational abilities and new capabilities to maintain or even create new opportunities by responding to and learning from current and previous challenges (Lengnick-Hall and Beck, 2003; Freeman *et al.*, 2004; Lengnick-Hall *et al.*, 2011). As a result, organisational resilience is defined as an organisation's ability to develop effective responses to specific situations that are potentially threatening the organisational existence and survival by engaging in transformation activities and accordingly changing current structures and processes (Coutu, 2002; McCann, 2004; Lengnick-Hall *et al.*, 2009; Lengnick-Hall *et al.*, 2011). Therefore, organisational resilience is an adaptive process that enables organisations to solve occurring issues and challenges. Moreover, they respond to these not only by bouncing back to previous benchmarks, but by developing a new repertoire of dynamic capabilities to cope with future challenges.

In order to achieve high organisational resilience, Lengnick-Hall *et al.* (2011) concluded that an organisation needs to develop an interacting set of organisational capabilities, processes and routines (Lengnick-Hall and Beck, 2009). These are derived from a systematic approach in developing sustainable and integrated business practices (Ortiz-de-Mandojana and Bansal,

2016). According to Lengnick-Hall *et al.* (2011), these practices can be further enhanced by developing a combination of individual skills, abilities and knowledge across the organisation. Individual skill sets need to be implemented by an effective and strategic HRM system that enables the organisation to conceptually position and adapt itself in changing environments. This can be achieved by continuously moving forward and establishing a holistic setting of diversity, flexibility and adjustable integration (Lengnick-Hall and Beck, 2009; Lengnick-Hall *et al.*, 2011). Considering this and the general assumption that resilient organisations require a resilient workforce, they require the development and selection of resilient employees.

2.3.6.2 Employee Resilience

Building on the definition of organisational resilience, employee resilience has been conceptualised as the individual capacity to positively respond, adapt and thrive in challenging, adverse and changing situations at work (Britt *et al.*, 2016). Employee resilience is described as a transformational process that develops an employee's resources and can be described as a process or a personality characteristic that responds to changes, in this case, to the working environment. Näswall *et al.* (2013) proposed that the organisational environment is a crucial factor that affects the development of employee resilience by providing specific empowering factors, such as a learning oriented, supportive, open work environment.

Resources needed for the process-orientation of resilience are commonly described as protective factors (Meredith *et al.*, 2011; O'Dougherty Wright *et al.*, 2013; Hu *et al.*, 2015). Previous literature revealed a range of protective factors that contribute to the development of individual resilience within and outside the workplace. These factors, listed in Table 2-3 (p. 42), have been found to be developed at the individual, family and community levels.

Recent literature on employee resilience has suggested that organisational and environmental factors are equally important to promote resilience in the workplace (Britt *et al.*, 2016). In particular, appropriate HRM practices are needed in order to promote and develop resilience in the workplace setting (see Table 2-4, p. 43) (Lengnick-Hall and Beck, 2009; Lengnick-Hall *et al.*, 2011; Bardoel *et al.*, 2014). In all the studies mentioned, employee resilience is recognised as a developable characteristic that, if implemented correctly, can help to foster positive outcomes in the workplace (Britt *et al.*, 2016).

2.3.6.3 Outcomes of Resilience

This section provides an overview on previous findings on the effects and outcomes of individual resilience. The outcomes are described in four broader categories: performance outcomes, mental health and well-being outcomes, physical outcomes, and psychological outcomes.

Table 2-3 Factors that Positively Influence the Development of Resilience

Individual Level	Source
Positive thinking	(Hoge *et al.*, 2007)
Realism	(Conger *et al.*, 1999)
Behavioural control	(Bonanno *et al.*, 2007)
Positive affect	(Bonanno, 2004)
Positive coping	(Haglund *et al.*, 2007)
Physical fitness	(McCraty *et al.*, 2009)
Altruism	(Haglund *et al.*, 2007)
Family Level	
Emotional Ties	(Hoge *et al.*, 2007)
Communication	(Black and Lobo, 2008)
Support	(Yehuda *et al.*, 2006)
Closeness	(Yehuda *et al.*, 2006)
Nurturing	(Barton, 2005)
Adaptability	(Black and Lobo, 2008)
Environment Level	
Belongingness	(Tedeschi and Kilmer, 2005)
Cohesion	(Maguire and Hagan, 2007)
Connectedness	(Vernberg *et al.*, 2008)
Collective efficacy	(Hobfoll *et al.*, 2007)

Resilience has gained increasing interest over the years by researchers and practitioners for several reasons. One of the main reasons why it became particularly interesting for organisations is its reported impact on individual performance. In the past decade, several studies have explored the influence of resilience on performance related measures and identified a broad variety of correlations to positive performance-related outcomes. Some studies reported increased levels of self-rated and supervisor-rated performance (Luthans *et al.*, 2005; Luthans

et al., 2007a; Carr *et al.*, 2013), observed performance (Arnetz *et al.*, 2009), productivity (Pipe *et al.*, 2012), goal attainment (Grant *et al.*, 2009), and overall products sold (Abbott *et al.*, 2009).

More recently, a study by Meneghel *et al.* (2016) found positive relationships between resilience and in-role and extra-role performance at the team-level across different organisations. The authors found that team-resilience moderates the relationship between job-social resources and team performance. Thus, the impact of HRM practices on team performance can be fostered by improving resilience at the individual and team levels.

Table 2-4 Organisational Factors that Contribute to the Development of Resilience

Contributing Factor	Source
Development of social supports in the workplace	(Luthans *et al.*, 2001)
Enhanced work–life balance practices	(Youssef and Luthans, 2007)
Employee assistance programs such as consulting services	(Johnson, 2008)
Employee development programs including specific resilience training	(Jensen and Luthans, 2006)
Flexible work arrangements	(Wang *et al.*, 2009)
Occupational health and safety systems	(Zanko and Dawson, 2012)
Risk and crisis management systems	(Bardoel *et al.*, 2014)
Diversity management	(Bardoel *et al.*, 2014)

A second category of factors that is affected by the individual level of resilience in the workplace are psychological outcomes, which primarily describe different factors that impact an individual's state of mind about work. Previous research found various factors that are affected by the individual level of resilience (Millear *et al.*, 2008; Liossis *et al.*, 2009). Moreover, scholars showed that resilience impacts work satisfaction, work-life balance (Millear *et al.*, 2008; Liossis *et al.*, 2009), motivation (Pipe *et al.*, 2012), mindfulness (Burton *et al.*, 2010; Pidgeon *et al.*, 2014), and social support (Burton *et al.*, 2010; McCraty and Atkinson, 2012). Moreover, self-esteem and self-efficacy were increased (Waite and Richardson, 2004; Liossis *et al.*, 2009; Sherlock-Storey *et al.*, 2013) as well as peacefulness, mental clarity, calmness, acceptance and self-compassion (Burton *et al.*, 2010; McCraty and Atkinson, 2012; Pipe *et al.*, 2012; Pidgeon *et al.*, 2014).

Despite the positive impact of resilience, negative correlations have been reported between resilience and several negative health-related outcomes, such as depression, anxiety

stress, negative affect, anger, or negative emotions such as sadness (Millear *et al.*, 2008; Abbott *et al.*, 2009; Arnetz *et al.*, 2009; Liossis *et al.*, 2009; Burton *et al.*, 2010; Sood *et al.*, 2011; McCraty and Atkinson, 2012; Pipe *et al.*, 2012). Sood *et al.* (2011) conducted a randomized controlled clinical trial study and showed that after a training intervention, the training group increased their resilience level significantly and accordingly. After some time, stress and anxiety levels were reduced. Previous research also revealed a positive impact on subjective well-being, self-acceptance, mastery, happiness and overall quality of live, vitality, and purpose (Millear *et al.*, 2008; Liossis *et al.*, 2009; Burton *et al.*, 2010; Sood *et al.*, 2011; McCraty and Atkinson, 2012).

Resilience not only has an impact on psychological, health and performance outcomes, but also on individual physical and biological states. A negative impact on fatigue was reported in several studies (Sood *et al.*, 2011; McCraty and Atkinson, 2012; Pipe *et al.*, 2012). Scholars also reported a negative relationship to physical impairments such as general physical ill-being, sleeplessness, heart-rate, high cholesterol, and high blood pressure (Arnetz *et al.*, 2009; Burton *et al.*, 2010; McCraty and Atkinson, 2012; Jennings *et al.*, 2013). Furthermore, studies that explored the impact of individual resilience on physically-ill individuals suggested that it could be responsible for better health. Stewart and Yuen (2011) showed that individuals scoring higher in resilience were less likely to experience a second heart attack and recovered faster after strokes or surgeries.

Previous research explored the amendable nature of the psychological construct and provided evidence that resilience training has a positive effect on the level of resilience (e.g. Grant *et al.*, 2009). By fostering psychological resilience in the workplace, a positive effect on individual well-being outcomes, such as lower perceived stress and reduced level on depression scales, were reported in several studies (Dumont and Provost, 1999; Haglund *et al.*, 2007; Davydov *et al.*, 2010). In addition, Robertson *et al.* (2015) demonstrated increased productivity levels, a higher behavioural performance and increased goal attainment. However, in their systematic review, the authors describe a general lack of consistency across their reviewed studies in terms of resilience definitions, variables used and interventions and trainings applied. The authors conclude that more studies needed to be conducted to explore the impact of interventions on resilience as only then research will be able to determine which training aspects are effectively enhancing individual resilience in the workplace (Robertson *et al.*, 2015).

2.3.7 Grit and Resilience

As it has been established in the previous sections, resilience is a construct that has received a lot of attention in different fields of research. Moreover, it has been shown that high levels of resilience have strong benefits for individuals inside and outside the workplace (Hu *et al.*, 2015). In particular, reports about the positive effects of resilience on performance and a reduction of experienced stress have sparked additional interest. As discussed above, various organisations started to implement processes into their HRM programs to enhance their employees' levels of resilience. Similarly, grit has been found to be at the centre of a lot of attention in the research community after being promoted as an important individual characteristic for long-term achievement, high performance and success (see Section 2.2). Moreover, a small number of recent studies have argued that grit might also be an important characteristic to increase performance and retention and reduce levels of stress at the workplace. Grit has even been promoted as a crucial trait that needs to be considered in the organisational context as part of recruitment and development programs (Elam, 2015).

However, in order to invest resources into the development of new HRM and HRD processes that aim to strengthen and develop newly developed individual personal capabilities, such as grit, more research is necessary to reveal if any of these provide additional impact in the organisation. Even more important, it needs to be clear that these new traits are not simply covering already existing traits under a different name, the so called old wine in new bottles problem (Pfattheicher *et al.*, 2017). Moreover, recent criticism argued that the close empirical relationship of grit to other personality traits raises questions about its unique nature (Credé *et al.*, 2017), Because of this, it seems surprising that so little research has been conducted that explored the conceptual relationship between the two personality traits of resilience and grit and gives reason to doubt the empirical distinctiveness of the two constructs (Perkins-Gough, 2013; Credé *et al.*, 2017).

Only in two recent doctoral dissertations, the researchers observed the relationship between grit and resilience and their impact on academic success and school climate perception (Arouty, 2015; Incantalupo-Kuhner, 2015). Nevertheless, these observations are limited in their contributions; Incantalupo-Kuhner (2015) used the definition of dispositional resiliency in their study, which describes it as a fixed trait opposed to resilience as a dynamic process. This is more common and also used in this study so the two studies can hardly be compared (Windle *et al.*, 2011). Moreover, the study conducted by Arouty (2015) contained a relatively small sample with 235 participants and thus, provides only limited empirical evidence for the relationship between the two concepts.

In a recent conversation with Perkins-Gough (2013), Duckworth acknowledged the similarity of grit to the construct of resilience. However, she explains that despite the similarities, grit means "… not just resilience in the face of failure, but also having deep commitments that you remain loyal to over many years" (Duckworth as quoted in Perkins-Gough, 2013, p. 16). Moreover, she argued that grit is different to resilience due to its long-term focus and emotional attachment to the subject as well as the ability to work consistently towards these, maintaining high levels of effort. Additionally, she argued that the difficulties in the current conceptualisation of resilience make it hard to find a way to compare grit to resilience. However, not helping to reduce the confusion about the concepts, Duckworth did commonly refer to resilience when talking about the dimensions and key characteristics of grit. Moreover, the title of her bestselling book which was first published in 2016 was changed in the paperback version to 'Grit: Why passion and resilience are the secrets to success' (Duckworth, 2017). Using the terms interchangeably like this does not provide further clarity on the conceptual relationship between the two constructs.

Nevertheless, when comparing the two definitions of resilience as a dynamic process, it is evident that there are certain characteristics that can be found equally in both personality traits (Duckworth *et al.*, 2007; Fletcher and Sarkar, 2013). This overlap becomes clearer when considering definitions of resilience such as the one outlined by Luthans and Youssef-Morgan (2017) who speak of resilience as "sustaining and bouncing back and even beyond […] to attain success" (p. 783). This corresponds very closely to the perseverance of effort dimensions of grit, which suggests that gritty individuals persevere and maintain their effort despite setbacks, challenges and adversity. Despite arguing that grit and resilience are not the same thing, this overlap is acknowledged by Duckworth who argues that gritty individuals possess this strength as well, but in combination with the aforementioned deep commitments towards long-term goals (Perkins-Gough, 2013).

Even if it could be argued that this distinction provided by Duckworth is not clear and needs to be reviewed, there is some differentiation between the concepts. First, as emphasised by Duckworth, grit encompasses a wider range of abilities and behaviours than the traditional understanding of resilience, such as goal setting, goal adaptation and an emotional component that is not inherent to resilience (Credé, 2018; Jordan *et al.*, 2019a; Jordan *et al.*, 2019b). Passion, as described by Duckworth, is one of the key distinct characteristics of grit; while resilience is mainly focused on the ability to bounce back from adverse events and develop personally from the experience of negative events (Hu *et al.*, 2015; Crane and Searle, 2016), grit is not only a personal resource in a challenging situation, but a characteristic that enables

individuals to work towards their passion and long-term goals in challenging and unchallenging times (Credé, 2018; Jordan *et al.*, 2019b). While it is suggested that grit can be developed as well, there is little evidence for the factors involved (Haist, 2015; Credé *et al.*, 2017). It is interesting to consider that Duckworth mentioned the lack of conceptual clarity for resilience, while there are similar issues in the current conceptualisation of grit. Considering the encompassing dimensions of grit and the rather uni-dimensional conceptualisation of resilience, the difference between the two concepts seems a bit clearer.

However, there is insufficient research that has identified and examined the relationships between the two personality traits. As such, this study aims to add knowledge to the debate about the distinctive nature of grit by empirically testing the conceptual relationship between the two constructs. The question if they are measuring the came construct or if resilience should be considered a part of grit is based on Duckworth's theoretical argumentation that even if there is some overlap in terms of the ability to withstand difficult times and negative events, gritty individual gain this ability through the perseverant effort towards long-term goals in combination with the emotional attachment to the subject of interest (Perkins-Gough, 2013; Duckworth, 2016; Jordan *et al.*, 2019b).

As a result of the theoretical discussion provided above that evaluated the current knowledge about the relationship between grit and the two more established concepts PsyCap and resilience, the third research question of this thesis was developed. It aims to explore the distrinctive nature of grit and the potential conceptual overlap between the three personality characteristics.

RQ3: Is grit a distinctive construct to the personality characteristics PsyCap and resilience?

Only if this question is answered, the evaluation of the impact of grit on individual outcomes is thoroughly justified. This is based on the assumption that if grit is indeed a unique personality trait in comparison to these two concept it can add value to the predictive validity for individual outcomes in the business context. Therefore, in a next step, the following section draws on previous findings that reported a relationship between the current conceptual model of grit and individual performance. It evaluates the three performance dimensions: task performance, OCB and innovative performance and develops research hypothesis how grit has an impact on all three measures, also beyond PsyCap and resilience.

2.4 Grit and Performance in Business

The preceding section provided a detailed overview of grit and its relationship to different measures of performance and effevtiveness in a variety of settings that have been explored in great depth in previous research. This section focuses on the relationship between grit and individual job performance in the organisational context.

As discussed in Section 2.2, grit has been shown to positively affect individual achievement and various performance measures in different contexts (Credé *et al.*, 2017; Vazsonyi *et al.*, 2019). In the light of those previous studies and findings, it seems remarkable that there is only limited evidence about its applicability in the business domain. In particular, given the strong indication that grittier individuals show higher levels of performance across various domains, there is an important gap in research in business and organisations to evaluate this relationship. In addition, there is a lack of understanding about the effect grit has on individual capabilities in business and whether it could be used to predict performance and other business-related measures. This study aims to close this gap and follows the suggestions for further research that were provided by Credé *et al.* (2017) in their meta analyses:

"… Grit researchers should consider examining criteria that span to different domains (e.g., work settings), a greater range of difficulty and a greater variety of task types (e.g., intellective tasks versus creative tasks). This may help to establish boundary conditions for the influence of Grit on success and performance" (p. 35).

As previously discussed, one response to the search of organisations for processes and policies that increase individual and organisational performance is the evaluation of the impact of personality on business related measures. Grit has been shown to be closely related to various performance measures in different settings. Most of those reported positive effects on performance and success outcomes. Therefore, in light of previous research it could be argued that grit could demonstrate a high utility for business and management. It is only recently that researchers started to look into the applicability of grit in the organisational context and initial findings provide some evidence that grit might be a beneficial factor for organisational development and particularly for HRM (Ion *et al.*, 2017; Peleașă, 2018; Dugan *et al.*, 2019; Jordan *et al.*, 2019a). This idea is reflected in previous theoretical discussions (Jordan *et al.*, 2019a; Jordan *et al.*, 2019b) and initial findings (Elam, 2015; Haist, 2015). To add to this limited body of work, this study aims to answer the research question of whether grit is an important factor in predicting individual performance in the business context.

2.4.1 The Nature of Job Performance

Job performance was defined by Motowildo *et al.* (1997) as "the aggregated value to the organization of the discrete behavioural episodes that an individual performs over a standard interval of time" (p. 72). Traditionally, job performance was commonly described and assessed by what is today called task and role performance (Borman and Motowidlo, 1997). However, despite the traditional focus on role performance, it has been suggested that individual performance is not unidimensional, but rather it is a complex and multidimensional construct (Motowidlo and Van Scotter, 1994; Campbell, 1999). Motowidlo and Van Scotter (1994) have argued that in order to assess and evaluate individual performance in the workplace it is necessary to include different conceptualizations of performance. Similarly, Podsakoff *et al.* (2000) note that only by looking at different dimensions of performance, its relationship to the individual contribution to organisational performance can be understood. In line with this, Borman and Motowidlo (1997) state that depending on the job description, different types of performance are needed more than others and therefore, a more nuanced assessment of performance is required (Borman and Motowidlo, 1993; Motowidlo and Van Scotter, 1994).

To respond to the distinction of performance into different dimensions, this section discusses the three types of job performance that are commonly assessed and described as crucial for the successful functioning of an individual in the workplace of a contemporary organisation. First, the traditionally assessed task performance is introduced, which refers to the effectiveness with which an employee fulfils the tasks that are stated in their role description (Griffin *et al.*, 2000). Second, extra-role performance is introduced, which describes any desirable contribution that is not part of the written job requirements (Podsakoff and MacKenzie, 1997). The third type of performance is innovative performance. Innovative performance is the creation, communication and implementation of creative and innovative ideas at work (Shanker *et al.*, 2017; Shipton *et al.*, 2017). Innovative behaviour has been found to be a major contributor of organisational innovation and thus, a significant factor for ensuring the organisational competitiveness and survival in challenging and dynamic market contexts (Shalley *et al.*, 2009; Shipton *et al.*, 2016c).

One of the key questions for organisations pertains to which factors are crucial to predict higher and lower levels of performance. In the 1950s, Mann (1959) was the first researcher to conclude that individual performance might be positively correlated to individual personality. He reported positive relationships to different measures of performance, such as leadership, task activity, total activity rate and social-emotional activity. This idea gained traction in the research community, which is shown for example in two recent meta-analyses that confirmed

these findings, looking into the relationship between the Big Five personality traits and different individual performance measures (Barrick *et al.*, 2001; Judge *et al.*, 2002). These studies found that personality is a statistically significant predictor of various individual performance measures across occupations and industries. However, the findings were inconsistent in the reported predictive validites for the different dimensions of the Big Five. While both studies found that conscientiousness is the best predictor of overall performance and neuroticism is negatively correlated with performance, findings of other traits such as openness, agreeableness and extraversion were inconsistent. These were shown to predict different performance measures in certain jobs but not for overall performance.

Other personality traits such as self-efficacy (Stajkovic and Luthans, 1998), PsyCap (Luthans *et al.*, 2007b), trait emotional intelligence (Perera and DiGiacomo, 2013), proactive personality (Fuller Jr and Marler, 2009), and resilience (Abbott *et al.*, 2009; Meneghel *et al.*, 2016) have also been shown to be predictors of performance across various jobs and occupations. Thw two concepts of PsyCap and resilience are explored in more detail in Section 2.5 (pp. 32).

Considering the large number of studies research the effects of personality on individual job performance and despite the well-established knowledge about grit and its effects on performance in other domains, not much attention has been given to the potential applicability of grit in the business context (see Section 2.2). Only a small number of studies explored grit in the business domain, suggesting that grit can be considered important for success and performance in this context (Elam, 2015; Meriac *et al.*, 2015; Wolfe and Patel, 2016; Ion *et al.*, 2017; Peleașă, 2018; Lechner *et al.*, 2019). They reported a significant impact of grit on different individual outcomes in the work setting. Peleașă (2018), for example, analysed the predictive validity of grit beyond for task performance, OCB and counterproductive work behaviours. However, these studies showed various methodological limitations, such as non-probability convenience sampling, small sample sizes and only for certain occupational groups. As a result, the understanding into how grit affects individual performance and which performance dimensions across the wider working population remains unclear. Therefore, this thesis uses a UK-based sample to answer the research question of whether grit is a valid predictor of individual performance in the workplace.

This is a major concern because recent studies found that some personality traits do not possess the same predictive validity across different domains, thus raising the question of whether grit is a stable and domain-general concept or whether it possesses domain-specific elements (Avey *et al.*, 2010b; Zampetakis, 2010; Larkin *et al.*, 2016). The research hypotheses

and the conceptual model (see Figure 2-2 on page 52) for this study was developed aiming to fill this gap of current knowledge in the research area of grit. The conceptual framework shows the hypothesized effects of grit on the three measures of job performance. Additionally, it is hypothesised that grit is a necessary condition for high levels of task performance, OCB and innovative performance. Lastly, it shows the presumed necessary condition of the Person-Centred Model of grit for high levels of task performance as well as the relationships with work-related stress discussed in Section 2.5.

2.4.2 The Relationship between Grit and Job Performance

In order to better understand the conceptual model, the following sections outline the theoretical development leading towards the hypotheses, starting with an exploration of the relationships between grit and the three key individual job performance dimensions in the following three sections.

2.4.2.1 Task Performance

A common definition of task-related performance, or job role performance, were provided by Borman and Motowidlo (1993) describing task performance as "the effectiveness with which job incumbents perform activities that contribute to the organization's technical core either directly by implementing a part of its technological process, or indirectly by providing it with needed materials or services" (Borman and Motowidlo, 1997, p. 99). However, this definition is applicable only to a limited extent to describe individual performance in contemporary work environments. This is due to the diverse nature of work, particularly when considering the increasing importance of service-based roles and jobs that largely rely on soft skills. A more general description of task performance defines it as how well the employee or individual performs the tasks and roles that are formally described as part of the job (Motowidlo and Van Scotter, 1994; Bozionelos and Singh, 2017).
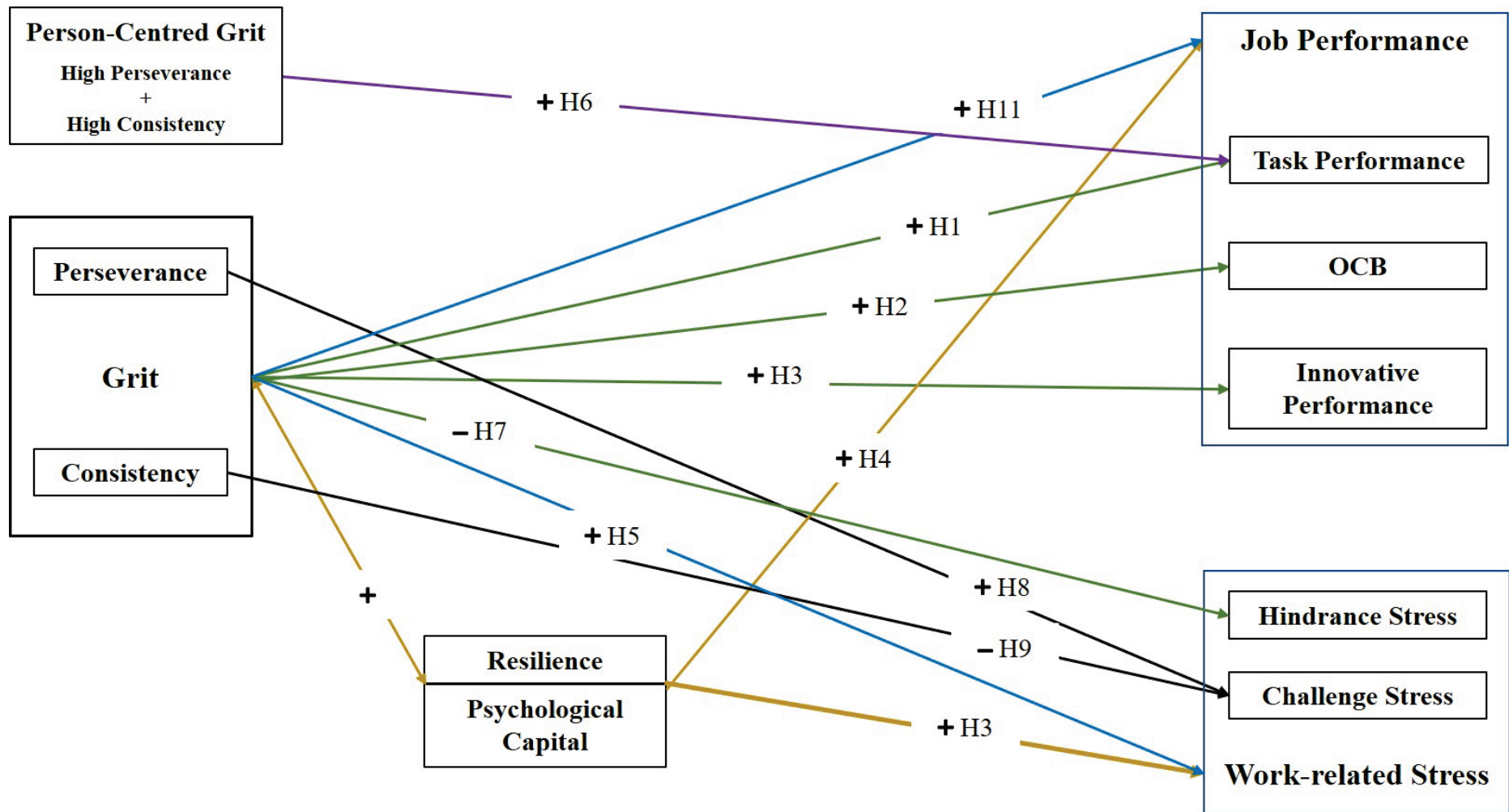
Figure 2-2 Conceptual Model of the Present Thesis

Task performance is one of the essential dimensions of job performance that has traditionally been used to determine the performance of employees, executing the task according to their job role and contributing to overall firm performance. As such, it can encompass different dimensions and is relatively individual and job specific. For some, high task performance can mean to bill as many hours at a client as possible, for others it might be to build a product, for others to finish a certain amount of manuscripts a year or answering 20 phone calls in a customer service centre in an hour. This shows the complex and individual nature of job-role performance in the workplace. This is the reason why first, a general measure for task-performance is needed, and second, why Williams and Anderson (1991) scientifically distinguished task performance from extra-role behaviour or extra-role performance and described task performance more broadly as all activities that are captured by the job description.

Task performance measures are ordinarily stated and used as the essential part of performance monitoring and appraisal. Commonly, task performance is considered as the most important dimension of job performance as only if main duties are fulfilled, the job can be considered to be successfully accomplished (Rotundo and Sackett, 2002). Rotundo and Sackett (2002) found that ta (sk performance and extra role behaviour or OCB are often rated similarly important. Even if it has been pointed out that with changing roles and job descriptions it might be harder to grasp and define task performance (Ones *et al.*, 1993), current research successfully and continuously applies task performance as the main measure of individual job performance in the workplace (Borman, 2001).

In summary, up to date there is only a small amount of published research that explores the impact of grit in the business environment. Moreover, since most studies were looking at small and very specific samples, it is not clear whether grit has positive effects on employees across different industries and occupations. Nevertheless, the majority of studies reported a positive effect, which requires further evaluation in broader samples. Therefore, and following Credé *et al.'s* (2017) suggestions, this thesis hypothesises that grit is indeed a valid predictor of task performance across industries and occupations in the UK business context.

Credé *et al.* (2017) claimed that the common practice of reporting an overall grit score based on the scores of the two dimensions perseverance and consistency results in a loss of predictive power for performance. As discussed in Section 2.2.5, this might be due to the fact that perseverance is the stronger predictor compared to consistency or even the overall reported grit score (Christensen and Knezek, 2014; Datu *et al.*, 2015; Jachimowicz *et al.*, 2018). Interestingly, the majority of studies that explored grit and its impact on performance in the business context, only provided the effects of the overall grit score but not for the individual

dimensions (De Vera *et al.*, 2015; Peleașă, 2018; Dugan *et al.*, 2019; Kim *et al.*, 2019). However, this would be necessary particularly when considering the criticism – discussed in the previous section – on the current conceptualisation and potential differential findings of the two dimensions. Based on previous research and the observed positive effects of , the present study tests the predictive power of the overall grit score and the two dimensions perseverance and consistency seperately for task performance.

Hypothesis H1: *Grit has a positive effect on task performance in the workplace.*

The second dimension of individual performance that is commonly discussed as being similarly important for the well-functioning of the team and organisation is extra-role performance or citizenship behaviour (Rotundo and Sackett, 2002).

2.4.2.2 Extra-Role Performance

Extra-role performance remains a highly debated topic. These debates arose around the meaning and definition of extra role performance as well as what it should actually describe and how it should be measured (Vey and Campbell, 2004; Borman and Motowidlo, 2014). Two terms are commonly used to describe the extra-role performance of employees: contextual performance (Borman and Motowidlo, 1997) and organisational citizenship behaviour (Williams and Anderson, 1991). Whereas some use organisational citizenship behaviour and contextual performance interchangeably (Jawahar *et al.*, 2008; Devonish and Greenidge, 2010), others contend that these are two different constructs and need to be treated and assessed individually (Borman and Motowidlo, 1997). It has been argued in a meta-analysis by LePine *et al.* (2002) that even though the original definition and conceptualization of OCB was arguably different to the definition provided by Motowidlo (2000), a more recent view on OCB mainly refers to contextual performance as described by Borman and Motowidlo (1993). Despite ongoing discussions and the introduction of yet another term, citizenship performance, this thesis follows the example of Werner (2000) and refers to extra-role behaviour or contextual performance using the term and definition of OCB because OCB describes the willingness of employees to both support the organisation and help and support colleagues and co-workers. As such, it covers a broader range of desirable behaviours and has been found to be highly important for various outcomes in the business context, as described below (Podsakoff *et al.*, 2009; Chahal and Mehta, 2010; Borman and Motowidlo, 2014).

Generally, OCB refers to behaviours that contribute "to the maintenance and enhancement of the social and psychological context that supports task performance" (Organ,

1997, p. 91). Organ (1997) has argued that these behaviours not only promote task-performance, but "typically go beyond an employee's job description and are useful to the organization as a whole" (Werner, 2000, p. 4). It has been recognized that OCB is a crucial dimension of the overall exhibited performance in the workplace as previous studies have reported that it increases productivity, efficiency as well as customer and employee satisfaction. Moreover, it has been found to reduce negative factors such as absenteeism or turnover and to have a highly positive influence on the individual, team and organisational levels (Podsakoff *et al.*, 2009). As such, OCB is described as the voluntary commitment of an employee towards co-workers and the organisation that is not necessarily part of the contract but desirable as it contributes to the functioning of the organisation as a whole (LePine *et al.*, 2002).

Most commonly, OCB is considered to be important as it directly influences individual and team-based task performance (LePine *et al.*, 2002). OCB is described as a construct that demonstrates a two-dimensional effect (LePine *et al.*, 2002). The two dimensions are organisational citizenship behaviour directed towards individuals (OCBI) and organisational citizenship behaviour directed to the organisation (OCBO). While both dimensions can have a significant impact on several organisational outcomes, McNeely and Meglino (1994) reported that high OCBI is correlated to individual dispositions such as conscientiousness and empathy, while OCBO is closer related to the organisational context. OCBI is described as all behaviours in the workplace that are directed at other individuals such as co-workers or managers. This dimension assesses a range of individual activities, for example altruistic or courteous behaviours. OCBO is described as a dimension comprising all behaviours that are beneficial for the organisation as a whole and includes conscientiousness or sportsmanship.

OCB is a frequently researched topic when assessing work-related performance and has been recognized as one of the key characteristic that are shown by high performing employees (Chahal and Mehta, 2010). Thus, as much as task performance is a desirable dimension of performance, OCB seems to be equally important for organisations and high performers alike. It has been reported that high levels of OCB lead to higher employee satisfaction – even though job-satisfaction has also been described as an antecedent of OCB (Zeinabadi, 2010) – and lower levels of absenteeism, turnover and counterproductive work behaviour (Dalal, 2005). These findings were supported in a meta-analysis by Podsakoff *et al.* (2009) who reported negative correlations with turnover intentions ($r = -.22$) and actual turnover ($r = -.14$). The same relationship was reported for absenteeism ($r = -.16$). Moreover, the authors found a strong correlation between OCB and job-performance ($r = .60$). The meta-analytic findings were extended to the unit level and showed a positive impact of OCB on the overall unit performance,

unit productivity and efficiency. Moreover, the authors reported a reduction of unit overall costs and overall turnover. These findings support the importance of extra-role performance in the form of OCB behaviours for managers and organisations alike. By developing OCB within organisations, firms can increase their organisational performance and success. Despite the large number of studies that evaluated the antecedents and outcomes of OCB, it is not clear which factors are important to predict extra-role behaviour (Leon *et al.*, 2015).

Previous research has explored the impact of different personality characteristics and their impact on the development and execution of OCB. Besides traditional psychological constructs like consciousness, more recently discovered and tested traits, such as PsyCap, have been shown to have a positive effect on OCB (Gupta *et al.*, 2017). Chiaburu *et al.* (2011) reported that individual personality traits further hinder or increase the motivation to show extra-role performance. Considering such findings there remains the question of whether other personality traits might play a crucial role in the demonstration of extra-role performance. One interesting potential predictor of OCB could be grit. As outlined, previous research has referred to personal long-term goals and continued interest of employees on the job and the organisation as important characteristics to enhance OCB. These are two characteristics that are inherent in the conceptualisation of grit. Gritty individuals might be more likely to show citizenship behaviours due to their strong commitment to the subject or job and the consistent interest they they have towards achieving their long-term goals. In order to reach these, it is often necessary to provide help, support and enhance the potential of colleagues and other contextual factors (Borman and Motowidlo, 2014).

Recent concerns have been raised about the potential dark side of grit, which refers to the potential egoism that could be caused by higher levels of grit (Zakrzewski, 2014). There is a rising concern that people who are too high in grit might become too focused on their long-term goals that they may forget about potential alternatives and colleagues and society around them (Zakrzewski, 2014; Tedesqui and Young, 2018; Siedle, 2019). This could be linked to recent discussions about the potentially limited flexibility of individuals that have a strong consistency of interest. It is suggested that there is a dark side to this consistency that could lead to obsessive behaviour (Mageau *et al.*, 2009). This could also explain some inconsistencies in previous findings (see Section 2.4.4 for a more detailed discussion). Therefore, testing the relationship between OCB and grit could help to identify if there is a potential negative impact of grit on extra-role citizenship behaviours. This might also be of interest for organisational researchers and practitioners when reviewing the recently claimed link between OCB, job and innovative performance in the workplace (Xerri and Brunetto, 2013).

A meta-analysis by Gonzalez-Mulé *et al.* (2014) examined the effects of different personality traits on task, contextual and counterproductive work performance, reporting positive relationships between personality and OCB that opposed current criticism by noting that grittier individuals were more likely to engage in citizenship behaviour. The variance explanation was shared between personality traits and cognitive abilities. Similar results have been reported in two subsequent studies that assessed grit in the organisational context (Elam, 2015; Ion *et al.*, 2017). Peleașă (2018) and Elam (2015) observed a statistically significant effect of grit on OCB in two different samples. (Elam, 2015) reported "a lower score of predicted contextual performance […] for the low grit participants ($M = 5.35$, $SD = .69$) when compared to the high grit participants ($M = 5.91$, $SD = .68$)" (p. 28). However, the previous studies by Elam and Peleașă mainly utilised small samples with less than 200 participants and thus their findings need to be interpreted with caution. Nevertheless, the strong correlation between task performance and OCB (Rotundo and Sackett, 2002; Harari *et al.*, 2016) in combination with the emotional attachment to one's long-term goals, which, at the workplace, commonly requires a positive team-based approach, suggest that grit positively affects OCB.

Even if the overall grit score is theorised to positively influence the level of OCB, it is expected that this relationship is mainly due to the consistent interest of the gritty individual on the subject. While perseverance of effort is expected to have only a very small positive effect because it could be argued that for an individual that is working continuously towards their own long-term goals, time spend on non-task related issues, such as helping others, might be considered as not so important (Lucas *et al.*, 2015; Morin, 2016). Therefore, consistent with H1 this thesis tests the predictive power of grit for OCB based on the overall grit score and the individual consistency and perseverance scores. Overall, considering the findings of previous work and the positive effect of grit on various performance indicators, this study hypothesises that grit predicts contextual performance across the UK working population.

> ***Hypothesis H2:*** *Grit has a positive effect on extra role performance in the workplace.*

2.4.2.3 Innovative Performance

In an increasingly competitive global market, organisations are seeking new ways to gain competitive advantage and to maintain and increase their revenue generating capacity. In the past 20 years, innovation has been named as one of the most crucial tools to secure future organisational success by introducing new innovative processes, products, or services.

(Bharadwaj and Menon, 2000; Hughes *et al.*, 2018). The process of innovative performance has received increasing attention since organisations started to embrace and incorporate the ideas, suggestions and proposals of their workforce. Organisations recognize the importance of innovation and its potential to lead to more distinct competitive advantage (Anderson *et al.*, 2004; Anderson *et al.*, 2014). As a result, organisations are actively searching for individuals, so-called corporate entrepreneurs, who show innovative entrepreneurial behaviour or innovative performance in the workplace to eventually increase organisational performance and competitiveness (Pinchot III, 1985; Covin and Miles, 1999). An increasing number of firms, including prominent examples such as Google and Facebook, are increasingly trying to encourage innovative work behaviours to support the organization to develop ideas, adopt new products and work methods, and reach new markets (Alpkan *et al.*, 2010; Yuan and Woodman, 2010).

Innovative work behaviour was defined by West and Farr (1989) as a purposeful creation, introduction and application of new and innovative ideas in the workplace to benefit individual, departmental and organizational performance. This idea was further developed by Janssen (2000), who stated that innovative work behaviour, often referred to as innovative work performance, is a complex individual behaviour that consists of the three steps or behavioural tasks: idea generation, idea promotion, and idea realization. The first set of behaviours, idea generation (Janssen, 2000), is also commonly referred to as creativity and describes the development of useful and novel ideas that are concerned with any dimension of work (Anderson *et al.*, 2014). This could be developing an idea to solve work-related issues, problem or incongruities, or it could relate to inventing new products or services (Amabile *et al.*, 1996; Lu *et al.*, 2019). Some authors argue that this phase actually consists of two individual steps; first, problem recognition, and second, idea generation, which represent the creativity-orientated part of innovative performance (De Jong and Den Hartog, 2010).

The second step in showing innovative behaviour in the workplace is idea promotion or coalition building. According to Janssen (2000), idea promotion is the engagement in behaviours that not only communicate the generated ideas, but also seek to find allies and backup to support the realisation of the proposed innovation. This innovative behaviour is considered to be the first phase of the implementation-orientated innovative performance that establishes a case for the developed idea with buy-in from colleagues and managers within the organisation (Janssen, 2000; Janssen, 2001; Leong and Rasli, 2014). The third step of the implementation phase is idea realisation. According to Kanter (1988) idea realisation refers to the process of producing a model of the proposed innovation and its experience of successful =

workplace implementation. Implementation can occur on the individual, the group or department, or organisational levels and defines a successful innovation. High innovative performance is the reappearing demonstration of innovative behaviour of an individual in the workplace that follows through all phases of the innovative behaviour process.

Previous research showed a positive relationship between task performance and innovative performance but also pointed out that these are two different dimensions of an overall performance measure (Dörner, 2012; Leong and Rasli, 2014). Parker *et al.* (2006) have argued that innovative performance shows important similarities with extra-role behaviour or contextual performance. This is because individuals who show high levels of innovative performance contribute beyond the scope of their described job role requirements thus benefitting the whole organisation. Even if research during the past decades introduced innovative performance as an important measure of individual work-performance, it is only recently that empirical evidence has been provided that innovative performance is a distinctive dimension of individual work-related performance. In their meta-analysis, Harari *et al.* (2016) reported that all three described dimensions of performance have a positive relationship, and that OCB and innovative performance are predictors of higher levels of task performance. They also showed that even if they share a significant amount of variance, they are distinct dimensions that add to the overall understanding of job performance in contemporary organisations. In light of previous discussions about the nature of individual performance in the workplace, innovative behaviour must be considered an important performance dimension along with OCB and task performance (West and Farr, 1989; Janssen, 2000; Anderson *et al.*, 2014).

It has been argued that innovative behaviour of employees positively impacts innovative performance at the firm level and results in overall increased organisational performance (Shipton *et al.*, 2017; Zhang *et al.*, 2018b). Moreover, it has been argued that innovative individuals and even more so innovative teams, are necessary for the successful implementation of change and thus, strengthening the long-term competitive advantage of organisations (West *et al.*, 2004). This was also noted by Agarwal (2014), saying that "one option for organisations to become more innovative is to encourage their employees to be innovative" (p. 43). Along with further recent research, the author argued that HRM plays an important role to facilitate such innovative behaviours in the workplace (Shipton *et al.*, 2005; Shipton *et al.*, 2006; Jiang *et al.*, 2012; Bos-Nehles *et al.*, 2017). It has been found that certain HRM practices, such as the supportive learning climate (Shipton *et al.*, 2005), appraisal and training (Shipton *et al.*, 2006) and teamworking (Fay *et al.*, 2015) can significantly increase innovative behaviour in the

workforce. In their systematic literature review, Bos-Nehles *et al.* (2017) drew from the Ability Motivation Opportunity (AMO) framework to describe specific HRM practices that have been found to foster innovative employee performance in the workplace. The authors argued that ability and opportunity enhancing HRM practices provide the strongest effects on innovative work behaviour, while motivation enhancing practices could have positive as well as negative effects.

Alongside the focus of research on the organisational or departmental level, such as HRM strategies and processes, one stream of research evaluated the effects of personality characteristics on innovative performance in the workplace as well as entrepreneurial behaviours (Zhao *et al.*, 2010; Harari *et al.*, 2016; Mooradian *et al.*, 2016; Mueller *et al.*, 2017). Personality characteristics, that can be be argued to be crucial for the development of skills that enhance innovative work behaviour have not been recognized accordingly in previous research (Wu *et al.*, 2014). In their recent study, Abbas and Raja (2015) reported a significant correlation between PsyCap and innovative work behaviour, suggesting that individuals with certain non-cognitive abilities were more likely to engage in innovative performance activities. Considering the need for innovation in an attempt to sustain a competitive advantage and show high performance and the nature of grit, it is argued that this personality trait could play an important role in the development of high innovative performance in the workplace.

Indeed, previous research of grit in entrepreneurs found a statistically significant impact of grit on venture performance and entrepreneurial success (Mooradian *et al.*, 2016; Mueller *et al.*, 2017). Cantamessa and Montagna (2016) suggested that entrepreneurs are required to show high levels of innovative performance during the creation, communication and execution of their vision in order to develop a successful business model. However, considering that not only entrepreneurs require innovative work performance (Yuan and Woodman, 2010), but that innovative behaviour is equally important in the organisational context, grit is suggested to positively effect innovative performance in this context as well. It is hypothesised that this effect is due to the consistent effort of gritty individuals to work towards their long-term goals that potentially require innovative changes in the strategy to reach these goals due to changing contextual influences (Mooradian *et al.*, 2016). It is argued that in order to engage in innovative behaviour, individuals require self-confidence in order to promote and communicate innovative ideas as well as the drive to persevere the implementation process of such ideas that are inherent to gritty individuals (Wolfe and Patel, 2016). Considering the nature of grit and its positive relationship with venture performance and entrepreneurial success, this research hypothesises that grit has a positive effect on innovative performance in the workplace.

Mooradian *et al.* (2016) recently reported that the two components of grit had different effects on innovation success in their sample of entrepreneurs. In fact, the authors reported that consistency of interest is negatively correlated with innovation but positively correlated with entrepreneurial success. Findings for perseverance were in the opposite direction, positively correlated positively with innovation and negatively entrepreneurial success. This finding is somewhat different to the interaction effects between effort and consistency of interest reported by Gielnik *et al.* (2015). The authors argued that consistency of interest arises due to effort and progress and is not an important trait that encourages higher effort in itself. The relationship between the two dimensions is therefore not clear and requires further evaluation. This study explores the predictive validity of both dimensions (perseverance and consistency) separately for innovative employee performance. However, it could be argued that the task of going through the three stages of innovative performance, idea generation, idea promotion and implementation is difficult and requires stamina and the ability to potentially work through setbacks and resistance (Mooradian *et al.*, 2016). As such, it not only important to show interest into the topic, but persevere with innovative ideas through the whole innovation process, which requires high levels of perseverance of effort to convince others, get important stakeholders on board and finally implement the ideas. In light of previous findings, the requirements for a successful implementation of innovative ideas and the provided definitions of the two dimensions of grit, it is hypothesised that overall grit, as well as both dimensions perseverance consistency have a positive effect on innovative performance.

> ***Hypothesis H3:*** *Grit has a positive effect on innovative performance in the workplace.*

Overall, it is theorised that grit provides predictive validity for all three measures of individual job performance for the representative sample of UK workers. This relationship is also based on extensive previous research on grit and the number of studies that reported a positive effect of grit on various measures of performance. This would mean that grit might be indeed a sufficient condition for high levels of performance across workplaces and occupations (Suzuki *et al.*, 2015; Moles *et al.*, 2017; Credé, 2018; Dugan *et al.*, 2019). However, several researchers argued that the findings are not consistent and grit does not add a unique explanation of variance beyond traditional measures to predict performance (Credé *et al.*, 2017; Ion *et al.*, 2017; Jachimowicz *et al.*, 2018; Schmidt *et al.*, 2018; Luthans *et al.*, 2019).

2.4.3 Grit, PsyCap, Resilience, and Job Performance

As discussed above, grit is not the first psychological factor that has been found to be related to individual performance and success. Research in non-cognitive factors aiming to explain individual performance and success has been conducted in an exhaustive number of previous studies (Cote and Miners, 2006; Dudley *et al.*, 2006; Poropat, 2009; Perera and DiGiacomo, 2013; Poropat, 2014). In particular, PsyCap and resilience emerged as important predictors for individual performance and prolonged success in different work environments and samples. Both constructs have been shown to have high correlations to employee performance, positive and desirable employee attitudes, organisational citizenship behaviour, and even beneficial outcomes at the organisational level (Sun *et al.*, 2012; Fletcher and Sarkar, 2013; Newman *et al.*, 2014; Luthans *et al.*, 2015; Vanhove *et al.*, 2016).

Considering the previous findings that reported a positive impact of all three constructs on various organisational outcomes and given the conceptual and theoretical similarities, it could be assumed that grit is an equally good, or better predictor of performance than PsyCap and resilience. This is, because the individual dimensions of grit entail characteristics that are innate in both resilience and PsyCap. However, these are combined with the emotional attachment to the subject in the form of passion and benefit from the long-term goals. This is of particular relevance, because only if grit exhibits a better predictive validity than the two already established constructs, there might be an interest in organisations to spend money and resources to embed it into their HRM processes. Research Question 3 questioned the relationship between grit, PsyCap and resilience. However, even if all three concepts measure different personality characteristics, it does not automatically mean that the predictive validity for the three could be entirely different. Even if it has been found that they all predict individual performance and work-related stress in some way, the question remains of whether grit adds unique explanation of variance beyond the PsyCap and resilience for these outcomes.

Nevertheless, previous literature showed a statistically significant effect of grit on performance in the organisational context (Duckworth *et al.*, 2007; De Vera *et al.*, 2015; Ion *et al.*, 2017; Dugan *et al.*, 2019). Even if these findings are based on unrepresentative samples, and Duckworth (2016) described passion and perseverance for long-term achievements as the unique characteristics of grit, this study hypothesises that grit provides an incremental explanation of variance in job performance beyond PsyCap and resilience. In emphasising that gritty individuals pursue a long-term achievement passionately and consistently, it is suggested that grit captures additional predictive validity above resilience and PsyCap that do not share

this attitude and mentality. This thesis aims to evaluate the effectiveness of grit in predicting performance above and beyond the personality traits PsyCap and resilience.

In an interview, Duckworth argued that grit is not only passion and perseverance, but it combines optimism and resilience. She went on explain that based on the confusion around the term resilience, optimism is just another definition of resilience as a construct (Perkins-Gough, 2013). Considering the above outlined discussion about PsyCap and its four dimensions, this would not only mean that grit shares a significant variance with PsyCap but that its conceptualisation extends beyond this framework. However, reviewing the research into PsyCap that showed that optimism and resilience are two entirely different factors and need to be considered separately it is therefore questionable if grit accurately measures optimism as an individual concept or rather as a facet of long-term orientation. A recent research revealed that the third dimension of PsyCap, (self-) efficacy is moderately related to grit and thus, three dimensions or PsyCap share a moderate amount of variance with grit (Usher *et al.*, 2019). However, it has been argued that despite the identified similarities, the concepts are still empirically distinguishable. Another recent study that explored the relationship between authentic leadership and organizational effectiveness explored the moderating / mediating roles of hope, grit and growth-mindset (Lee, 2018). The authors found a strong moderate relationship between grit and hope ($r = 0.462$, $p < 0.01$, p. 391). Thus, evidence for the theoretical similarity between grit and PsyCap has been provided (Lee, 2018; Luthans *et al.*, 2019; Usher *et al.*, 2019).

Similar to the development of Hypothesis 3.3 that discussed passion as one of the crucial factors of grit that is responsible for a stronger predictive validity of grit for work-related stress, this factor is also considered to be crucial for high performance in the workplace. Vallerand *et al.* (2007) argued that passion (using the bimodal conceptualisation of harmonious and obsessive passion) stimulates two predictors of performance, deliberate practice and mastery goals. Moreover, passion has been found to positively effect goal attainment, which was also reported to result in an improved individual performance (Vallerand *et al.*, 2007). Even if PsyCap arguably considers a long-term mindset that is connected to hope and optimism - captured in the item ""I feel confident analysing a long-term problem to find a solution," from the Psychological Capital Questionnaire by Luthans *et al.* (2007a), it does not reflect passion in its conceptualisation. Overall, grit seems to capture a wide variety of positive resources that positively affect outcomes in the workplace that are not captured in the four dimensions of PsyCap. Therefore, this study theorises that grit provides incremental predictive validity for work performance above PsyCap by representing similar characteristics that are captured in

PsyCap and going beyond considering passion as the emotional bond towards work and long-term goals.

Similarly to previous research on PsyCap, research exploring the effects of resilience on organisational outcomes comprises various findings that were discussed before. One of the more common subjects of interest was its relationship to job performance and work-related stress. However, even if resilience has been shown to be positively related to work related performance and stress in previous research, findings were not consistent and varied due to different reasons. One of these reasons is the conceptual lack of clarity and use of differing definitions and conceptualisations of resilience (Fletcher and Sarkar, 2013). Nevertheless, there is basic evidence that resilience, in this case employee resilience positively effects job-performance (Britt *et al.*, 2016) and work-related stress (Shatté *et al.*, 2017; Seville, 2018). Recent research promoted the idea of implementing employee resilience theoretically in research in the field of HRM and practically by implementing more resilience building programs into current HR processes (Bardoel *et al.*, 2014; Robertson *et al.*, 2015; Cooke *et al.*, 2016; Meneghel *et al.*, 2016; Vanhove *et al.*, 2016; Seville, 2018; Tonkin *et al.*, 2018). This is an interesting approach and, as outlined in Section 2.2, a similar idea to the one promoted in recent grit research. However, it could be argued that an implementation of grit into HRM programs – alongside or instead of resilience – would only be useful if grit would either have a stronger predictive validity of performance or provided there were an incremental predictive validity beyond resilience.

An argument for assuming that grit does indeed provide predictive validity beyond resilience was first provided by Duckworth, arguing that grit covers not only resilient, sustaining and long-term orientated characteristics, but combines these with the additional dimension of passion (Perkins-Gough, 2013; Duckworth, 2016). This factor that encompasses an emotional attachment and a forward looking perspective is not represented in resilience and has been linked to improved performance in the work setting (Gorgievski-Duijvesteijn and Bakker, 2010). Therefore, it is argued that grit might be an even stronger predictor of job performance than resilience. Consequently, these research hypothesises that grit explains incremental variance in job performance beyond both concepts, PsyCap and resilience:

> ***Hypothesis H4****: Grit explains unique variance of work-related stress beyond PsyCap and resilience.*

Testing grit as a sufficient condition for job performance beyond the two measures PsyCap and resilience is a first step in shedding light on the importance of grit in the

organisational context. However, it has been argued that even if grit might be a sufficient condition, it would only be interesting for organisations if it proved to be a necessary condition for higher levels of performance (Credé, 2018; Jordan *et al.*, 2019b). Therefore, this study aims to test if grit is a necessary condition for performance by applying a newly developed statistical method, Necessary Condition Analysis (Dul, 2016b).

2.4.4 Grit as a Necessary Condition for Job Performance

Even if grit might be a sufficient condition for performance, there is very little evidence that if an organisations would invest in new practices that target gritty individuals to increase performance might not necessarily yield a positive effect. However, given the focus on optimum performance, practitioners and organisations would be interested in whether the development of a certain factor, such as grit, is worthy and if they can be sure that this factor will indeed lead to a positive outcome (Dion *et al.*, 2002; Hauff *et al.*, 2019). So, from a practitioners point of view it could be argued that grit should only be considered in the workplace if it is indeed a condition necessary for higher levels of performance. Previous studies provided initial insights into this relationship; however, they remain challenged due to small and homogenous samples and the use of traditional quantitative methodologies that can only argue for sufficient conditions (De Vera *et al.*, 2015; Meriac *et al.*, 2015; Mooradian *et al.*, 2016; Singh and Chopra, 2016; Wolfe and Patel, 2016; Ion *et al.*, 2017; Mueller *et al.*, 2017; Credé, 2018; Peleaşă, 2018). Therefore, the question remains if grit is not only a sufficient, but also a necessary condition for job performance.

A necessary condition means that if the condition is not present, it cannot be replaced by any other factor and the outcome will not occur (see Brennan (2017); and Dul (2020) for a more detailed discussion about the difference between sufficient and necessary conditions). While previous findings can suggest that grit is a sufficient condition for performance, which is tested on the representative sample of the UK working population in H1 to H3, it would be even more important to understand if a certain level of grit is necessary for a certain level of performance. If this is the case, then high levels of performance would not occur if grit (or high levels of grit) would not be present (Dul, 2016b).

Previous findings are strong indicators for such a relationship between the two variables. Additionally, the terminology used in various academic and practitioner papers draw from the necessary condition logic to emphasise the importance of grit. Considering the previously observed effects of grit on performance and the above discussed positive theoretical

relationships between grit and performance measures, this study theorises that grit is a necessary condition for high levels of the three dimensions of individual job performance.

> ***Hypothesis H5:*** *A high level of grit is a necessary condition for a high level of job performance in the workplace.*

As suggested by (Credé, 2018), the best way to test the applicability of the Person-Centred Model of grit that was introduced in Section 2.2.5, is by running any type of cluster analysis, or an NCA. Considering the benefits of NCA when compared to the traditional analysis techniques, it was decided to run an NCA to test if grit (high level of perseverance and high level of consistency simultaneously) is a necessary condition for task performance. Considering previous findings and the hypothetical development in the previous section, it is theorised that this Person-Centred Model of grit is a necessary condition for higher levels of performance.

> ***Hypothesis H6:*** *A high level of person-centred grit (simultaneously high perseverance and high consistency) is a necessary condition for high levels of task performance in the workplace.*

However, not only individual job performance has been a major longlasting concern in the industrialised western world, but work-related stress has been identified to be a similarly important issue that affects individuals both inside and outside the workplace (Bliese *et al.*, 2017). A recent paper argued that the strong focus of organisations on high-performance might be a factor that can be responsible for the increasing number of individuals reporting higher levels of experienced stress (Topcic *et al.*, 2016; de Reuver *et al.*, 2019). Therefore, and considering previous research on the effects on grit, the following section evaluates the potential positive impact of grit on the experience of work-related stress.

2.5 Grit and Work-Related Stress

Interest in work-related stress has recently intensified as a result of a focus on mental health and well-being (Kortum *et al.*, 2010; Nieuwenhuijsen *et al.*, 2010; Harvey *et al.*, 2017). A large number of studies has highlighted the negative effects that stress has on individual performance (e.g. Cohen, 1980; Staal, 2004; Nielsen *et al.*, 2017). Increasing attention has been given to the impact of workplace stressors on various organisational and individual measures. Hassard *et al.* (2018) and Wainwright and Calnan (2002) describe work-related stress as a serious threat for individual health and organisational success as it causes absenteeism and long-term health and

66

well-being problems. Moreover, a negative impact of high stress on these outcomes was demonstrated in several studies (Jamal, 1984; Sullivan and Bhagat, 1992; Judge *et al.*, 2001; Abu Al Rub, 2004). Three recent meta analyses by Harvey *et al.* (2017), Ganster and Rosen (2013) and Nielsen *et al.* (2017) reviewed work related risk-factors and their impact on employees' physical and mental-health problems, concluding that there is evidence of the negative impact of work-related stress on both dimensions of employee health.

Smith *et al.* (2003) demonstrated that such health issues lead to a growth of organisational, personal and medical costs. It has been shown that work-related stress not only negatively affects health and well-being, but can also lead to a loss in productivity, work satisfaction and performance (Sullivan and Bhagat, 1992; Gilboa *et al.*, 2008; Nixon *et al.*, 2011). Three studies that investigated the economic and financial burden that is associated with work-related stress concluded that estimations of the costs in the UK alone range from £1.26 billion (SCMH, 2007), £3.66 billion (HSE, 2013) up to £7- 12.6 billion (Chandola, 2010). In a systematic review, Hassard *et al.* (2018) reported that the numbers differ across countries due to different conceptual and methodological approaches. However, they concluded that the numbers are alarmingly high and need to be considered in future debates and new policies and practices to stop the increasing occurrence of work-related stress.

However, despite the number of policies that are applied across organisations (such as flexible working or reduction of working hours), the number of individuals suffering from severe issues such as burnout and depression continue to rise. In response, organisations introducing a variety of policies and schemes to decrease the experienced stress at work and strengthen individual capabilities and the ability to cope with different work stressors (Karasek and Theorell, 1992; Van der Klink *et al.*, 2001; Van Gordon *et al.*, 2014).

Personality has been discussed as one of the key factors that could impact this relationship by organisational and occupational psychologists. Harvey *et al.* (2017) and Nielsen *et al.* (2017) reported that certain internal (e.g. personality) and external (e.g. work-environment) characteristics can act as positive resources and have a positive impact on the experience and the outcomes of work-related stress. Several psychological concepts, such as resilience, hardiness, coping skills and Psycap, have been found to be related to the development of protective skills and abilities to withstand continuous high pressure in and outside the work environment (Cavanaugh *et al.*, 2000; Davydov *et al.*, 2010; Britt *et al.*, 2016). Even more importantly, they have been shown to be responsive to interventions, possess developable characteristics, and are negatively correlated with work-related stress (Cherniss, 2000; Waite and Richardson, 2004; Luthans *et al.*, 2006b; Luthans *et al.*, 2008a; Nelis *et al.*,

2009). However, despite skill training programs and initiatives, high levels of stress at work continue to be reported.

Thus, recognizing the negative effects of stress on individual mental and physiological health, this thesis intends to determine the extent to which grit can predict work-related stress in the business context across industries and occupations. This is important because even if findings have highlighted a relationship between non-cognitive factors and work-related stress (Nikolaou and Tsaousis, 2002; Slaski and Cartwright, 2003; Jackson *et al.*, 2007; Avey *et al.*, 2009; Avey *et al.*, 2011b), this has not led to an improvement in the number of individuals suffering from work-related stress. To further understand the potential relationship between the two constructs, the following section provides a more detailed overview of work-related stress, its antecedents, impact and the relationship between grit and work-related stress.

2.5.1 The Nature of Work-Related Stress

The term stress has traditionally been used to describe the individual, physiological, psychological, or behavioural response to external demands, challenges and changes (Ganster and Perrewé, 2011). However, recent literature conceptualised stress more as a process, triggered by mainly external events that lead to physiological and cognitive reactions impacting individual emotional, psychological and physiological well-being (Griffin and Clarke, 2011; Ganster and Rosen, 2013). These external events are commonly referred to as stressors. In the case of work-related stress, they trigger individual psychological stress responses, potentially resulting in undesirable outcomes.

2.5.1.1 Theories of Work-Stress

Historically, the stressor-strain perspective has served as the theoretical basis for explaining the negative effects that work demands have on employee attitudes and retention-associated behaviours (Schaubroeck *et al.*, 1989). The stressor-strain theory suggests that work stressors are the stimuli that unintentionally trigger the stress process and develop the experience of strain. Anxiety, tension, and exhaustion have been argued to be immediate outcomes of this process (Jex, 1998). However, strain is undesirable because it triggers negative emotions and cognitions, which in turn trigger coping mechanisms that can potentially result in the emotional and physical withdrawal from work. However, inconsistent research findings and variability in the definition have been used to argue that this traditional stressor-strain perspective is limited in its scope and does not reflect the actual experience of stress inside and outside the workplace (Ganster and Rosen, 2013).

In terms of the inconsistent findings, some studies reported negative effects of stress on work-related outcomes whilst other reported a positive correlation (LePine *et al.*, 2005). In terms of the definition, Ganster and Rosen (2013) have argued that the wide variety of definitions of work-stress significantly reduces the ability to compare study results and to understand the underlying mechanisms and processes of work-stress. In order to resolve the ambiguity, a new conceptual and theoretical model of work-related stress was developed (see Source:). This Challenge-Hindrance Stressor Framework was introduced by Cavanaugh *et al.* (2000) and distinguishes between two dimensions of stress: challenge and hindrance. According to the Challenge–Hindrance Stressor Framework, hindrance stress is associated with negative effects on employee engagement, performance and well-being. Challenge stress tends to be positively correlated with performance, job-satisfaction and intention to leave (Beehr *et al.*, 2000; LePine *et al.*, 2004; LePine *et al.*, 2005). Even if several other occupational stress models are commonly applied in OB and HRM research – as for example the Job Demand Control Model (Karasek Jr, 1979), the Effort-Reward Imbalance Model (Siegrist *et al.*, 2004), and the Job Demands-Resource Model (Demerouti *et al.*, 2001) – these models lack the general idea that stressors are not necessarily experienced in a negative way. This is also the reason why in recent years the challenge-hindrance model has gained more attention in the research community (Webster *et al.*, 2011; Min *et al.*, 2015; Gerich, 2017).

Figure 2-3 Challenge-Hindrance Stressor Framework
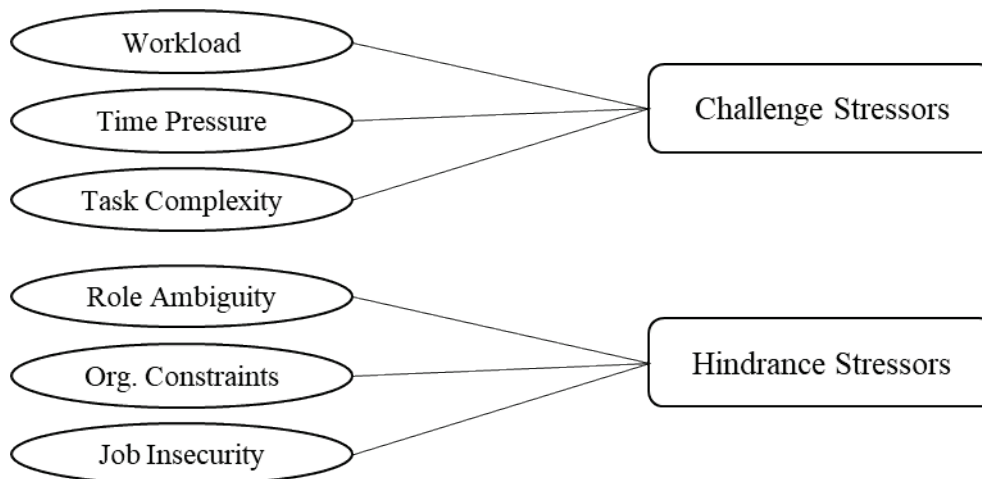
Source: (Searle and Tuckey, 2017).

The definition of work-related stress that was introduced by Ganster and Rosen (2013) alongside the Challenge–Hindrance Stressor Framework reflects all previous definitions of stress. The authors defined work-stress as a "process by which workplace psychological experiences and demands (stressors) produce both short-term (strains) and long-term changes in mental and physical health" (Ganster and Rosen, 2013, p. 1089). This definition of stress is

used as the basic model of stress in this thesis due to its ability to distinguish between different types of stressors, which could be affected differently by the level of grit (Ceschi *et al.*, 2016).

The theoretical model that describes the framework's negative correlation between hindrance stressors and individual performance is termed the negative linear model. This was initially postulated by Allen *et al.* (1982) and Jamal (1984) who proposed that stressors are negatively related to individual performance in the workplace. As a response to a perceived demand in the workplace that is potentially threatening or harmful, employees will use up energy and time to cope with this stressor and with their immediate reactions (e.g., anxiety and discomfort). Therefore, work-related stressors are thought to reduce an employee's performance ability by diverting effort away from performing job functions towards coping with the stressors (Jex, 1998). Moreover, high levels of stress are inevitably associated with involuntary physiological responses that interfere with performance to a certain extent (Motowidlo *et al.*, 1986; Lazarus, 2006). These high levels of stress tend to create an information overload that may lead to a lower perceptual attention of individuals. As a result, employees ignore performance-related information and cues, which in turn affects their job performance (Cohen, 1980).

The theoretical model that explains the expected positive relationship between challenge-based stressors and performance is the positive linear model. It states that when a stressor is appraised primarily as a challenge, it can lead to an increased internal arousal and results in higher performance outcomes (LePine *et al.*, 2005; Podsakoff *et al.*, 2007). In previous research, it has been shown that although all stressors appear to cause strain, different types of stressors are associated with different affective and behavioural responses. In their study, Cavanaugh *et al.* (2000) made a major contribution to stress research, providing a two-factor solution that best explained the variance in items that were used to measure overall work stress. The first factor was composed of items reflecting high levels of workload: time pressure, job scope and responsibility, and was labelled challenge-related stressors. Participants tended to view these job demands more positively and described these as stimuli that create challenges and the opportunity for personal development and achievement. The second factor of Cavanaugh *et al.'s* (2000) model is composed of items measuring role ambiguity, organizational politics, and concerns about job security, and was labelled hindrance-related stressors. Employees tended to view these job demands as obstacles to personal growth and task accomplishment. The results of this study indicated that the two factors were only moderately correlated to each other ($r = .28$) and that challenge-related stressors were positively related to job satisfaction and negatively related to job search behaviours. However, hindrance-

related stressors were negatively related to job satisfaction and positively related to job search behaviours. In addition, the authors reported that although hindrance stressors were positively related to turnover, challenge stressors were not. Thus, the two-factor model has been described as a more realistic operationalisation of work-related stress than the traditional models of stress because it acknowledges the ambiguous nature of stress (Cavanaugh *et al.*, 1998; LePine *et al.*, 2004; Podsakoff *et al.*, 2007; Pearsall *et al.*, 2009; Ventura *et al.*, 2015).

LePine *et al.* (2005) used the Challenge-Hindrance Stressor Framework to explain previous inconsistent research findings regarding the work stressors' relationship and employee motivation and job performance. Using a meta-analysis, the authors reported that while hindrance stressors were negatively associated with performance, challenge stressors were positively associated with performance. They further showed that the different effects on performance could be attributed to varying stressor effects on motivation. Although this study did not examine retention criteria, it is important as it supports the validity of the challenge-hindrance stressor framework as a theoretical explanation for the reported inconsistencies with the stressor relationships with important individual-level criteria (Podsakoff *et al.*, 2007; Pearsall *et al.*, 2009). Contrary to the traditional view of stress, there is evidence that certain stressors can have motivational and performance-enhancing effects on individuals. However, this needs to be interpreted in the light of the number of overall present stressor variables. The higher the number of different stressors or antecedents of stress, the more likely that the stress outcomes are perceived in a negative way (LePine *et al.*, 2005; Mazzola and Disselhorst, 2019). This means that if several stressors are present at the same time, they will more likely result in negative outcomes, such as lower performance.

This model was successfully adopted to analyse the different effects of stress on individuals in the workplace (e.g. LePine *et al.*, 2005; Yuan *et al.*, 2014). This thesis adopts the challenge-hindrance stressor framework to evaluate the various stressors that can have different effects on employees and are potentially differently perceived by individuals based on their level of grit. The framework describes the two dimensions of stress that have differentiated unique effects on health and well-being related outcomes. Empirical evidence suggests that challenge stressors are associated with higher job-performance and job-satisfaction (LePine *et al.*, 2005; Podsakoff *et al.*, 2007; Kawai and Mohr, 2015; Min *et al.*, 2015), whereas hindrance stressors result in lower levels of performance and job satisfaction (LePine *et al.*, 2005; Podsakoff *et al.*, 2007; Yuan *et al.*, 2014). This distinct assessment of stress is the reason why this model was chosen for this research as it provides a clear insight into the influence of grit on these different stressors.

2.5.1.2 Outcomes of Work-Stress

This section provides a brief overview of the impact that work-related stress has been found to have on employees. Previous research reported a wide variety of outcomes of work-related stress. However, because of the scope of this thesis, this review focuses on performance- and well-being-related outcomes at the individual level and neglects other reported effects and outcomes on the team and organisational level.

Previous research has revealed a high impact of work-stress of task performance. For three job-performance measures - objective, self-ratings, and supervisor / peer ratings - negative implications were shown (e.g. Frone *et al.*, 1997; Tubre and Collins, 2000; Gilboa *et al.*, 2008). Moreover, there is a negative correlation to performance-related outcomes such as organisational commitment (Carlson *et al.*, 2000; Jaramillo *et al.*, 2011), non-compliant behaviours (Lim, 1997), turnover intentions (Podsakoff *et al.*, 2007; Kim and Stoner, 2008; Jaramillo *et al.*, 2011), turnover (Lloyd *et al.*, 2002; Podsakoff *et al.*, 2007), and absenteeism (Iverson *et al.*, 1998; Darr and Johns, 2008). Generally, it can be concluded that most stressors do have a negative effect on individual performance in the workplace. Even though the challenge and hindrance stress framework provided a distinction between the two types of stressors, studies concluded that both could have a negative impact on performance or performance related outcomes. However, several studies reported positive effects of different challenge stressors, such as responsibility, workload and time pressure, on individual performance and effectiveness (LePine *et al.*, 2005; Tang and Tang, 2012; Yuan *et al.*, 2014). Therefore, the challenge-hindrance model is the most suitable model of stress that could explain different effects of various stressors in the workplace.

In two meta-analyses, Nixon *et al.* (2011) and Lee and Ashforth (1996) reported modest to strong relationships to different stress indicators for physical ill-being. Examples are: emotional exhaustion, which is one dimension of burnout (Maslach, 2003), sleep disturbances, gastrointestinal problems, fatigue, backache, headache, eye strain, dizziness, and appetite (Lee and Ashforth, 1996; Åkerstedt *et al.*, 2002; Nixon *et al.*, 2011). Other studies reported a negative impact on job satisfaction (e.g. Pugliesi, 1999; Podsakoff *et al.*, 2007) and a positive correlation to job-dissatisfaction (Lloyd *et al.*, 2002; Jaramillo *et al.*, 2011). Additionally, some scholars reported a negative impact on overall life satisfaction (Lim, 1997; Bonebright *et al.*, 2000).

These findings in combination with the estimates about the monetary loss and negative long-term effects on resources show that the avoidance of stressors in the workplace should

play an important role for the daily work of organisational leaders and HRM departments. However, despite the collective knowledge about the outcomes of work-related stress, there still seems to be a lack of feasible solutions that can be implemented in order to fight organisational stress. One of the reasons for this might be the fact that there is a wide variety of potential stressors that can affect individuals in their daily work and that these are not always as evident or considered to be as important by higher management within organisations.

2.5.1.3 Antecedents of Work-Stress (Stressor Variables)

The outcomes in the previous section are caused by a variety of stressor variables that have been identified in the literature as key stressors at work. This review does not provide an exhaustive list of work stressors and only focuses on the antecedents that have been shown to appear most commonly across workplaces. In light of the two-dimensional Challenge-Hindrance Framework, all covered stressors have been shown to have a significant effect on various work-related outcomes such as performance, effectiveness and individual health and well-being.

Workload has received increasing attention in recent years as it has been shown to be an important stressor at work. According to Nixon *et al.* (2011), workload is a combination and interaction of quantitative and qualitative components. It refers to the overall amount of work that an employee is required to complete in a given amount of time as well as the individual effort that is needed to accomplish the tasks successfully (Spector and Jex, 1998). Previous research has identified impacts of high workload on employees' physical and emotional well-being (Robert and Hockey, 1997; Lundberg and Frankenhaeuser, 1999; Mulki *et al.*, 2008). Some studies reported a positive relationship between workload and time pressure and performance and efficiency outcomes (Podsakoff *et al.*, 2007; Webster *et al.*, 2011). *Job-responsibility* that entails to the overall amount of responsibilities on the job can refer to management and leadership of employees but it can also refer to the specific tasks required by employees that need execution, such as delivering intended services and producing work without additional guidance (Tang and Tang, 2012; Karatepe *et al.*, 2014; LePine *et al.*, 2016). Previous research found positive effects of job-responsibility on work-engagement, task performance and effectiveness (Karatepe *et al.*, 2014; LePine *et al.*, 2016). Therefore, the two stressors are generally considered as challenging work demands. Thus, it was argued that they increase desirable organisational outcomes if applied effectively.

On the other side of the challenge hindrance stressor framework are the so-called hindering work demands. These were found to have negative effects on employees and should

therefore be reduced or avoided. *Work hours* refer to the total amount of time an employee spends on his or her work on average per day and is often identified as a stressor in the workplace. Previous research reported an increased risk of injuries and accidents due to long working hours (Costa, 2003; Landrigan *et al.*, 2004; Dembe *et al.*, 2005). In addition, long work hours have been associated with sleeplessness, loss in concentration, decreasing satisfaction and other conditions that negatively impact the accomplishment of tasks and duties in the workplace (Nixon *et al.*, 2011). Previous studies found that reducing the work-hours for employees, significantly reduces the experienced level of stress across different occupations (Nixon *et al.*, 2011; Barck-Holst *et al.*, 2017; Schiller *et al.*, 2018). Nonetheless, a recent study found that extreme working hours of 60 hours or more did increase in recent years (Burger, 2015). Thus, it could be argued that organisations take the chance of higher levels of work stress by not implementing restrictions and taking appropriate action to ensure compliance with guidelines for working hours.

Role Conflicts are another major group of stressors in organisational environments. Role conflicts can occur when employees receive inconsistent or conflicting job-related information by multiple members of the organization (Rizzo *et al.*, 1970; Jackson and Schuler, 1985). It also occurs when the set of employee behaviours are incompatible with those perceived by the role sender (Katz and Kahn, 1978). Role stress also arises as a response to perceived incompatible performance or tasks expectations of different stakeholders, or when job requirements or duties are not made clear in advance (Rizzo *et al.*, 1970; Chang *et al.*, 2009). Role stress commonly appears due to issues in leadership and leader-member exchange within organisations and thus could be reduced by a clear and transparent approach to information and expectation sharing across different stakeholders (Skogstad *et al.*, 2007; Thomas and Lankau, 2009).

Organisational constraints refer to specific elements of the job that prevent employees from completing their tasks and duties and impair individual job performance. Such constraints can occur when there is not enough necessary job-related information, enough authority to complete a task without consulting another individual, or enough time or materials to complete a task successfully. Another constraint is job-control which refers to the individual's perceived control over the performed tasks in the workplace. High levels of job control – or job autonomy – relate to the perceived autonomy to make certain choices (e.g. planning or timing) regarding how and when to execute specific tasks, (Karasek Jr, 1979; Van Yperen and Hagedoorn, 2003).

Work-Family conflict refers to the extent to which an individual's participation in one role (e.g. job) decreases the ability to reduce the responsibilities in the other role (e.g. family) and therefore cause tensions and stress (Greenhaus and Beutell, 1985; Frone *et al.*, 1997). Due to the high psychological importance of both areas of life, research shows that an increase of effort and time devoted to one of both areas results in increasing pressure in the other (Greenhaus and Beutell, 1985; Frone *et al.*, 1992). Thus, increased effort to maintain a healthy private life may lead to a reduced performance at work (Frone *et al.*, 1997; Kinnunen and Mauno, 1998; Allen *et al.*, 2000). One of the issues concerning this stressor might be that the understanding of the impact and widespread of it is lacking among leaders. This could be seen for example in the rising numbers of working from home and teleworking schemes. These are assumed to reduce stress for all employees, whereas recent studies suggested that working from home, technologization (work laptops at home, work emails on private phones) and blurring the boundaries of work and private life at home can further increase the experience of stress (Solís, 2017; Yao *et al.*, 2017; Delanoeije *et al.*, 2019; Song and Gao, 2019).

Job insecurity generally refers to the lack of certainty about future job features or income (Jacobson, 1987). Job insecurity results in high levels of stress and anxiety and reduces commitment and satisfaction at work (Jacobson, 1987; Sverke *et al.*, 2002). However, job-insecurity has been described as being a subjective experience and is perceived differently by each employee (Hartley *et al.*, 1990). Recent societal trends led towards an increasing gig economy and thus, a larger number of employees working in precarious working conditions. But also the increasing use of organisations of sub-contractors, short-time or zero hour contracts, and temporary contracts might be a responsible for additional strain because of job insecurity (Clarke *et al.*, 2007; Wood and Burchell, 2014; De Stefano, 2016).

Overall, the overview of these stressors shows the varied influences that can affect individuals in the workplace. More importantly, the overview shows that the majority of workplace stressors are generally considered as hindering individuals in their execution of daily work and reducing their health and well-being. This and the previous section highlight not only the variety of stressors but also provides evidence for the importance of ongoing efforts to reduce work-stress.

There is evidence of various factors that can be used at the individual, team, departmental and organisational levels to reduce work-related stress in the workplace. As a consequence, organisations started to implement changes in their work environment (e.g. workplace design, flexible working-hours), reduced job demands and introduced new employee development systems to decrease the experienced level of stress at work as early as in the 1990s

(Karasek and Theorell, 1992; Van der Klink *et al.*, 2001). Successful factors for organisations were the implementation of different schemes, such as promoting transformational leadership (Gill *et al.*, 2006), providing meaning to job tasks and duties (Arnold *et al.*, 2007), introducing flexible working arrangements (Russell *et al.*, 2009), increased social support systems (Abu Al Rub, 2004) reduced working hours (Barck-Holst *et al.*, 2017), or trainings and interventions to increase personal resources, such as mindfulness and coping strategies (Dolbier *et al.*, 2007; Hülsheger *et al.*, 2013). However, considering the increasing numbers of individuals suffering from high levels of work-related stress, such systems seem not to be working efficiently – for various above discussed reasons – and alternative approaches are necessary (Chandola, 2010; Ganster and Rosen, 2013; Bliese *et al.*, 2017).

One possible approach for organisations could be to not only change the work environment but also by developing protective factors and individual skills to challenge these work-related stressors. In this sense, in recent years, an increasing number of studies have reported that non-cognitive personality traits and attributes are potential determinants of individual stress in the workplace. Several psychological concepts, such as resilience, coping skills or PsyCap, have been found to be related to the development of protective skills and abilities to withstand continuous high pressure in and outside the work environment (Cavanaugh *et al.*, 2000; Davydov *et al.*, 2010; Britt *et al.*, 2016).

Additionally, a small number of previous studies provided initial evidence that grit has a negative relationship to certain measures of stress in different small-scale samples (Robertson-Kraft and Duckworth, 2014; Meriac *et al.*, 2015; Lee, 2017). The definition and characteristics of grit that describe it as a positive personality characteristic that enables people to work towards their long-term goals despite difficulties emphasize the potential positive effects it might have on the experience of stress. In light of such previous findings and theoretical unclarities in the relationship between grit and stress, in particular in the workplace, requires further evaluation.

2.5.2 The Relationship between Grit and Work-Related Stress

The relationship between grit and work-related stress has been discussed and distinguished by Jordan *et al.* (2019b). The authors differentiate between two justifications of the stress-reducing effect of grit. First, some papers argue that grit has a direct effect on the perception of the stressor, whereas other authors propose that grit impacts individual vulnerability to stressors in the workplace. The effects of grit on the perception of stressors are based on the successful mastery of challenges and threats depends on the individual appraisal of the stressor

experienced (LePine *et al.*, 2005). Based on the challenge-hindrance stressor framework, the appraisal of stressors is a crucial element in determining its impact on the individual. If the obstacle or demand is considered to be achievable by adjusting goalsetting or individual attainment strategies, then the stressor is perceived as developmental and a challenge. Hindrance stressors on the other side are perceived as requiring efforts and resources that are not available and thus, lead to behavioural constraints and a decreasing enactment of endeavours to overcome such stressors (Cavanaugh *et al.*, 2000; Prem *et al.*, 2017; Jordan *et al.*, 2019b).

In their initial work, Duckworth *et al.* (2007) argued that grit is an important factor to withstand challenging and demanding working conditions. Moreover, it has been argued that grittier individuals appraise stressors in a more favourable way and perceive them as challenges and opportunities in achieving long-term goals, development and growth rather than as a barrier (Eskreis-Winkler *et al.*, 2014; Duckworth, 2016). It is assumed that gritty individuals are highly interested in what they do and thus, have a greater value attributed to their set goals. As a result, gritty individuals perceive goal attainment processes generally as less stressful and achieve desired goals by continuous efforts and changes in behaviours. Such changes in behaviours might be to search for alternative approaches to reach the desired long-term goals. (Ceschi *et al.*, 2016; Jordan *et al.*, 2018; Jordan *et al.*, 2019b).

The second perspective on the stress-grit relationship considers grit to be a positive resource that reduces the negative effects of stressors by decreasing the stress vulnerability of individuals. As resilience and other personality traits have been positioned as personal support resources, grit was described as being one of them, As such, Jordan *et al.* (2018) argued that gritty individuals have higher available resources in the form of long-term goal-setting and adaptability to changing situations, these are crucial to cope with work-related stressors (Duckworth *et al.*, 2007; Maddi *et al.*, 2012; Jordan *et al.*, 2019b). In their study, Blalock *et al.* (2015) reported that grit buffered the relationship between adverse live events and suicide intention on a statistically significant level. The authors argued that gritty individuals possess the ability to focus on the long-term, stating that this "future-focused cognitive-attributional style" (Blalock *et al.*, 2015, p. 782) might enable individuals to minimise the attention that is attributed to stress and put their spotlight on the problem solving, or focus on the long-term goals altogether. Similar to this, Jordan *et al.* (2018); and Jordan *et al.* (2019b) argued that grit provides a stressor vulnerability for gritty individuals:

"By inherently focusing on long-term, purpose-driven goal pursuits, high grit employees inevitably invest considerable resources and time into goal attainment in the face of

adversity […]. As such, although goal setting and adjustment involve the consumption of personal resources, grittiness, in and of itself, serves as a general resistance resource […], reducing threat vulnerability" (Jordan *et al.*, 2019b, p. 21).

Therefore, it is argued that the available resources, such as emotional attachment, long-term focus and adaptability to changing situations, which are inherent to gritty individuals provide the resources to successfully cope with stressful situations. Empirically, the effects of grit on the experience of work-related stress remains largely under-researched with only a few studies focusing on this relationship (Meriac *et al.*, 2015; O'Neal *et al.*, 2016; Halliday *et al.*, 2017; Lee, 2017; Wong *et al.*, 2018; Jordan *et al.*, 2019b). In addition, previous research on grit and its predictive validity for stress has used small specific samples of students (Meriac *et al.*, 2015; Lee, 2017), teachers, physicians (Wong *et al.*, 2018), and employees working in sales departments (O'Neal *et al.*, 2016; Lee, 2017; Wong *et al.*, 2018; Dugan *et al.*, 2019) and their findings have presented inconclusive results. Ultimately, tthere is no clear evidence provided yet for the effects of grit on the experience of stress in the workplace. Some authors reported a statistically significant negative correlation of grit with work-related stress (Meriac *et al.*, 2015; O'Neal *et al.*, 2016; Lee, 2017), while others (see Wong *et al.* (2018) found no statistically significant relationship. Finally, some authors (see Ceschi *et al.* (2016) reported different effects of grit on different stressors such as role conflict, emotional demands, hassle, and exhaustion.

Three recent studies used broader samples of working individuals. Ceschi *et al.* (2016) observed positive effects of grit on exhaustion, job role conflict, emotional demands and hassles. However, 63% of participants were clerks, the rest was not further specified. Therefore, the findings lack generalizability to the wider working population. The second study from Kabat-Farr *et al.* (2019), observed the three individual stressors: "supervisor incivility experiences", "co-worker incivility" and "negative affect". As a result, the findings are only accountable to the stressors observed and do not represent the varied nature of work-related stress as specified in the challenge-hindrance framework. Meriac *et al.* (2015) explored the relationship and distinctive features of the two constructs, grit and work ethic. The authors reported a statistically significant negative relationship between grit and stress in their sample of employed students ($r = -.42$, $p < .01$). Even if these findings are limited due to a single, relatively homogenous group of employed students ($n = 322$), they suggest that a relationship between grit and work-related stress does exist. However, the insights remain superficial and do not take into account the multifaceted nature of stress as proposed in the Challenge-Hindrance Framework (LePine *et al.*, 2004).

However, the differentiated conceptualisation of stress might help to further develop the current understanding of the relationship between grit and work-related stress. Given the findings of previous studies and the ongoing need of organisations to address the issue of work-related stress, it is important to explore the relationship between grit and the experience of stress in the workplace in more depth. This is because the problem of increasing levels of work-related stress is multidimensional. As discussed above its consequences affect not only the employees themselves, but different stakeholders within and outside the organisation. Even if such consequences might not be visible in the short-term, they can create a create a cumulative scenario of unproductive outcomes and long-term negative impacts over time. Given the long-term nature of grit and its reported effects on stress across research domains, this research aims to provide insights into the differentiated effects of grit on work-related challenge and hindrance stressors across industries and occupations. Therefore, nine hypotheses were developed which are visualised in the conceptual model of this study shown in Figure 2-2 on Page 52. The conceptual model displays the hypothesized effects of grit, perseverance and consistency on work-related stress. In order to understand the conceptual model, this section outlines the hypothesis development for the present study.

As mentioned above, previously discussed findings reported a stress-reducing effect of grit on various stress-related measures in different small samples. However, existing research did not provide consistent results in the effects of grit on the experience of stress and also produced the limited findings based on small and homogenous samples. Therefore, this thesis aims to provide insights in the effects of grit on the experienced level of work-related stress for the UK working population across all industries and occupations.

In their recent paper, Credé *et al.* (2017) argued that the current approaches in grit research are often incomplete or misleading. Particularly, the authors claimed that the practice of reporting an overall grit score based on the scores of the two dimensions perseverance and consistency, results in a loss of predictive power. According to the authors, this is due to the fact that perseverance is a stronger predictor compared to consistency or even the overall reported grit score (Credé *et al.*, 2017). Nevertheless, the majority of recent studies have continued to report the overall grit score and did not provide empirical evidence for the individual predictive validity of the two facets of grit for work-related stress.

Considering the inconsistency of previous findings and the theoretical debates about the ambiguity of the two grit factors in the higher-order conceptualisation of grit, it is argued that previous research in the grit-stress relationship have reported non-conclusive results due to the unidimensional nature of grit and stress that was measured. While previous research used

different conceptualisations and operationalisations of work-related stress in their studies (Meriac *et al.*, 2015; Ceschi *et al.*, 2016; O'Neal *et al.*, 2016; Lee, 2017; Wong *et al.*, 2018). However, none of the previous studies considered the multidimensional nature of stress. Thus, one of the reasons why previous findings were inconsistent might be the lack of distinction between the two dimensions of work-related stress, challenge and hindrance stressors. While grit and various hindrance stressors that are considered to have negative effects on individuals in the workplace have been previously explored, the experience of challenge stressors that are commonly linked to positive work-outcomes has not been explored in detail. Even with hindrance stress, previous research did not provide conclusive findings across the working population (Ceschi *et al.*, 2016; Wong *et al.*, 2018).

Hindrance stress is generally associated with negative effects on individual outcomes and are reducing the individual well-being (LePine *et al.*, 2005). Considering the positioning of grit as a positive personal resource that reduces the vulnerability of individuals towards various stressors it is hypothesised that grit reduces the undesirable impact of such stress on the individual by positively impacting the stressor-strain relationship (Ceschi *et al.*, 2016; Jordan *et al.*, 2019b). Moreover, the effects of hindrance stress are further buffered by a general reinterpretation of hindrance stressors in the workplace from restrictive and unchangeable factors to just another obstacle that needs to be overcome to reach the long-term goal.

Duckworth *et al.* (2007) described perseverance as the level of exerted stamina, diligence and effort towards specific long-term goals, despite challenges and setbacks. This definition implies the ability to sustain even under pressure and experiencing negative influences, such as hindrance stress. Consistency of interest, is described as the consistent interest into a topic over a longer period of time despite alternative options. Therefore, according to the first perspective of the stress reducing effect of grit, high levels of perseverance could lead to a change in perception of the hindrance stressor. While individuals lower in perseverance interpret the experienced stressor as negative and impeding, an individual high in perseverance would interpret this stressor as a challenge that needs to be overcome in order to achieve the desired long-term goals. A high level of consistent interest could affect the individual perception of a stressor due to the attachment to the subject and the need and interest to further pursue it despite the stressor. Therefore, this thesis hypothesises that grit has a negative correlation with hindrance stress, which is higher levels of grit lead to lower levels of hindrance stress.

Hypothesis H7: *Grit, consisting of perseverance of effort and consistency of interest, has a negative effect on hindrance stress, that is, increase in grit will lead to decrease in hindrance stress.*

As discussed before, the traditional conceptualization of grit predicts the completion of challenging goals despite setbacks due to gritty individuals persevering and working actively towards such challenging goals (Duckworth and Gross, 2014). This conceptualisation leads to the assumption that individuals scoring higher in grit will have a different attitude towards work stressors than people that are scoring lower in grit. More specifically, it is theorised that individuals scoring higher in grit embrace challenging work demands and situations. It might even be that they potentially seek such situations in an attempt to challenge themselves and eventually progress personally. However, it is assumed that this relationship accounts primarily for the perseverance of effort dimension.

Duckworth and colleagues argued that individuals who score high in perseverance are potentially perceiving challenge stressors not as negative stressors or strains but as challenges that need to be overcome. Moreover, Duckworth (2016) argued that the long-term goal setting and adaptability components that are inherent of grit, particularly perseverance, are helpful personal resources in challenging work contexts. In their randomised control trail study, Alan *et al.* (2019b) described the observed tendency of students, that scored higher in grit after an intervention, to actively set challenging goals for themselves. Generally, this is a tendency that is linked with desirable outcomes, such as personal growth and individual development (Duckworth, 2016). However, it could be argued that even if individuals purposefully set ambitious goals to challenge themselves in an attempt to develop their abilities, skills and grow personally (Duckworth, 2016; Jordan *et al.*, 2019b), such an intensification of challenging situations, could unintentionally increase the perceived level of challenge stress. This would mean that a person who is high in perseverance could actively increase its challenge stress by seeking challenging situations in the workplace. Therefore, it is assumed that higher levels of perseverance lead to higher levels of experienced challenge stress.

Hypothesis H8*: Perseverance of effort has a positive effect on challenge stress, that is, increase in perseverance will lead to increase in challenge stress*

In contrast to the impact of perseverance, it is expected that individuals who have high levels of consistent interest in a certain topic or towards a certain long-term goal, experience challenge goals as less desirable but equally as less threatening. Thus, based on its description by Duckworth *et al.* (2007), consistency of interest is assumed to have a negative impact on the

experience of challenge stressors. There are two main arguments that support this assumption. First, contrary to the basic considerations of overall grit and perseverance, it is expected that individuals who are scoring higher in consistency do not actively seek for challenging goals and situations. This is, because individuals high in consistency of interest develop skills that are related to the topic of interest, leading to the ability to understand and expect challenging situations. Thus, they are prepared for working through challenging situations without experiencing increased levels of stress. This is represented in the previous argumentation where Duckworth *et al.* (2007) noted that grit entails the "ability to sustain effort in the face of adversity".

Moreover, Jordan *et al.* (2018) argued that even if grittier individuals appraise stressors potentially differently, they are still experienced as stressors. Thus, individuals who have a consistent interest into a topic, or towards long-term goals might not be looking for challenging situations to reach these, but rather for the straightest forward approach towards these set goals. Furthermore, consistency of interest might lead to a different attribution of stressors such as workload, time pressure and task complexity, and consequently lead to the ability to augmented efforts to reach the desired goals. This could be done by changing short-term goals that are aligned to the long term-goals or behavioural changes that lead to different perception of the apparent stressors (Jordan *et al.*, 2018; Jordan *et al.*, 2019b). By doing so, it is expected that not only levels of hindrance stress are reduced, but also levels of challenge stress. Therefore, this thesis hypothesises that consistency of interest has a negative effect on the experience of work-related challenge stress:

> **Hypothesis H9:** *Consistency of interest has a negative effect on challenge stress, that is, increase in consistency will lead to decrease in challenge stress.*

2.5.3 Grit, PsyCap, Resilience, and Stress

As discussed before, it can be argued that grit exhibits characteristics that are not reflected in the conceptualisation of PsyCap. Grit is assumed to have a positive impact on the stressor perception of the gritty individual due to the long-term oriented effort in working towards work and job-related goals. As proposed by Duckworth (2016), gritty individuals appraise stressors in a more favourable way than individuals lower in grit. Moreover, Duckworth argued that reaching a goal is perceived as being less challenging and therefore, stress levels are reduced. Similarly, Maddi *et al.* (2012); Jordan *et al.* (2018) argued that the focus on long-term goals and the adjustments in goal setting consumes considerable resources, so the authors argued that this in turn leads to a reduction of stress vulnerability. Thus, grit is expected to be an additional

personal resource that can support individuals in dealing with the stressors inside and outside the workplace.

Another unique feature of grit is its incorporation of consistency of interest, which reflects the ongoing interest and emotional attachment towards various topics and areas of life (Duckworth *et al.*, 2007; Duckworth, 2016). Consistency of interest or passion has been promoted as a trait that enhances the individual ability to 'burn' for a project or the "fire of desire" in various professional settings (Vallerand *et al.*, 2007; Cardon *et al.*, 2009; Perrewé *et al.*, 2014). Even if recent research argues that it does possess a dark side, that can exhibit negative effects on the individual (Perrewé *et al.*, 2014), recent research argued that in an entrepreneurial setting, passion can be developed as a result of effort and overall venture progress (Gielnik *et al.*, 2015). As such, consistency and effort, forming the overall grit scale, are assumed to be interdependent variables that have an overall stronger effect than PsyCap, which is missing the emotional component. With the long-term focus and the emotional attachment, it is assumed that gritty individuals use more positive attributions when confronted with stressors and perceive a reduced level of work-related stress.

While PsyCap has been argued to impact stress through its positive state of mind, resilience is described as a positive resource that enables individuals to reduce stress vulnerability through adaption to the stressor and learning of new coping strategies (Hu *et al.*, 2015; Britt *et al.*, 2016). Considering the long-term perspective of individuals and their ability to perceive stressors in the workplace in a more favourable way it is theorised that it is a stronger predictor of lower levels ofexperienced work-related stress than resilience. Considering the explanation provided by Jordan *et al.* (2018) that the resources that are needed to uphold goal-setting, attainment and adjustment are being supported by grit, the experience of stress in the workplace would be further reduced. This in itself is a stress vulnerability resource that provides a theoretically stonger protective effect for the experience of stress than grit. Even if high levels of resilience are assumed to be helpful when individuals are being confronted with hindrance stressors that are consequently perceived as being less stressful grit is assumed to have a stronger impact on the restricting experience of stress for the long-term goal-attainment. Therefore, this thesis postulates that grit grit explains incremental variance in work-related stress beyond PsyCap and resilience.

> ***Hypothesis H10:*** *Grit explains unique variance in work-related stress beyond PsyCap and resilience.*

However, even if grit is shown to be a sufficient condition for work-related stress and predicts lower levels of stress beyond PsyCap and resilience, this might not be enough evidence for organisations to consider grit as a factor that would need to be considered in their current practices. As discussed above, a convincing argument for practitioners would be established if it could be shown that grit is not only a sufficient condition for lower levels of stress, but also a necessary condition.

2.5.4 Grit as a Necessary Condition for Work-Related Stress

Taking into account previous studies that reported a statistically significant effect of grit on stress (e.g. Lee, 2017; Wong *et al.*, 2018) and following the previous developed hypotheses for this study that postulate a predictive validity of grit for work related stress, this thesis aims to identify whether a certain level of grit is necessary in order to experience a reduced level of work-related stress. Based on recent findings that suggested that grit is a crucial positive individual resource that can significantly reduce the level of experienced stress at work, the aim of this study is to explore this relationship across industries and occupations. Considering other personality characteristics and their proven effects on work-related stress, Credé (2018) recently argued that grit is only useful to be conceptualised and applied in its current way if it is not only a sufficient, but a necessary condition for experienced stress at work. As argued above, the stress reducing effects of grit are assumed to be based on the nature of grit that allows them to focus on their long-term goals and not considering short-termed negative stressors to be important or restrictive.

The strong consistency of interest towards long-term objectives, paired with the willingness and ability to put in continuous effort to reach these goals, provides the fundamental capability of gritty individuals to sustain through stressful periods in their lives (Ceschi *et al.*, 2016; O'Neal *et al.*, 2016; Jordan *et al.*, 2019b). Moreover, it could be argued that only with the possession of such attributes that are innate to gritty individuals, the experience of stress can be reduced. While characteristics such as hope, optimism or the ability to bounce back from stressful times are helpful and represented by PsyCap, only with high levels of grit stressful periods are perceived as not so stressful in the first place, and thus, more easily overcome. Therefore, and based on previous findings, this study hypothesises that grit is a necessary condition for a reduced level of experienced stress, and particularly hindrance stress in the work context:

> **Hypothesis H11:** *A high level of grit is a necessary condition for a lower level of work-related challenge and hindrance stress.*

This Section outlined the critical role that stress plays for individuals in the modern workplace, organisations and the whole society. Negative impacts of work-related stress included burnout, depression and physical issues to name but a few. Although a considerable amount of literature has been published on practices that have been shown to decrease work-related stress in specific circumstances, the mechanisms to successfully reduce stress across individuals, occupations and industries are yet to be established.

Therefore, more research was called for to be conducted that explores and supports the promotion, understanding and implementation of practices that aim to reduce stress in the organisational context. As outlined, particularly promising is the research in personality traits and characteristics as recent findings suggested that certain personality traits can act as protective factors and thus, reduce individual stress in the workplace (Raman *et al.*, 2016; Shatté *et al.*, 2017). As such, grit is theorised to be a stress reducing personality trait, which is explored in more detail in this study. The impact of grit on challenge and hindrance stress at work is explored in a representative sample of the UK working population. This extends current understanding of the impact of grit and its effect on individual outcomes. It provides further insights on the applicability of grit to the business context and developing a framework that organisations can draw from to develop a high performing and, even more importantly, a healthy and sustainable workforce. However, the effects of grit on work-related stress and performance are only important, as long as they prove to affect these outcomes in the business context beyond other factors. Therefore, the theorised incremental predictive validity of grit for work-related stress beyond PsyCap and resilience was established. Moreover, it theorised that grit is not only a sufficient condition for lower levels of work-related stress beyond PsyCap and resilience but also a necessary condition for it. Therefore, this study provides insights beyond that add to RQ1-3 and research hypotheses H1 to H11 and is important to evaluate the true meaningfulness of grit for businesses and organisations.

2.5.5 Summary

This chapter provided a detailed overview of the existing literature, current knowledge and present issues of all variables that are included in this thesis. In the first part, the psychological concept of grit was introduced, and the growing body of existing literature was critically evaluated. Moreover, it raised current debates in the grit literature and outlined the lack of literature that tested its potential applicability to the business context. Reseearch question 1 and 2 were developed that aim to test the current structural and measurement model of grit and its applicability to the business context.

The subsequent part evaluated the nature of personality, including a brief history and a critical evaluation of the psychological constructs of PsyCap and resilience. It discussed the impact of personality in the business context and critically evaluated current issues in relation to personality testing and the potential contribution of grit. Moreover, it evaluatted the relationship between the three personality characteristics and developed the third research question that aims to empirically tests the conceptual relationship and potential overlap of the three concepts.

In the following section an in-depth review of the potential impact of grit on individual job performance was provided. Therefore, the nature of individual job performance and its three dimensions task performance, OCB and innovative performance were analysed. Research hypotheses were developed that theorise a predictive validity of grit for job performance. Moreover, PsyCap and resilience were added into the predictive model and it was theorised that due to the unique combination of perseverance and consistcy of interest for long-term goals grit adds predictive validity fro jpb performance beyond PysCap and resilience. Also, it was theorised that grit is not only a sufficient condition but that it is a necessary condition for performance. Lastly, this study followed suggestions from previous research to transform grit into a Person-Centred Model of grit, which can be tested using necessary condition analysis (Dul, 2016b) for job performance.

In the subsequent section, the issue of work-related stress and its implications on the individual, contemporary organisations and society were ediscussed. It reviewed the antecedents and various outcomes of work-related stress and discussed different approaches aiming to reduce such stressors in the workplace. Research hypotheses were developed that theorised a stress reducing effect of grit for work-related stress. However, contrasting effects of the grit dimensions were theorised for the experience of challenge stressors. Grit was hypothesised to provide incremental validity beyond PsyCap and resilience in predicting work-related stress. Lastly, itn was postulated that grit is not only a sufficient condition for work-related performance beyond those traditional person laity cgharacteristics but that is is a necessary condition for lower levels of work-related stress.

In sum, this chapter provided the theoretical development and the accompanying conceptual model of this thesis that guided the theoretical and empirical foundations of this research. Therefore, the following chapter discusses the philosophical positioning of this research and the adopted research design for the three studies. A detailed explanation of the methodological approach is provided, including a detailed analysis of the research process and corresponding data analysis procedures.

Chapter 3 Research Methods

3.1 Introduction

The present chapter discusses the philosophical and methodological positions that informed the methdological decisions to answer the research questions and the research hypotheses outlined in the prvious chapter. This thesis explored the role of grit in the business context and its impact on performance in the workplace. It aimed to explore whether grit, in its current conceptualisation, is a unique construct in relation to PsyCap and resilience and its relationships with work-related job performance and work-related stress. The purpose and aims of this thesis guided the methods chosen to undertake this research.

This chapter consists of six sections. First, Section 3.2 outlines the ethical considerations that underpin this research. Section 3.3 provides an overview of the philosophical underpinnings and explores the link between the theoretical foundation and the philosophical perspectives of this research. Section 3.4 outlines the research approach and research design. Section 3.5 provides essential details of the methodology and methods adopted in this thesis. Lastly, Section 3.6 outlines the data analysis procedures.

3.2 Ethical Considerations

This research was conducted following the ethical approval from the Humanities and Social Sciences Ethics Committee at Newcastle University. The considerations of research ethics is a crucial part of any research conducted to minimise the potential risk of causing harm to the research participants, the researcher and to ensure the maximum benefit of the research for all stakeholders involved (ESRC, 2015). While all research conducted should include ethical considerations, this is of particular importance in research that involves human participation. However, even if there are various ethical research guidelines published by different governing bodies, such as the American Psychological Association, the British Psychological Society, the British Academy of Management, the Economic and Social Research Council, as well as every higher education institution, Bell and Bryman (2007) have argued that the guidelines vary between the proposed frameworks and they are often not practical. Nevertheless, the authors emphasise the importance of ethical principles for research in the social sciences and, in particular, in business and management. There are three key principles of research ethics that are shared by most codes of ethics or ethical frameworks, which are informed consent,

anonymity and harm to participants (Bell and Bryman, 2007). These are also represented in the ethical guidelines for all research undertaken at Newcastle University.

Therefore, and to ensure the highest standards of integrity and to develop meaningful findings, this research adhered to ethical guidelines that are shared by various governing bodies. The University's Code of Good Practice in Research was used as the first point of guidance for ethical considerations in this thesis (Newcastle University, 2018). The three key principles underlying this framework are the welfare of the participants and the researcher, autonomy and justice. According to the Newcastle University Ethics framework, autonomy refers to the honest conduct conduct of research, which includes the safety of the participant, the researcher and informed consent. Integrity and honesty refer to the actions that researchers undertake throughout the whole range of research work (RPIE, 2012). Further, it entails the actions of the researcher in response to other researchers and the acknowledgement of indirect or direct contributions to the research. Confidentiality and anonymity of provided data are two major factors needed to ensure integrity for participants. All names and email addresses were anonymised (list of email addresses, without links to datasets) and no individual datasets were presented for academic or any other purposes (GOV, 2016). Also, participants were assured that participation in the research and responding to the survey invitation was completely voluntary and no negative consequences were associated to their refusal to participate or to their withdrawal from the study. They were informed of their right to withdraw at any moment during the study or after data collection if they no longer wished to be part of the project. Moreover, participants were informed that neither their employer, nor their managers would have access to any of the data collected from their responses. Participants were provided with the researcher's and supervisory team contact details to ensure the availability of advice and help in the case of any issues concerning the survey or the research project in general (for further reference please see Appendix O and Appendix P).

Additionally, as part of the ethical approval of this research, a risk assessment for the researcher and participants was undertaken in order to ensure the safety of both parties throughout the whole research process. The risk for this research was considered to be at a low level, as no travel was involved and no sensitive, person specific information was requested. All documentation, such as information sheet, informed consent and a draft of the participant debriefing sheet were checked by the Ethics Committee for their compliance with University regulations.

This research project upheld all ethical requirements by treating participants respectfully and fairly, providing all required information for participants to provide informed

consent and to contact the researcher at any time throughout the research. Therefore, contact details were provided to each participant from the researcher, the supervisory team, and the Dean of Postgraduate Studies at Newcastle University Business School. Participants were given the choice of receiving a summary of the research after completion to increase transparency and fairness. The researcher upheld the highest level of integrity throughout the research process by maintaining a professional relationship to all participants and avoiding conflicts of interest and personal gain associated with this research. It is intended that the results of this research could be disseminated with participants, involved bodies, the research group at the university level and academic journals.

In line with the university ethics requirements, potential or existing conflicts of interest need to be declared, managed and communicated appropriately and support, direct or indirect, needed to be acknowledged. No conflicts of interest, either financial or professional, were part of this research. No organisation was involved that benefits individually from the findings of this research and no personal gain, other than academic, was intended from this project.

Moreover, to prevent suspicions of misconduct this thesis was written acknowledging the originality of the work and citing all resources that have been used to shape this. Further, the (anonymised) collected data is kept for until the full completion and publication of this work as stated in the informed consent. This is to provide insights into the anonymised final dataset that has been used for the statistical analysis for this thesis to check for its accuracy if required. Researchers at Newcastle University are further expected to be aware of the guidance published by professional bodies and act accordingly. Therefore, as a member of the British Psychological Society and the British Academy of Management, the guidelines and codes of conduct of the BPS and BAM were used for further guidance of ethical considerations for the three studies conducted (BPS, 2009; BAM, 2013).

The British Psychological Society's code is based on four main principles: competence, responsibility, respect, and integrity. According to the code of ethics, all four principles must be upheld by every member of the BPS when conducting any kind of research. The British Academy of Management's Code of Ethics and Best Practice describes a set of values that are "reflecting the fundamental beliefs that should guide the ethical reasoning, decision-making and behaviour of all BAM members" (BAM, 2013, p. 5). The seven values are: Responsibility and Accountability, Integrity and Honesty, Respect and Fairness, Privacy and Confidentiality, Avoidance of Personal Gain, Conflict of Interest, and Collegiality.

In order to comply with these principles, steps were taking throughout the planning and development of the research. For example, ahead of any data collection, participants received an detailed description of the research outline (Please refer to Appendix P for reviewing the invitation document). Participants were ensured that they would receive a detailed description of the research, including the findings and implications, after completion if interested (please see Appendix Q). The guidelines require the researcher to uphold the highest standards when documenting study results and storing the collected primary data. It involves the communication of these standards and the strict obeyance of required procedures. Following new Data Protection Act and General Data Protection regulations in place since 2018 (GDPR, Chassang, 2017), the researcher ensured the safe storage of data and documentation of results also in accordance with university guidelines. Data storage procedures were explained and described as part of the informed consent and accepted by all participants. In line with documentation and storage of the results, participants were provided with a clear outline of the intended use of data collected. This included the use for completing and writing the PhD dissertation as well as the potential publication of the research. Records of all research procedures were managed and retained in accordance with relevant legislation requirements, such as GDPR and Freedom of Information Act 2000 (GOV, 2016) in order to demonstrate a rigid research process and prevent allegations of misconduct to the researcher or university.

Overall, the present research was set up along the ethical guidelines proposed by Newcastle University, the BPS (2009) and the (ESRC, 2015). This was done in order to ensure avoiding harm for both participants and researcher, to ensure anonymity of participation and the appropriate handling of the data obtained. Participants received an outline, providing information about the research in advance of participation, they provided informed consent and received a summary of the research project upon completion. This was done to ensure integrity and good practice of this research for the participants, the researcher and Newcastle University.

3.3   Philosophical Considerations

This section provides a discussion of the main philosophical assumptions that are the basis for guiding each research project (Bryman and Bell, 2011; Saunders *et al.*, 2012). Moreover, the philosophical underpinnings that form the basis of this research are outlined. All research is influenced by sets of beliefs and underlying assumptions that influence and guide the way and methodology by which research is approached. This set of beliefs is termed as 'research paradigm' or 'research philosophy' (Guba, 1990). Lincoln and Guba (2003) defined the three basic and distinctive principles of research philosophies as epistemology, ontology and

methodology. Saunders *et al.* (2012) suggest that researchers should select their epistemological, ontological and methodological philosophy according to the aims of the study. They emphasize that the research philosophy links to important issues, such as beliefs, the way reality is perceived, methodological and technical approaches, and values and ethical considerations. Before deciding on the methods used in a research project, Guba and Lincoln (1994) claim that the consideration of the appropriate research philosophy should be a crucial step in order to produce meaningful contributions to the body of knowledge.

Ontology is the study of being and relates to the nature of reality (Blaikie, 2009) and deals with the general question of whether specific phenomena or entities exist and if they exist, what their most general features are? Ontology requires the researcher to decide if these entities need to be perceived as subjective or objective and adjust the ontological positions correspondingly. Epistemology is drawn from the Greek word "episteme" standing for knowledge. The question of epistemology refers to 'how much do or can we know?' It studies the general nature of knowledge and is mainly concerned with the rationality behind truth, beliefs and justification. The epistemological principle defines the beliefs in what and how knowledge can be obtained, questioning individual beliefs about what real truth is and if it can be used to acquire knowledge about the observed phenomena (Guba, 1990; Guba and Lincoln, 1994; Lincoln *et al.*, 2011). Therefore, ontology and epistemology try to define what reality is and how can we know what it is. The answer to these two questions guide the methodological approach taken to obtain and provide further knowledge to the topic of interest. Methodology is concerned with the specific ways used to increase our understanding of the world; it relies on the researcher's perception and their ontological and epistemological view of the research object. This means that the decision of which methodological approach to choose depends on the researcher's ontological position, how they see reality and their epistemological position.

3.3.1 Research Philosophies

Guba (1990) identified four basic research philosophies, namely, positivism, post-positivism, constructivism, and critical theory, which set the foundation for the methodology used in a given research project. Most commonly, positivism and constructivism are used in business and management research (Bryman and Bell, 2011). However, more recently researchers have argued that there are more philosophical assumptions that guide a researcher's approach than those outlined by Guba (1990). In his book, Blaikie (2007) evaluates a variety of research philosophies that can be distinguished in modern and past research approaches. A detailed overview of the research philosophies discussed by Blaikie (2007) can be found in Appendix

B. However, only the three most commonly discussed philosophies in business and management research: positivism, post-positivism and constructivism, are presented in this section. A short review of the three can be found in Table 3-1. This is followed by a discussion of the researcher's philosophical stance.

Table 3-1 Summary of Research Philosophies

	Positivism	**Post-Positivism**	**Constructivism**
General comments	Principles and approaches to natural sciences apply to social sciences.	Natural and social sciences differ in content, but not in the logic. All observation is driven by theory	Unlike nature, social reality is the product of social actors - hence different methods are needed.
Ontology	Everything is observable. Independent of social actors.	An independent external reality exists, but humans cannot perceive it accurately.	Radical interpretivists deny the existence or relevance of an external world.
Epistemology	Empiricism - Knowledge is true when it represents what is out there	Rationalist empiricism - or Falsification Logic, reason and mathematics through human thought, is the path to knowledge.	Variations of constructionism. Social reality has to be discovered rather than filtered by the expert.
Research Strategy	Inductive	Deductive, rarely inductive	Abductive
Methodology	Quantitative	Quantitative	Qualitative
Analysis	Identifying correlation	Conjecture and refutation Explanation enables prediction	Constructing models of typical meanings used by typical social actors in typical scenarios.
Desired outcomes	Theory confirmation.	Causal explanation through setting and testing hypotheses.	Understanding more so than explanation.

Source: (Blaikie, 2007).

Positivism: Positivism assumes that reality of the object of study is objective and that knowledge about it can be obtained through direct observation, independently of other social actors (Becker *et al.*, 2012). Therefore, positivism is considered as being the basis for a deductive research approach that starts with an existing theory through which hypotheses are developed and quantitatively tested on the subject of study to reach a generalizable conclusion (Crotty, 1998). The epistemological assumption underpinning positivism is that reality can be known and is true when it represents what is observed. The principles of positivism rely on observations that can be quantified and lead to statistical analyses. In positivism, it is assumed that both the observer and observed entity are isolated and not influenced by each other. Moreover, positivism sees the researcher as an objective analyst observing the subject of interest free from any external influences, describing reality as it is (Gill and Johnson, 2010; Bryman and Bell, 2011). In contrast to interpretivism, positivism focuses solely on facts without taking human interest into account. In order to apply a positivist approach to a study, the researcher needs to maintain minimal interaction with the research objects or subjects, with a view to ensure objectivity (Wilson, 2014). Finally, positivism highly focuses on three major tools that are essential for the use of this philosophy: validity, reliability and generalizability (Golafshani, 2003). Validity describes the extent to which the applied assessment method corresponds to the real world. High validity ensures that ensures that the chosen research approach or measurement assesses what it intends and claims to measure (O'Leary-Kelly and J. Vokurka, 1998). Reliability refers to the extent to which an applied research method produces consistent and stable results when the research is replicated in the same context. Thus, it is a measure for the accuracy of an assessment method and ensures high quality of obtained results, it is sometimes referred to as replicability (Fowler Jr, 2013). Generalizability is one of the crucial points for positivism as it suggests that findings that are obtained through large datasets and quantitative methods should be generalizable beyond the assessed context. Thus, assuming that the observed findings are objective and true also in other circumstances (Leung, 2015).

Constructivism: Constructivism proposes that the researcher generally assumes that an objective truth does not exist and therefore cannot be discovered (Saunders *et al.*, 2012). The constructivist approach applies the researcher's subjective perspective to the research, assuming that reality is socially constructed rather than objectively determined. Therefore, the researcher establishes meaning in the observations by using their individual subjective knowledge in different ways without necessarily being connected to a single phenomenon (Husserl, 1965; Berger and Luckmann, 1991; Crotty, 1998). This means that contrary to a positivist approach, the meaning of the observation is based on the individual researcher's interpretation. As emphasized by Kelliher (2005), constructivism promotes the value and uniqueness of

qualitative data in the pursuit of knowledge. She emphasized the contribution of the constructivist approach as providing an in-depth knowledge and understanding of a specific situation or subject (Kaplan and Maxwell, 1994; Myers, 1997). Most commonly, constructivist research follows an inductive research strategy to examine a broad scenario that establishes the feelings, ideas and views of participants. Researchers adopting constructivism have been criticised for not using objective quality measures, such as validity (the quality of the observation is methodologically sound and likely to represent the real-world) and reliability (quality of the result of an observation that ensures that there is consistency and accuracy) are commonly applied in positivist research (Eisenhardt, 1989; Mays and Pope, 1995).

Post-Positivism: Post-positivism is considered a philosophical corrective to positivism. A post-positivism researcher acknowledges that his values, theories and knowledge might influence the object of observation (Guba and Lincoln, 1994; Robson and McCartan, 2016). Taking a post-positivist stance includes the belief that every observation is not necessarily objective but biased in terms of the researcher's values, beliefs and experiences (Guba and Lincoln, 1994). Robson and McCartan (2016) describe the ontological position of post-positivism as the acceptance that an external and independent reality exists; however, assuming that it can only be known imperfectly. The epistemological stance of post-positivism can vary depending on the interpretation of the researcher. Generally, post-positivism needs to be discussed in strong reference to Popper's discussion of critical rationalism, deeply rooted in anti-positivism (Holtz and Odağ, 2018). According to Popper, strict rationalism is unable to explain how proof is possible, and ultimately leads to flawed conclusions as any subsequent observation could provide a different result (Popper, 1962; Popper, 2005). However, critical realism as the epistemological interpretation is not equal to post-positivism, but rather provided the ground for a critical evaluation of positivism. In critical realism the researcher acknowledges that reality exists but that it can never be reached because observations are fallible and as a result, theories require constant revision. Steps towards understanding reality can only happen through falsification, which involves the rejection of induction und thus, searches for falsification rather than confirmation of hypotheses and theories (Blaikie, 2007; Holtz and Odağ, 2018). However, in contrast to critical rationalism, according to Guba and Lincoln (1994), post-positivists assume that findings that are tested critically and can be replicated are as close as possible to the truth, whereas critical realism acknowledges that there is no theory that can obtain the status of truth (Holtz and Odağ, 2018).

3.3.2 Philosophical Assumption in the Present Research

The present thesis aims to examine the role of grit in the business context and its relationship to related psychological concepts, job performance and work-related stress. In doing so, the researcher considered the suggestion proposed by Guba (1990) and Remenyi (1996) that the choice of research paradigm should relate to the research question and the contextual factors, such as the current state of knowledge about the subject of interest, as well as to the underlying beliefs of the researcher. In the previous chapter, it was shown that there is a large body of literature on grit (more than 4.500 citations of Duckworth's first published article) across a different domains. This knowledge can be used as a basis when exploring the meaning and impact of grit in the business context. Thus, a solid base of existing or 'old' knowledge can be used to formulate new hypotheses to be tested.

This research adopted a positivist stance in its ontological position. A positivistic approach assumes that causal laws can be generated by scientific observation (Lincoln and Guba, 2003). It assumed that an external reality that can be observed and accurately measured does exist. Therefore, the research hypotheses were developed adhereing to previous findings and existing theorey. By using an appropriate methodology it is possible to observe the true relationships between different variables of study in research. To do so, the hypothesis development needed to be transparent and clear, aiming to reduce bias and external influence, in order to develop meaningful findings. The theoretical development of this research was based on the large body of literature that already exists and assessed grit in a variety of settings, as described in Chapter 2. This provided sufficient knowledge for a strong foundation in order to adopt a deductive research approach. According to previous literature, grit as a non-cognitive personality construct can be seen as an objective reality. Therefore, previous literature was the basis for this research project as it allowed for the development of research hypotheses that could be tested using structured quantitative methodologies in observation and analysis (Crotty, 1998; Saunders *et al.*, 2012). Moreover, drawing from the positivist ontology, it is argued that using the right research methodology (large amount of quantitative data) everything is observable and social actors do not necessarily influence the observations.

The epistemological assumption of this research followed the positivist assumption that knowledge can be gained through logical reasoning, mathematics and human thought. In order to do so, the research deployed an appropriate and specific methodology to test the research hypotheses and compare the results and conclusions to existing knowledge and theory (Blaikie, 2007). To develop meaningful insights, the researcher ensured that potential biases were taken into account in the development of the hypotheses and methdology to ensure that there are no

biases in the data collection and the observations represent the truth. The specific steps taken are outlined in Chapter 3.5. The epistemological perspective suggests that observed knowledge is true when it truly represents what is out there. The methodological approach remains rooted in the assumption that quantitative data will be the only way to observe the truth by drawing from a large and representative sample of the target population. This positivistic approach allows the researcher to generalise the identified and observed correlations to the wider population.

As it was established in Chapter 2, organisations are looking for solutions to issues such as the rising numbers of employees suffering from work-related stress, employee effectiveness, and ways to increase individual performance at the workplace. Therefore, the aims of this research were to explore grit and its potential to provide such solutions. In order to do this effectively, a positivist epistemological stance was found to be the most useful and an important approach. As shown in Section 2.4, there is little knowledge about the effects of grit in the business context. Positivism allowed this research to translate knowledge on the effects of grit that has been developed in various psychology-related contexts into the area of business and management.

Since a few researchers started to claim that grit can be useful for organisations, there is a need to provide a deeper knowledge about its potential contribution. To do so, for the research question of whether grit is actually an effective tool for predicting performance and work-related stress in the business context, the positivist approach can generate the necessary evidence. Given this question, this paradigm is the most appropriate since it can produce information that can be used by businesses in their decision making, should they consider grit as a tool for current HRM practices or not. This is an important contribution to the knowledge development in this context and follows a 'tradition' that has been shown to be the most useful way to provide research based insights about the effects of personality to practitioners. In particular, practitioners require information that is useful and can be implemented practically in the working context. Positivism is necessary to further develop the current insights of grit not only in the underexplored context of business, but also to develop the understanding of grit and its effects on individual outcomes in general. The following sections provide an outline of the adopted methodology chosen to answer the research questions and to test the research hypotheses developed in Chapter 2.

3.4 Research Design

A research design depends to a high extent upon the underlying research philosophy, the proposed research questions and the overall aims of the study (Krathwohl, 1993; Stern *et al.*, 2012). The design is also influenced by the sampling method of participants and the time frame of the study. Research study designs are frameworks or the "the set of methods and procedures used to collect and analyse data on variables specified in a particular research problem" (Ranganathan and Aggarwal, 2018, p. 184). Before specifying the research design, it needs to be clarified what kind of data will be collected and analysed to answer the research question. Generally, there are two main approaches of research methodologies, quantitative and qualitative, and even though there are instances where positivists apply qualitative or mixed methods research, quantitative methods are the most commonly applied (Blaikie, 2009; Stern *et al.*, 2012). Considering that this research is based on a positivist paradigm, a quantitative research approach was deemed to be the most effective way to conduct the research.

Quantitative research has been described as an attempt to describe and explain phenomena in the social world through the numerical representation and manipulation of observations (Black, 1999). It employs empirical statements that describe observations in the 'real world' and are commonly expressed in numerical terms and utilizes different mathematically based methods (mostly statistical methods) to test these statements empirically (Cohen, 1980; Creswell, 2014). Positivist philosophical assumptions are guiding the quantitative approach adopted in this thesis to explore the relationships between different variables in order to answer research questions and test research hypotheses. The aim is to test a theory in the most objective way possible, which requires a set of clearly theorised hypotheses. Positivism assumes that the research outcomes are the true observation that can be achieved when the applied research approach is tightly controlled (Guba and Lincoln, 1994). The use of sophisticated and methodologically sound measures and statistical analyses to explore these relationships enables the positivist researcher to observe reality objectively.

As discussed in Chapter 2, this research was set up along three overarching research themes that aim to identify the effects of grit in the business context. Considering the aims of this research and the philosophical stance of positivism, a quantitative research approach was chosen as the primary approach for this thesis. In a next step, the quantitative research design was chosen to collect the data necessary in order to answer the research questions and test the research hypotheses.

There is a wide variety of possible research designs; commonly, there are four main distinct types of research designs discussed in the literature for quantitative research: Descriptive, Correlational, Quasi-Experimental and Experimental (Blaikie, 2009). The main distinction between these study designs is the extent to which the researcher controls the variables observed. The differentiation of these designs could be seen as a continuum. Descriptive studies that provide information based on simple observations about specific conditions, situations or characteristics of a certain group without influencing or controlling the study variables at all. Therefore, this type of design does not provide any information of correlation or causality, but a simple description of a phenomenon. Then there is the set of correlational studies that are used to examine the relationships between two or more variables and the extent to which these relationships occur (Feldman and Hass, 1970). This type of design enables the researcher to observe patterns and correlations but is restricted by a lack of causation of the observed relationships.

The third category of study designs is the group of quasi-experimental studies. Campbell and Stanley (2015) referred to the term quasi in order to highlight the fact that the design lacks one of the key elements of a 'true' experimental design, which is the random assignment of participants. Therefore, the findings cannot be generalised to a wider population. The fourth category of study designs are experimental studies. Experimental study designs are commonly used to examine the impact of specific interventions on the target groups and to purposefully manipulate study variables (Jackson and Cox, 2013). This type of research design can often be found in psychological or medical research, for example, to explore the effects of specific treatments or drugs. In contrast to the three other designs, true experimental designs are designed to not only provide information about the correlations between two or more variables, but to provide information about the casualty of these relationships (Jackson and Cox, 2013; Campbell and Stanley, 2015).

In order to answer the research questions and research hypotheses that are outlined in Chapter 2, and informed by the underlying philosophical stance of positivism, a quantitative correlational research design was chosen. Within the category of correlational study designs, there are different sub-categories, such as cross-sectional, cohort studies, and case-control studies (Lau, 2016). However, the most commonly adopted correlational study type in the business and management context is the cross-sectional approach (Rindfleisch *et al.*, 2008). The cross-sectional approach was chosen as it is considered to be the best way to answer the research questions and to test the research hypotheses of the present research. The correlational approach allows the researcher to test the relationship between grit, PsyCap, resilience, job

performance and work-related stress across a large study sample. More specifically, the adopted correlational research design adopted in this research was cross-sectional. Basically, cross-sectional research designs are used to describe the relationship between various study variables across different groups at a single time (Bryman and Bell, 2011).

The first part of the present research aimed to empirically test the structural and measurement model of grit in the business context. It initially explored the higher-order model of grit and its applicability for the business context relying on the quantitative data collected. Cross-sectional data provided a good basis to answer these research questions as it allowed the evaluation of a large sample size across different categories of participants. Additionally, the cross-sectional design was deemed to be most useful as it allowed to critically explore the conceptual uniqueness of the grit construct in relation to PsyCap and resilience on a large sample size across various industries. This approach enhanced current knowledge by testing these relationships on a large sample. Thus, the findings are more likely to provide the accurate mean and distribution among the observed factors and are less likely to be distorted by outliers and provide a smaller margin of error.

The second part of this study explored the research hypotheses that theorise that grit is a statistically significant predictor for the three measures of job performance. In order to do so, cross-sectional data is the most useful method as it provides the ability to compare the relationship between grit and job performance. The cross-sectional design was well suited based on the positivist philosophy by testing the hypothesis to critically explore the concept of grit in a new, yet mainly underexplored context. Moreover, this approach enabled the researcher to make statements about the added validity to predict individual performance above the two well-known measures PsyCap and resilience.

In the final part of the thesis, the cross-sectional research design was considered the most useful approach in order to explore the relationship between grit and work-related stress. More specifically, it investigated the predictive validity of grit for work-related stress. This approach is deeply rooted in the positivist paradigm, as the cross-sectional design allowed to use broad and representative sample for the UK working population and develop a contribution to knowledge for businesses and management research. The study was approached deductively, developing a theory based on findings from other domains aiming to assess the validity of the assumption using a large dataset in business. Moreover, this approach enabled the researcher to make statements about the added validity to predict work-related stress above the two well-known measures PsyCap and resilience. Therefore, the positivist stance provided the basis for the chosen cross-sectional research design to test the research hypothesis and contribute to

current knowledge by translating the findings from other domains and evaluate the effects of grit in the business context. Moreover, it enabled the researcher to develop insights into the importance of grit for individual outcomes at the workplace that could provide significant practical implications for organisations to increase performance and develop a healthier workforce.

This section provided an overview of the chosen research design that builds upon the philosophical stance and aims to answer the previously outlined research questions. A quantitative, cross-sectional research design was chosen to select a representative sample of the UK working population and evaluate the concept of grit in this new context. Building upon the philosophical stance and the chosen research design, the next section provides a detailed outline of the adopted research methodology following the principles of a positivistic, cross-sectional quantitative research approach. It discusses the applied sampling technique, the final sample and the applied measurement tools. It also provides an overview of the data collection and data analysis procedures.

3.5 Methodology

3.5.1 Sampling Method

Generally, there are various different sampling techniques described and adopted in previous literature. The main categorization differentiates between probability sampling and non-probability sampling. Quantitative research methods are almost always based on a study sample that aims to be representative for an overall population that is intended to be measured. A sample is chosen as it is often impractical or impossible to collect data from the whole population, as in the case of this research, the UK working population. Therefore, in order to develop insights for the overall population, the sample chosen for this type of research needs to be representative of the key characteristics that are researched within the overall population. This creates certain requirements on the sampling approach. In probability sampling, each individual from the population has an equal chance to be selected into the sample, while in non-probability sampling, the probability of being selected is not equally distributed. However, non-probability sampling methods, such as convenience or self-selection sampling, are rarely used in quantitative research as they might create sampling biases and errors which can result in the significant distortion of study findings (Levy and Lemeshow, 2013). In order to avoid such issues in the process of sampling, non-probability sampling techniques were not considered for this research. Therefore, only the four main probability sampling techniques: simple random

sampling, systematic sampling, stratified sampling, and cluster sampling were taken into consideration for this research (Tillé and Wilhelm, 2017).

In light of the aims of this research to test the effects of grit in the business context on a representative sample of the working population across industries and occupations, the stratified probability sampling method was chosen to select participants for this research. Stratified sampling is a type of probability sampling that divides the overall population into different groups (strata) based on a certain characteristic. (Neyman, 1992). This approach has been adopted in previous grit research (Robertson-Kraft and Duckworth, 2014; Beyhan, 2016) as well as other research that aimed to gather a representative sample (Bartram *et al.*, 2009).

After deciding on the sampling method, and to select a representative sample of the UK working population, the desired sample size was calculated. In order to calculate the sample size, three key factors need to be determined (Israel, 1992): First, the total population size was established; according to the Office for National Statistics, 33.07 million people were employed across the UK in April 2020 ONS (2020). Second, two parameters (confidence level and confidence interval) were selected. The confidence level describes the certainty that the observed value in the sample represents the true value in the population and represents the desired level of accuracy of estimate, which is basically a proportion within which the researcher can be sure that the true value lies (Naing *et al.*, 2006). Commonly, most research adopts a confidence level of 95% and a confidence interval of 0.5 (Kotrlik and Higgins, 2001). This gives researchers the ability to say that they can be 95% sure that the true population value lies within +/- 5 of the observed value (Krejcie and Morgan, 1970). In order to make the findings of this research more accurate and to reduce the margin of sampling error, a confidence level of 99% and a confidence interval of 3% was chosen for the present research. The confidence interval was calculated using the following formula:

$$\bar{X} \pm t^n \frac{S}{\sqrt{n}}$$

Because the mean for the population is unknown and the there is no known standard deviation, the calculation is based on a simple random sample of the size *n*. For this, *s* represents the standard error which replaces the standard deviation. t^n describes the upper $\frac{1-C}{2}$ for the distribution of t with n-1 degrees of freedom (Efron, 1987). To calculate the necessary sample size a sample size calculator was used (ABS, 2018). The final sample size that is required to represent the working population of the UK that is based on 33.08 million working individuals,

and with which the researcher can be 99% sure that the true population value lies within +/- 3% of the observed value is 1,843.

The initial database used was the UK Government's Companies House Basic Company Data. This dataset provides an overview of all officially registered companies in the UK and contained an initial total number of 4,206,442 companies (all company sizes included). In a first step, only companies that had a registered residence within the UK and had a valid postal address were kept in the dataset. Secondly, all companies that did not have an active status (dismissed, in strike-off, dissolved etc.) were removed from the dataset to ensure accessibility. By following this procedure, the final dataset consisted of 3,788,672 companies.

To follow the stratified sampling method, the organisations were then further categorized into 18 pre-defined work sectors, the strata in this study, based on the official Standard Industrial Classification of Economic Activities provided by Companies House, Government Agency, UK. This was done in order to ensure that the final sample was distributed across all eighteen predefined sectors. The lists of companies in all 18 sectors were kept in individual Excel files and randomly sorted within the individual files. In a next step, every 1000th company was selected to be approached for the study, resulting in a total of 3,789 companies. Initial emails were sent to these organisations (official contact forms, organisations representative, CEO or HR director) to ask for permission to contact their employees regarding this research. Further, LinkedIn was used to contact relevant individuals in those companies. Only 2,214 of the selected companies did have available contact details, of which 928 provided permission to get in contact. This resulted in a total number of 15,867 sent invitations for study participation. However, only 78% of emails and in-mails were received by potential participants (email response systems acknowledged their delivery), the rest went undelivered as a result of outdated, invalid or blocked addresses.

A link with the invitation to participate in this study was sent out from July 2017 until December 2017 and was possibly received (no automatic reply) by 8,409 participants. Of those, 747 were either not available during that time (maternity or paternity leave, sabbatical or extended annual leave), replied that they are not interested in taking part in the study and further communication, or did not read the message (a short summary of replies received can be found in Appendix C. In total, 3,018 responded to the invitation and opened the first introduction page of the survey. However, 920 participants did not fully complete the survey and withdrew from the study in the process and therefore, were not considered for further analysis. The final sample considered for this study spanned 2,098 respondents aged 16 and older with a survey response rate of 24.9%. This is a high response rate for an online survey, considering the findings of two

recent meta-analyses by Manfreda *et al.* (2008) and Shih and Fan (2008) who reported a significant lower response rate for online surveys compared with any other data collection methods. Generally, several studies have found that response rates to cold-calling email survey invitations are expected to be below 30% (Cook *et al.*, 2000; Guo *et al.*, 2016). Moreover, Shih and Fan (2008) reported significantly lower response rates for larger surveys as well as the dependence on the study sample, with samples of professionals and employees resulting in significantly lower response rates. Examples of other reasons for low response rates are the increasing use of spam blocking tools that were introduced by organisations due to an increasing amount of unsolicited e-mails (Couper *et al.*, 2007), no use of monetary incentives (Guo *et al.*, 2016) and the general increase of unsolicited requests, such as for answering surveys or provide feedback for different services (Fan and Yan, 2010) or purchases. As a result, the response rate of 24.9% can be considered substantial and good. This might be due to several reasons, such as the topic being of particular interest, appealing of the design and length of the survey, the invitation layout as well as the precise information provided to ask for informed consent (Fan and Yan, 2010).

Due to the nature of the sampling technique, participants were not only recruited from specific large or medium sized organisations, but also small and one-person run firms were contacted. This was done to ensure the representativeness of the sample for the UK working population. Moreover, some contacted organisations were simply agencies for freelancers that enabled this research to conduct this study not only with regularly employed and self-employed individuals, but also integrating freelancers. This increased the representativeness of the sample, but also created a sample that consisted of a wide range of occupations with significantly different job characteristics. Even if this could be considered a desired sample composition, there might be issues in terms of comparability of results and assessment methods; these potential issues and countermeasures applied in this research are outlined in the following sections.

3.5.2 Measures

Following the literature review, it was decided that only existing instruments would be included in the questionnaire to measure the key variables in this thesis. There are two main reasons for this decision. First, previous research criticised the increasing number of developed survey measures instead of relying on existing measurement tools that have proven to be useful and psychometrically reliable and valid (Lambert and Lambert, 2012). Second, the development of new and valid measurement scales with the aim of providing excellent psychometric properties

is a challenge that is often not met adequately (Clark and Watson, 1995). Even if some academics argue that the development on new scales is crucial for the advancement of knowledge and as a response to encountered issues in research (DeVellis, 2016), others argue that this increases confusion and requires resources and time that could be spent on the conceptual development and the analysis and discussion of research findings. Moreover, Morgado *et al.* (2018) have argued that the same issues are being made in scale development for the past 30 years. Therefore, it is argued that by relying on psychometric validated instruments the reliability and validity of the findings could be increased. The following section provides an extended overview of all measurement instruments used.

Grit was assessed using the Grit-S scale (Duckworth and Quinn, 2009) which, as previously explained, is the most commonly applioed measure to test an individuals level of grit in previous work and has been shown to produce similar findings as in other contexts (Haist, 2015; Suzuki *et al.*, 2015; Peleaşă, 2018). The scale consists of eight items in total which are divided into the two dimensions: persistence of effort and consistency of interest (see Appendix A). Some example items for persistence of effort are "I finish whatever I begin" or "I am diligent" and for consistency of interest: "I often set a goal but later choose to pursue a different one" or "I have been obsessed with a certain idea or project for a short time but later lost interest". The Grit-S score equals the average score of the eight items. The items are scored on a 5-point Likert-scale ranging from 1 = 'not at all like me' to 5 = 'very much like me'. The scale showed adequate reliability (Cronbach's Alpha) scores in a large range of studies ranging from .73 to .85 (Duckworth and Quinn, 2009; Duckworth *et al.*, 2011; Von Culin *et al.*, 2014) and one-year rest-retest reliability ($r = .68$, $p < .001$). The measured alpha coefficient in the present study was .77 (Consistency .73 and Perseverance .71) for the overall sample and .79 for self-employed participants. Even though, as discussed in Section 2.2.4, there is growing criticism of both the original and the Grit-S Scale, with the Grit-O Scale it is still the only current operationalisation of grit. One of the main reasons for using it in this study was to explore its validity in measuring grit in business and to conduct a psychometric analysis of the instrument in a large sample.

Individual Performance was assessed in two different ways. Two groups of employed individuals were included in this study. One group consisted of regularly employed participants, and the second group included freelancers and self-employed individuals. This was essential to represent the working population in the UK. However, it also meant that there were issues in the assessment of certain performance measures. For all self-employed and freelancing individuals, job performance was assessed by a task performance measure only, while for all

regularly employed participants this research used an individual job performance questionnaire consisting of the three essential work-performance dimensions: task-based performance, extra-role performance and innovative performance (see Section 2.4.1). A combination of the three different measures of work-performance were used for several reasons, responding to previous research in organisational studies and grit. First, task-performance and contextual performance – in this study conceptualised as organisational citizenship behaviour (OCB) – are considered to be two of the most important facets of performance in the workplace (Motowidlo and Van Scotter, 1994; Borman and Motowidlo, 1997). Moreover, previous research shows that OCB accounts for a large proportion of the leader performance rating in the work setting so OCB needs to be taken into account as a positive performance dimension in the work context (Borman and Motowidlo, 1997; Vilela *et al.*, 2008). As discussed in Section 2.3.3, innovative performance has received increasing attention over the past two decades mainly because organisations are striving to gain a competitive advantage over their contestants, which requires some form of innovative behaviour by their employees (Abbas and Raja, 2015). Given the increasing demand for innovative behaviours in the workplace, this measurement was included in the overall performance evaluation of regularly employed individuals in the present study.

While this was the case for all regularly employed individuals, several self=employed pilot study participants reported issues when answering OCB and innovative performance items. Participants argued that OCB is not applicable to their work situation and most of the innovative performance items are equally difficult to answer for self-employed individuals and freelancers. Therefore, it was decided that only task performance would be used to assess the work performance of this specific group. For all non-self-employed and freelancers, a triangulation method was used that combined a self-report with a direct supervisor / line manager rating. Previously, self-reports have been shown to generate mixed results; while some have been of high quality, others were of rather poor quality, with missing reliability and validity. However, when a triangulation method was used - for example by combining self-reports with other scores such as supervisor ratings or objective performance data - higher data validity could be achieved (Conway and Huffcutt, 1997; Atkins and Wood, 2002; Heidemeier, 2005). Therefore, the authors argue that performance assessments should preferably be conducted either by supervisor ratings and objective measures or by implementing a triangulation method.

In this study, both employees and direct line-managers were asked to complete the individual job performance questionnaire, consisting of a combination of the three previously developed and validated scales:

Task performance. Task performance was measured using four items derived from Williams and Anderson's (1991) In-Role Performance Scale. The four items were chosen due to their factor loadings and successful usage by Odle-Dusseau *et al.* (2015) reporting a Cronbach's alpha of .97 (resp. .91). The four task performance items were: "Adequately completes assigned duties", "Fulfils responsibilities specified in job description", "Performs tasks that are expected of him/her", and "Meets formal performance requirements of the job" (see Appendix D). Supervisors were asked to rate their subordinate on a 5-point scale when comparing the employee to all other employees they carry responsibility for. The same items were reworded and answered by employees. They were asked to rate their own performance comparing themselves to their co-workers. The observed internal consistency of the task-performance measurement in this study was .88 for all participants and .92 for self-employed only. A t-test was run to evaluate the comparability of the two groups task performance scores ($t(2087) = .82, p = .41$). Mean levels of both groups do not differ significantly and can therefore be compared.

Figure 3-1 Triangulation Approach of Performance Ratings in this Research
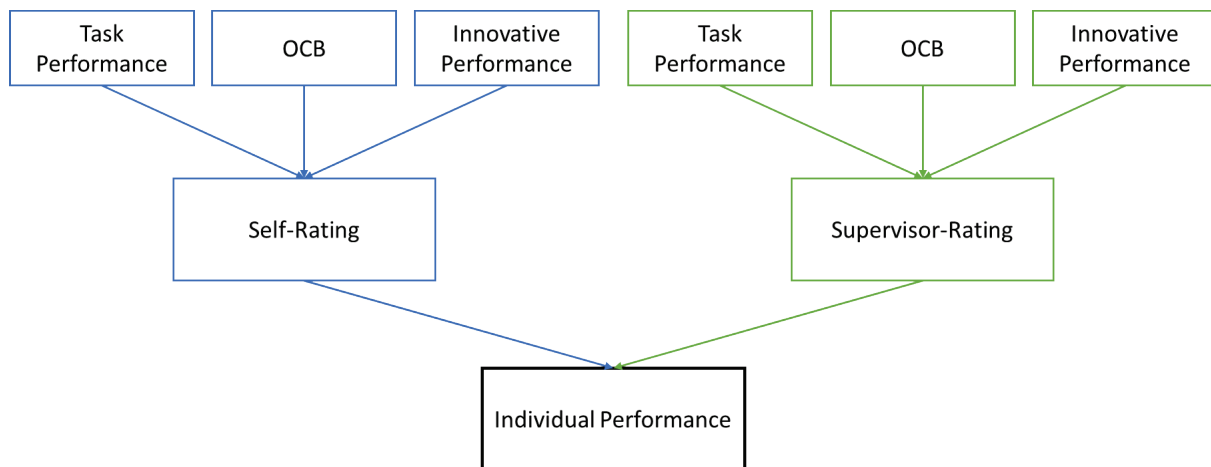
Extra-role performance. Extra-role performance was represented and measured by using the Organizational Citizenship Behaviour Scale (OCB Scale) (Lee and Allen, 2002). The OCB Scale consist of 16 items and explores individual contextual performance. Previous research promoted the assessment of a two-dimensional assessment of OCB, operationalising OCB as a second-order construct (LePine *et al.*, 2002). The two dimensions are organisational citizenship behaviour interpersonal (OCBI) and organisational citizenship behaviour directed to the organisation (OCBO) and together they form an overall citizenship behaviour measure (LePine *et al.*, 2002; Dalal, 2005; Judge *et al.*, 2014). Overall OCB was assessed consistent

with previous research by taking the average measure of both OCBI and OCBO scales (see Appendix E).

OCBI, described as all behaviours in the workplace that are directed at other individuals such as co-workers or managers, assesses a range of individual activities, for example altruistic and courteous behaviours. Example items that are used to assess OCBI are "Help others who have been absent" and "Show genuine concern and courtesy toward co-workers, even under the most trying business or personal situations". Eight items are used to measure the second dimension, OCBO, which describes all behaviours that are beneficial for the organisation as a whole and include consciousness and sportsmanship. Example items are "[I] attend functions that are not required but that help the organizational image" and "[I] express loyalty towards the organization". Participants are asked to indicate on a 7-point scale (1 = never, 7 = always) how often they engaged in the described behaviours. The scale showed consistent high coefficient alphas between .83 and .96 (Lee and Allen, 2002; Cote and Miners, 2006; Piccolo and Colquitt, 2006; Rich *et al.*, 2010). The alpha coefficient for OCB in this study was .90 and .87 for OCBI and .90 for the OCBI dimension.

Innovative job performance: Innovative job performance was assessed using the Innovative Job Performance Scale, developed by Janssen (2000). The scale was chosen due to its very good psychometric properties and the validation of the scale across different countries, work-sectors and occupations. Moreover, it is a relatively short measure and reflects all three parts that are considered as key for innovative performance in the workplace, namely idea generation, idea promotion and idea realisation. The scale consists of nine items and assesses individual innovative behaviours in the workplace. It draws on the work of Kanter (1988), who described different stages of innovation in the workplace.

As discussed in Chapter 2, the three dimensions: idea generation, idea promotion and idea realisation, which are represented in the scale as well. Idea generation is considered to be the first step of an individual innovation process and comprises the development of an idea that can be derived from an existing process or product or can be entirely original. In order to promote the innovative idea, the employee is required to gain key stakeholder approval for these ideas. Thus, they needs to engage in social activities with relevant and potentially helpful supporters to realise the idea. Idea realisation is conducted by the innovator, transforming it into a process or product that has individual benefits or is of use to the team or the whole organisation (Kanter, 1988; Wang *et al.*, 2015).

Each dimension is represented by three items (see Appendix F for an overview of the whole scale). Participants were asked to rate how often they showed these nine innovative work behaviours in the workplace on a 7-point Likert scale ranging from "1 = Never" to "7 = Always". In previous research, the scale achieved consistent high to very high internal consistency that ranged from .95 to .98 (Janssen, 2000; Janssen, 2001; Janssen and Van Yperen, 2004; Janssen, 2005; Abbas and Raja, 2015; Wang *et al.*, 2015). In the present study, an alpha coefficient of .92 was found for all employed individuals – self-employed participants did not answer these items.

Work-Related Stress was assessed using the Challenge and Hindrance Stress Scale developed by Cavanaugh *et al.* (2000). The scale is divided into the two dimensions: challenge (six items) and hindrance stress (five items). Each item of the scale represents an individual stressor in the workplace. Participants were asked to indicate the stress level they experienced as a result of each stressor on a five-point Likert scale ranging from "1 = produces no stress" to "5 = produces a great deal of stress". The challenge stressors assess the individual's perceived level of time urgency, workload, job responsibility, and job complexity. An example item to measure challenge stress is "The volume of work that must be accomplished in the allotted time". A comprehensive list of the challenge and hindrance items can be found in Appendix I.

The hindrance stressors describe perceived levels of role ambiguity, hassles, role conflict, and the excessive regulations or conformity to rigid formal rules (LePine *et al.*, 2004). An example item to measure hindrance stress is "The inability to clearly understand what is expected of me on the job". The scale showed good internal consistencies ranging from .79 / .70 (challenge stress / hindrance stress) to .93 / .86 in previous research (LePine *et al.*, 2004; Rodell and Judge, 2009; Hon *et al.*, 2013; Yuan *et al.*, 2014). In this study, the alpha coefficient for the whole cohort (n = 2.089), was .82 for the overall stress scale, .87 for the challenge and .71 for the hindrance subscales. This differed only slightly and was non-statistically significant for the self-employed and freelancers, with a Cronbach's alpha of .80 for the overall stress scale, .86 for the challenge and .69 for the hindrance sub-scales.

Employee Resilience was measured using the Employee Resilience Scale (Näswall et al., 2015). When assessing resilience based on the process orientation of resilience, there are only four existing operationalisations available. The most commonly utilised scales are the Resilience Scale for Adults (Friborg *et al.*, 2003), the Connor-Davidson Resilience Scale (CD-RISC; Connor and Davidson, 2003b), and the Resilience Scale developed by Wagnild and Young (1993). Even if the CD-RISC and the Resilience Scale by Wagnild and Young are the most prominent measures of resilience in the current literature (Campbell-Sills and Stein, 2007;

Baek *et al.*, 2010; Gucciardi *et al.*, 2011), none of the scales operationalises resilience in the workplace setting specifically for employees. However, Gilligan (2004) argued that in order to assess resilience from a process-orientation point of view in a particular context, the situation plays a crucial role. Therefore, Näswall *et al.* (2013) offered a solution by developing the Employee Resilience Scale (EmpRes), that specifically aims to measure resilience in the workplace. The EmpRes Scale focuses on resilience as a developable process rather than a stable trait. Therefore, the EmpRes Scale was chosen over the alternative measures because of its specific indication of employee resilience, not only covering innate qualities but also comprising employees' behaviours (Näswall *et al.*, 2013; Näswall *et al.*, 2015; Tonkin *et al.*, 2018). Furthermore, the scale was selected as a result of a critical evaluation of the resilience literature described in Chapter, Section 2 2.3.6.

The EmpRes asks participants to rate on a 7-point Likert-scale, ranging from 7 (Almost always) to 1 (Never), how often they engage in resilient behaviours in the workplace. The scale consisted of nine items in total and showed good to high internal consistencies in previous studies (i.e. .91, Näswall et al., 2015; .86, Nguyen, 2015). The alpha coefficient for this study was .83 for the whole sample and .80 for self-employed participants, which highlights no statistically significant differences between the two independent groups. Example items of the EmpRes scale are "I effectively collaborate with others to handle unexpected challenges at work" and "I use change at work as an opportunity for growth". A complete overview of all EmpRes items can be found in Appendix G.

Psychological Capital was assessed using the Psychological Capital Questionnaire Self-Rater Short Form (Luthans et al., 2007). The PCQ-12 self-rater version was answered by participants and consists of twelve items that measure the four dimensions efficacy, hope, resilience, and optimism. The PCQ-12 asks participants to "describe how you may think about yourself right now" and is measured on a 6-point Likert-scale ranging from 1 = "strongly disagree" to 6 = "strongly agree". Efficacy, defined as the individual's confidence into his / her own motivation and resources to complete a specific task, is assessed in the PSQ-12 by three items. The second dimension, optimism (the positive mental state of combining the two sub-dimensions agency and pathways), is assessed by four items in the PCQ-12 questionnaire. Resilience - the ability to bounce back from negative events and potentially even personally grow, based on work-related events - is measured by three items. The fourth dimension, Optimism - based on the attribution theory - describes the internal attribution of positive events and the external attribution of negative events and results in a positive explanatory style of the individual. It is measured by two items. An overview of the items can be found in Appendix H.

The PCQ has undergone extensive validity analysis and has been shown to be a reliable and valid measurement in several studies revealing high internal consistencies with Cronbach's alpha coefficients ranging from .81 to .98 (Youssef and Luthans, 2007; Luthans *et al.*, 2008a; Norman *et al.*, 2010; Avey *et al.*, 2011b; Luthans *et al.*, 2011; Peterson *et al.*, 2011; Luthans *et al.*, 2013). In the present study, the observed alpha coefficient was .82 for the overall sample and .84 for self-employed participants.

3.5.3 Demographic and Sample Characteristic Variables

In order to better understand the relationship between grit and the researched dependent variables, a set of demographic variables were applied. Demographic variables are included in this research for two main reasons. First, they can be used to control and potentially eliminate confounding factors and to test different aspects that might change the influence of a variety of variables in the workplace. This is particularly important as various demographic factors have been shown to impact the level of grit (Christensen and Knezek, 2014; Eskreis-Winkler *et al.*, 2014), the experienced level of stress at work (Narayanan *et al.*, 1999; Bradley, 2007; Kim *et al.*, 2009), individual performance (Ng and Feldman, 2008; Ng and Feldman, 2010; Roth *et al.*, 2012), PsyCap and resilience (Portzky *et al.*, 2010). Therefore, the inclusion of demographic variables that were found to predict several of the outcome variables enables to test the predictive validity of grit beyond these factors. Moreover, it provides the opportunity to spot if grit is only important in certain parts of the workforce or, as hypothesised, across the whole population. Second, in order to establish if the study sample meets the criteria for representativeness for the overall UK working population, the inclusion of demographic variables is necessary to compare it to the official UK workforce statistics. Therefore, the following demographic variables were used in this research:

- Age
- Gender
- Level of qualification
- Overall work-experience
- In-role work-experience
- Position (level) within the organisation and department
- Work-sector or industry

All variables were computed in dummy variables to facilitate the analysis process (e.g. gender 0 and 1 instead of male and female).

3.5.4 Research Process

The research process took place in two separate phases. First, following ethical approval, a pilot study of the online survey tool was conducted. Second, the pilot study was followed by the data collection process and the subsequent downloading of survey data. Part of the second data collection process was the pre-screening of the dataset, evaluating the usability of the collected data and scanning for potential issues within the records.

3.5.4.1 Pilot Study

In order to ensure high quality data collection practices, a pilot study was initiated to identify any inconsistencies or potential issues in understanding of the consent form, instructions and items applied in this survey. Moreover, Fan and Yan (2010) argued that a well-designed and evaluated pilot study can help to overcome issues, such as low response rates, higher number of non-completers, or decreasing the likelihood of experiencing any data safety issues when downloading the dataset (Couper *et al.*, 2007; Shih and Fan, 2008; Fan and Yan, 2010).

A sample of 16 individuals was acquired for the pilot study. The pilot study sample represented a good distribution across the different demographic characteristics such as age, gender, industry, position and work experience of the expected final study sample (see Section 1.1.1.1.1Appendix J). No clear guidelines on the size of a pilot sample exist and the aim was simply to detect the aforementioned issues: inconsistencies across the survey, understanding problems and spot errors. Given the missing guidelines for conducting a meaningful pilot study, a sample size of 16 could be sufficient if the representation of the final sample is considered and can help to uncover potential difficulties and issues (Hertzog, 2008). All individuals answered the questionnaire and eleven of these provided detailed feedback for the survey and consent statement. A summary of the feedback and comments is shown in Table 3-2 and an extended overview can be found in Appendix K.

Based on the feedback received from pilot study participants, minor adjustments to the wording and content of the consent statement were made, such as a general reduction of words, shorter and more specific statements using a numbering system. In addition, modifications in the wording and spelling of some instructions within the survey were implemented.

Table 3-2 Short Summary of Feedback Derived from the Pilot Study

Participant	Comment
P1	"I found the question about "what department do you work in" a bit tricky to answer because in my particular situation I am a working student in an institution (Immunology and infection research) within the School of Biological Science so I wasn't really sure which department to pick."
P4	"There is a spelling mistake on page 3: "Please respond to the following 8 items using the scale from 1…""
P2	"I would prefer to have the information about data confidentiality as a separate paragraph in order to know immediately what to expect and don't necessarily have to read it (always the same bla bla). Then the whole text would look a bit clearer as well"
P1	"I forgot to answer a question and the webpage highlighted this question in red but the background of the text was dark blue. Somehow when I was reading the red text it was hard for me to distinguish the text on the dark blue background. It was strange but the best way I can describe it is that my eyes found it hard to focus."
P7	"The instructions for answering the questions are clear enough."
P2	"Some questions didn't fit to my profession and my daily work. So maybe there should be a line where I can note that."

3.5.4.2 Data Collection

Following the pilot study and the adjustments to the questionnaire, invitations to participate in this research project were send out to 8,409 potential participants working in the UK via direct, cold-call emails and LinkedIn in-mails (see Appendix P for the invitation letter). Following the link embedded in the invitation email, the participants were asked to complete an online consent form (see Appendix M) and to answer the survey. On average it took participants about 15 minutes to complete the online survey that consisted of 80 questions (refer to Appendix N). On the last page of the survey, participants were provided with two options. The first one was to forward a link personally leading to a second questionnaire to their supervisor or line manager. The second option was to provide the email address of their supervisor or line manager to be contacted by the researcher instead. In both cases, an invitation to participate in the second 'Performance-Rating-Questionnaire' was provided to the immediate supervisor or line manager. These were asked to fill out the performance rating for the respective employee (both datasets could then be linked within the analysis tool).

Participants had the option to provide their email addresses to receive a summary of the results of this thesis, 1,453 signed up for this as received a summary of the research and research findings upon completion. The online survey remained available for five months (from the 1st August until the 31st December 2017) to give potential participants enough time to respond to the invitation. This was mainly because several potential participants mentioned beforehand that contacting people during August and early September could pose the challenge of people being on holiday. Several people asked for a short extension and mentioned they would be able to respond to the survey towards the end of December when their workload decreased.

After the main online questionnaire and supervisor performance rating questionnaire were closed, the data were downloaded and securely and anonymously saved on the University's shared file store service. It was then transferred into IBM SPSS 24 for data cleaning procedures and the initial data analysis. After transferring data into SPSS, the main data set was divided into two groups, consisting of participants on self-employed or freelance basis in one group and regularly employed individuals in another. To do so, a new variable was created in SPSS (Employment Style) that could be used as a selection variable to run statistical analyses only for one of the groups if necessary. This was an essential step in order to adjust the dataset according to the performance ratings of participants. Self-employees or freelancers reported that they were not able to answer questions about organisational citizenship behaviour in their work circumstances. Moreover, they did not answer innovative performance questions, which resulted in a solely task-performance based performance rating for freelancers and self-employed participants. Issues with this kind of performance assessment are further discussed in Chapter 6.

The second step was an initial evaluation of the supervisor ratings. However, only 89 datasets were collected, of which only 51 supervisors / line managers finished the performance rating for their employees. With a response rate of about 2.4% compared to the self-ratings of performance, the dataset could not be used to triangulate the performance measure appropriately. This is, because it could not be assumed that the second units responses were missing completely at random, given that 97.6% of the data were missing. Proceeding with a complete case analysis in which the data that had been gathered for second respondents were included in the analysis, is likely to produce biased estimates when the missing completely at random assumption is violated (Allison, 2009; Young and Johnson, 2013). This would be the case in this research, and therefore, second unit responses were not used in the statistical analyses. However, a basic descriptive analysis was executed for this part of the research with the answers given by direct line managers; this is displayed in Table 3-3. Task-performance

ratings were generally very high (M = 4.67, SD = .36), whereas ratings of OCB (M = 5.61, SD = .92) and innovative performance (M = 3.71, SD = .68) were in the normal to higher ranges. These results are statistically similar to the ones that were reported by participants themselves. As previously reported in Section 3.5, the self-reported mean for task-performance was 4.56 (SD = .53), 5.61 (SD = .82) for OCB and 3.62 (SD = .74) in the case of innovative performance. Despite their statistical similarity, the findings of the supervisory ratings could not be used as an additional source of performance ratings in this thesis due to the small number of respondents. Thus, they are excluded from further analyses and performance is only measured by self-reported ratings. However, despite common issues with self-report measures, the dismissal of supervisor ratings had no negative impact on this study.

Table 3-3 Descriptive Statistics for Supervisor Ratings (n = 51)

	N	**Minimum**	**Maximum**	**Mean**	*SD*
Task Performance	51	4.00	5.00	4.84	0.36
OCB	51	3.50	6.81	5.61	0.92
Innovative Performance	51	2.22	4.67	3.78	0.68

3.6 Data Analysis

This section describes the statistical data analysis approach that was taken to answer the research questions and test the research hypotheses developed in Chapter 2. First, the data were pre-screened for missing data, outliers and other meaningless data. In the subsequent sections, the statistical analyses techniques used for the individual research questions and research hypotheses are explained in more detail.

3.6.1 Pre-Analysis Data Screening

Before commencing the data analysis, this research started with a pre-screening of the data. This is an essential step to ensure high quality of data, assessment reliability and validity, missing data, and potential outliers. Because this study uses multivariate statistics, it followed the guidance of Tabachnick *et al.* (2019) and Sedlmeier and Renkewitz (2008) to prepare the dataset for advanced statistical methods. The process followed five main steps that are shown in Figure 3-2 on page 116.

First, the data were visually inspected to identify potential data entry errors. Several datasets were spotted that contained implausible values (i.e. values that were more than three standard deviations from the mean) for some variables. Therefore, distributional characteristics

of those items were calculated to identify outliers and extreme values. Pre-screened was conducted for univariate and multivariate outliers and for missing data (Mertler and Vannatta, 2010). By scanning and potentially discarding or replacing outliers and missing data, possible negative effects on the outcomes of a study can be reduced (Roth *et al.*, 1999).

Missing data is a common issue in quantitative research as there are various reasons for participants not responding to all questions in a survey. This can have a serious impact on the results of the study. Several authors (Malhotra, 1987; Roth, 1994; Acurna and Rodriguez, 2004) have argued that dealing with missing data up to 5% in a data set can easily be dealt with, and up to 15% can be dealt with by using more sophisticated statistical methods. Through the use of statistical methods, it is possible to replace missing values, preventing the researcher from deleting all datasets with missing cases that could result in smaller sample sizes and a potentially biased remaining sample (Rubin *et al.*, 2007). There are various techniques that have been developed over the years for the researcher to deal with missing data, including case deletion, mean imputation, median imputation, and pairwise regression (Roth, 1994; Acurna and Rodriguez, 2004).

The replacement of missing data in this study was based on a fifth option, the K nearest neighbour strategy (KNN, Hall *et al.*, 2008). This method was chosen instead of more common data replacement techniques to overcome severe issues occurring when using case deletion, mean imputation or median imputation (Acurna and Rodriguez, 2004). Such issues include problems with impacting the variance of the observed variable, the covariances are biased towards zero, or the distortion of the median and other important characteristics (Rubin *et al.*, 2007; Aguinis *et al.*, 2013). The KNN is an algorithm method that inputs missing data by finding the k closest neighbour to the missing value. The weighted mean KNN method was applied that calculates the missing value based on the similarity of the missing value to the non-missing values (Beretta and Santaniello, 2016).

Outliers were checked using single construct and multiple construct techniques, mainly relying on visual tools, such as box plots and scatter plots. More than 50% of missing values were detected in six datasets. In these, mainly performance and grit items were not answered and thus were removed from the study. Two datasets were identified that revealed several error outliers that could not be corrected and thus were removed from the final dataset (Kutner *et al.*, 2005). In total, eight datasets were removed in the first two steps of the pre-screening of the data.

Finally, data were checked for invariant responding, also including response time of participants for the individual survey pages. One dataset was found that showed a suspicious

patter in long string responding. This means that across the different scales, the answers were found to be mainly one side of the Likert-Scale, even when confronted with a reversed item. Moreover, the same data set showed fast completion times of the survey. Completion time can be used as post-hoc identification of meaningless data of a survey that can indicate issues in the responses of participants, particularly in combination with response patterns (Leiner, 2016). The analysis of completion times followed recommendations by Leiner (2016), who proposed to use a threshold of 2.0 or greater in the relative speed index (RSI) or 200 and greater (DEG_TIME) to identify extremely fast completed surveys. Such completion times can be an indicator of a dataset that has been completed in a non-meaningful way. The observed completion time of the identified dataset was 367 (DEG_TIME) and 3.1 RSI. In other words, the responded replied to the survey 3.1 times faster than the average respondent and the RSI was 1.4 times higher than the second fastest respondent. Therefore, this dataset was excluded from further analysis due to the length of invariances in responding (including reverse scored items) and an RSI of 3.1. In total, nine datasets were removed manually from the study, resulting in a total sample size of 2,089 cases.

Figure 3-2 Data Collection and Data Cleaning Procedure for the Final Data Sample
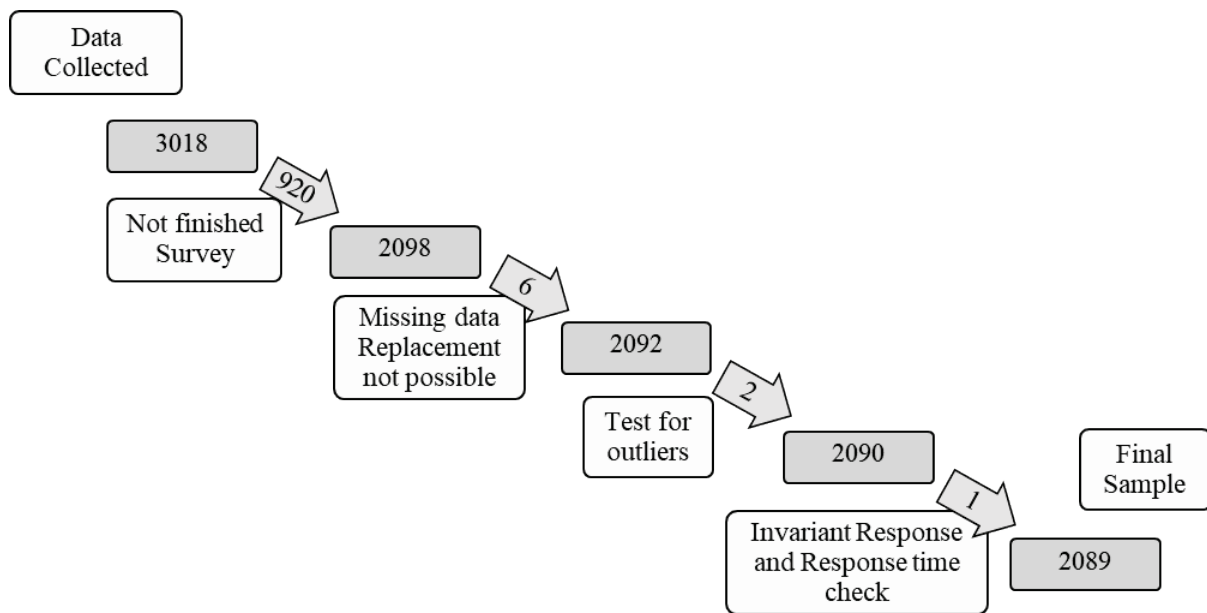
Data analysis used the following software: IBM SPSS 24, the PROCESS macro for SPSS by Hayes (2017), IBM SPSS Amos 22, and R v3.6.1. In a first step of the analysis procedure, the descriptive data analysis was run for all study variables, namely age (in years), gender (0, 1), work sector (categories), department (categories), years of work experience (codes), in-role experience (codes), job level (codes), education (codes), senior management experience (codes), grit, perseverance of effort, consistency of interest, PsyCap, EmpRes,

overall stress, challenge stress, hindrance stress, task performance, OCB, and innovative performance.

As laid out in Chapter 2, this thesis covers three overarching research themes. To answer the research questions and test the previously developed hypotheses, a variety of different data analysis procedures were applied. The following sections provide an individual in-depth description of the data analysis approach used in this thesis.

3.6.2 Data Analysis for testing the Research Questions

Following the theoretical development in Chapter 2, this thesis explored the applicability of grit to the business context. It aimed to answer the research questions of whether the higher-order conceptualisation of grit is correct and if the Grit-S scale is a useful instrument to assess grit in the workplace.

3.6.2.1 Structural Equation Modelling

Structural Equation Modelling (SEM) is a set of statistical methods that "uses various types of models to depict relationships among observed variables, with the same basic goal of providing a quantitative test of a theoretical model hypothesized by the researcher" (Schumacker and Lomax, 2010, p. 1). SEM is particularly helpful when working with latent variables that are not directly observable and provides an analysis that combines the modelling of manifest and latent variables at the same time including the measurement errors. As such, the tool is preferable to traditional multivariate analyses (Anderson and Gerbing, 1988). SEM thereby tests the formulated hypotheses and estimates the causal relationships between the observed variables and eventually formulates the final model (Kline, 2011). It is commonly considered to be a two-step technique that includes, first, the testing of the measurement model, and second, the structural model. The measurement model basically estimates the relationship between the directly observed and the latent variables of the study (Kline, 2011).

Because this study aimed to test the structural and the measurement model of grit, a confirmatory factor analysis (CFA, Hurley *et al.*, 1997) was used. CFA is a multivariate SEM technique that is covariance-based and takes a hypothesis-testing approach to the analysis of a structural theory. It is used to test the multidimensionality of a theoretically or observed construct based on a large sample size (Byrne, 2010). CFA is an advanced statistical method that may be used to calculate and confirm the relationships between different manifest and latent variables based on a developed theory or previously reported empirical results (Schreiber *et al.*,

2006). It is most appropriate when the researcher has a certain amount of knowledge of the latent variables included in the structure (Hair *et al.*, 2011).

In the present model, grit is the known manifest variable and the dimensions of perseverance and consistency are the latent variables. Because they have been developed previously, CFA was the most effective tool to test the structural relationship model between grit and its two dimensions. Therefore, and to answer RQ1 that explores the applicability of grit in business and RQ2 that test the operationalisation of grit in the business context, a CFA was run to test the two-factor model of grit. In a first step, the proposed second-order model of grit, which aggregates the individual facet-level scores into an overall grit score, was analysed for its model fit and subsequently compared to the alternative model, in which the two facets perseverance and consistency, are treated as individual but correlated dimensions. Additionally, CFA results could be used to evaluate the measurement model and thus the applicability of the Grit-S scale in the business context.

In order to test the measurement model, five steps need to be followed. First, the chi square statistic ($\chi2$) should be examined. The $\chi2$ statistic is one of the key statistics that provides a measure of difference to compare the covariance matrices of the observed and estimated variables and overall represents an absolute model fit. Generally, a non-significant overall fit statistic is expected and desired to confirm the current higher-model of grit that is represented by a low $\chi2$ value and a large p-value (Hair *et al.*, 2018). Only then is it confirmed that the model is representative for the data. Second, the covariance and correlation matrices are evaluated. This is an important step in CFA in order to ensure that the level of covariance and correlation between the variables of interest is observed. The sample covariance matrix shows the variance observed for each variable as well as the covariances between them. The sample correlation matrix provides the standardised covariance matrix, which shows the standard correlations between all indicators of the latent variables (Holmes-Smith, 2011: p. 1.19).

Third, the most important part of the CFA is the evaluation of the model fit indices (see Table 3-4). These model fit indices show if the measurement model is acceptable and how well the data fits the model (Kline, 2015). As suggested by Dagnino and Cinici (2015), there are various reasons for not only reporting one single but different fit indices, one of them being the potential complexity of the model or the sensibility towards sample size. The most commonly observed fit indices are: the chi-square index, the relative chi-square, the root mean square error of approximation, the comparative fit index, and the Tucker-Lewis Index (Kline, 2015; Hair *et al.*, 2018). The chi-square index (CMIN), also referred to as $\chi2$ GOF (goodness of fit), compares the observed model of the data with the predicted model. In this case, lower values indicate a

good fit (Hair *et al.*, 2018). The second observed index is the relative chi-square (CMIN/DF). This model fit index takes the model complexity into account and adjusts the $\chi2$ to the observed degrees of freedom. Good model fit in this index is indicated by values lower than 2 and acceptable model fit is signalled by values from 2 – 5 (Kline, 2015). An overview of the five model fit indices that are assessed in this study are presented in Table 3-4, alongside the recommended values that indicate a good model fit.

Table 3-4 Assessed Model Fit Indices to Test the Structural Model of Grit

Model fit index	Recommended values	Source
CMIN	the < the better	(Kline, 2015; Hair *et al.*, 2018)
CMIN/DF	< 2 – ideal, 2 – 5 – acceptable	(Kline, 2015)
RMSEA	< 0.08, ideally < 0.05	(Hair *et al.*, 2018)
CFI	> 0.9 – acceptable, > 0.95 - good	(Kline, 2015; Hair *et al.*, 2018)
TLI	>0.9	(Hair *et al.*, 2018)

One of the issues with the $\chi2$ GOF is its tendency to reject measurement models that were tested on large sample sizes. Therefore, the root mean square error of approximation (RMSEA) is explored next, as it not only evaluates how well the model fits the sample, but it tests how well the model fits the population (Hair *et al.*, 2018). An advantage of RMSEA is that confidence intervals can be constructed, thus avoiding the necessity of a strict threshold level. Nevertheless, there are cut-off levels recommended that should be adhered to if not justified otherwise (.05 and .08). RMSEA could also be described as a badness of fit measure, as higher values indicate a poor fit, rather than a good fit (Hair *et al.*, 2018), which makes it a crucial model fit index to be evaluated.

In addition to the absolute fit indices described, there are certain incremental fit indices available that measure the model fit in comparison to an alternative baseline model. The comparative fit index (CFI) is the most commonly used of these because of its insensitivity to sample size and model complexity (Hair *et al.*, 2018). It follows the normal range from 0 to 1, where the higher value describes a better model fit and generally, all values below .9 are considered not acceptable and the closer to 1 the better the model fit (Kline, 2015). The final incremental model fit index that is discussed in this thesis is the Tucker-Lewis Index (TLI). The TLI compares the normal chi-square values to the null and specified model and therefore, to a certain degree, takes the complexity of the model into account. The TLI is a non-normed index

that results in the possibility of scores falling below 0 and above 1; however, good fit is indicated by values > 0.9 (Hair *et al.*, 2018).

3.6.2.2 Reliability and Validity

In addition to evaluating the estimates for all indicators and the five different model fit indices, the reliability and validity of the measurement model needed to be evaluated as a necessary step to evaluate the preciseness of the grit scale and to answer RQ2. In order to do this, first, the composite reliability and average variance extracted (AVE) for all constructs of this study were calculated (Hair *et al.*, 2018).

The reliability of a scale describes the stability of the measurement scale over time (e.g. repeated measure) and the dimensionality of the scale (internal consistency, Kline, 2015). The main focus of this study was the examination of the internal consistency of the Grit-S scale and thus whether the proposed items are actually measuring the same underlying concepts as they intend to. In order to analyse the internal consistency, the Cronbach's alpha coefficient, the inter-item correlations, the composite reliability (CR), and average variance extracted (AVE) were estimated.

However, even if acceptable reliability is observed, this does not mean that validity is established as well. Hair *et al.* (2018, p. 124) stated that validity is the: "extent to which a single variable or set of variables (construct validity) correctly represents the concept of study - to which it is free from any systematic or non-random error". Therefore, it was necessary to run further analysis to ensure the validity of the model. Of particular interest in this case was the construct validity of grit. Two subcategories of construct validity that were evaluated in this study are convergent and discriminant validity. This was a necessary step to establish construct validity beyond the model fit evaluation and testing of factor loadings (Hair *et al.*, 2018). Convergent validity is established if the indicators of the construct of interest "share a high proportion of variance in common" (Hair *et al.*, 2018, p. 675). In other words, it describes the similarity between different measures that assess a theoretically similar concept (Bühner, 2011). Convergent validity can be tested by exploring the loadings of the construct and the AVE.

Table 3-5 Coefficients Assessing Reliability and Validity of Grit in this Study.

Type of Reliability	Coefficient	Suggested Values
	Cronbach's alpha (α)	≥ 0.70
	Inter-item correlations	0.30 - 0.70
Internal Consistency	Composite reliability / Construct reliability (CR)	≥ 0.70
	Average Variance Extracted (AVE)	≥ 0.50
Type of Validity		
Convergent Validity	Average Variance Extracted (AVE)	≥ 0.50
	Composite reliability (CR)	≥ 0.70
Discriminant Validity	Comparison of AVE and squared correlations (SIC)	AVE > SIC

Sources: Hair et al. (2018), Kline (2015), Pallant (2016)

Discriminant validity describes the true distinction of the observed concept of interest to other constructs or variables. Therefore, discriminant validity measures if the concept of interest is truly unique and offers the assessment of phenomena that cannot be measured by other concepts (Hair *et al.*, 2018). In this case it meant that discriminant validity were present if grit were measured by perseverance and consistency, and not by other concepts, such as resilience or PsyCap. To establish discriminant validity, CFA tested if two observed constructs could as well only represent a single construct. Thus, it tested if grit was actually represented by a single dimension, grit, or if it was indeed measured by the two-dimensional model consisting of perseverance and consistency. This was done by comparing the values of AVE with the square of the correlations between the two observed corresponding constructs. If the construct passed this test, good discriminant validity was present. If the test showed the presence of high cross-loadings of indicators, the discriminant validity was not good (Hair *et al.*, 2018). Table 3-5 provides an overview of the required reliability and validity test that were run for this study. Additionally, it includes the suggested thresholds to accept or reject high reliability and validity of the model.

To test RQ3 that explored if grit is a unique and distinctive construct compared to resilience and PsyCap, SEM was chosen as the most suitable approach. Similar to answering RQ1, CFA was identified as the most effective assessment technique to test the structural relationship models between grit as a second-order construct, consisting of perseverance and consistency, and grit as a first-order construct, consisting of perseverance, consistency, resilience, and PsyCap. In a first step, the second-order model of grit was compared to grit as a

first-order construct (Alternative Model 1). A CFA was run and the model fit indices of the two structural models were compared. In a second step PsyCap was added as a third latent variable of grit. This Alternative Model 2 was tested, and the model fit indices were evaluated and compared to the basic higher-order model. In a second step, PsyCap was replaced in the model by adding resilience as the third latent variable. The model fit indices of this Alternative Model 3 were evaluated and compared to the basic model. In the third step, PsyCap was added back into the model alongside resilience, perseverance and consistency as a fourth latent variable. Another CFA was run, and the model fit indices of this Alternative Model 4 were evaluated. Moreover, the convergent and discriminant validity were tested, which is crucial to determine the uniqueness of grit (Hair *et al.*, 2018). Additionally, factor loadings for all items were checked to examine that the grit items were loading on the grit dimensions and if there were issues of multicollinearity involved.

3.6.3 Data Analysis for testing the Research Hypothesis

3.6.3.1 Correlation and Regression Analysis

This thesis tested the predictive validity of grit for job performance and work-related stress beyond the established measures of PsyCap and resilience in working individuals in the UK across industries, departments and occupations. For the sake of comprehensibility and based on the findings that the assessed measures did not differ between the group of regular employees and the group of self-employed and freelancing individuals (see *Table 4-12* for the statistical results on Page 140), the datasets were combined for the analysis and findings presented in the following sections. Contextual and innovative performance were only assessed for employed participants and thus, are reported for regularly employed individuals in the UK only.

Initially, basic correlation analyses were run to test the relationship between all study cariables, including grit, job performance, work-related stress, PsyCap, resilience, and all demographic control variables in this study. Linear regression analysis is the most commonly applied statistical test to calculate the predictive validity of a predictor variable for the outcome variable (Montgomery, 2012). Linear regressions help to answer three underlying questions by determining the strength of the predictor, predicting an effect of the IV on the DP variable, and predicting a trend in this relationship. Because this study intended to test the predictive validity of grit for all three performance measures and work-related challenge and hindrance stress, a series of linear regression analyses was conducted. Additionally, the individual contributions of the two dimensions of grit were compared to the overall grit score.

Moreover, the thesis aimed to test if grit is a unique construct that adds predictive validity for performance and work-related stress beyond the demographica control variables and resilience and PsyCap. Therefore, these linear regressions were followed by a series of hierarchical regression analyses where grit was added into the regression model to test the added predictive validity beyond resilience and PsyCap for the two dependent variables (stress and performance). All analyses were run for overall grit and for the two grit dimensions separately. As such, the individual contribution of both predictor dimensions could be assessed comparably. Hierarchical regressions allowed to determine the overall predictive validity for all IV together and also the individual contribution by each predictor separately. Therefore, hierarchical regressions were the most suitable way to allow the researcher to explore the individual contribution in explaining the variance of both dimensions of grit separately and for the overall grit score. (Gelman and Hill, 2006). Further, hierarchical regressions were run to control for effects of the demographic variables, industry, department, current job position, overall work experience, and in-role experience of participants on the grit-performance relationship. By adding the demographic variables into the hierarchical regression analysis on the grit-stress relationship to test the contribution of grit beyond these factors (Kim *et al.*, 2009; Hessels *et al.*, 2017).

Following the hierarchical regressions, a series of moderated regression analyses was run (Hayes, 2017; Morgado *et al.*, 2018). These analyses were performed using the PROCESS macro in SPSS to test for possible interaction effects of different demographic variables, including age, overall work-experience, PsyCap, and resilience on the relationship between grit and performance, and grit and work-related stress (Karatepe and Uludag, 2008; Shultz *et al.*, 2010). All variables have previously been shown to have a significant impact on the level of job performance and experienced work-related stress. Moreover, some have been shown to moderate relationships between other personality traits and various work related performance measures in previous studies: age (Ng and Feldman, 2008), gender (Roth *et al.*, 2012), current job position (Fuller Jr *et al.*, 2010), and work-experience (Ng and Feldman, 2010). Therefore, potential interaction effects were tested.

3.6.3.2 Necessary Condition Analysis

In the next step, a series of necessary condition analysis (Dul, 2016b) was run to empirically test whether grit is not only a beneficial factor but a necessary condition for increased performance in the workplace. NCA is a statistical data analysis technique that, contrary to the traditional regression approach, focuses only on a single determinant. It defines necessary but

not sufficient conditions for one or several outcomes. The advantage of NCA is its ability to spot necessary conditions that need to be present in order for the outcome to occur. This means that NCA explores if single determinant is necessary in order for the outcome to occur.

If grit would be a sufficient condition for performance, it would indicate that high levels of grit might result in high performance, however, high performance could also be obtained by other factors. However, if grit were a necessary condition for high performance, then there would be no high performance unless grit is present. Thus, NCA provided more insights about the actual importance of a single or multiple determinant for an outcome to appear. This was a useful addition to traditional hypothesis testing, as most social sciences build upon the logic of additive sufficiency (Hauff *et al.*). Thus, the single or combination of factors are sufficient to affect the outcome, whereas they can compensate for each other and are not necessarily necessary for the outcome. However, evaluating the necessity of a condition for a certain outcome is highly important for organisations because they could save resources instead of investing into HRM and TD development programs to select or develop a certain personality characteristic that can have an effect on the outcome. A short and precise description of the logic of NCA is provided by Karwowski *et al.* (2016):

> "The effect size (*d*) of a necessary condition is the area of the "empty" zone above the ceiling line divided by the area of the "scope," which is the total area where observations would be possible given the minimum and maximum values of X and Y. Thus, the larger effect size, the lower the ceiling line and the larger the constraint that X puts on Y" (p. 108).

The first step in analysing a potential necessary condition in NCA is the visualisation and analysis of a scatter plot of data. The scatterplot shows the condition = X on the X-axis and the outcome = Y on the Y-axis (see Figure 3-3).

In a next step, the upper left-hand corner is examined for an empty space. This space, if empty, indicates that outcome Y is constrained by the condition X. To further analyse this empty space, a ceiling line is drawn between the observed cases (below the dashed line) and the empty space. This enables the researcher to calculate the ceiling zone, which is the size of the empty space. It is represented by the equation $Y \leq f(X)$. Drawing ceiling lines is entirely different to the conventional logic of regression, in which a line (or surface in 3D) is drawn through the middle (mean) of the dataset.

Figure 3-3 NCA Methodology and Analysis
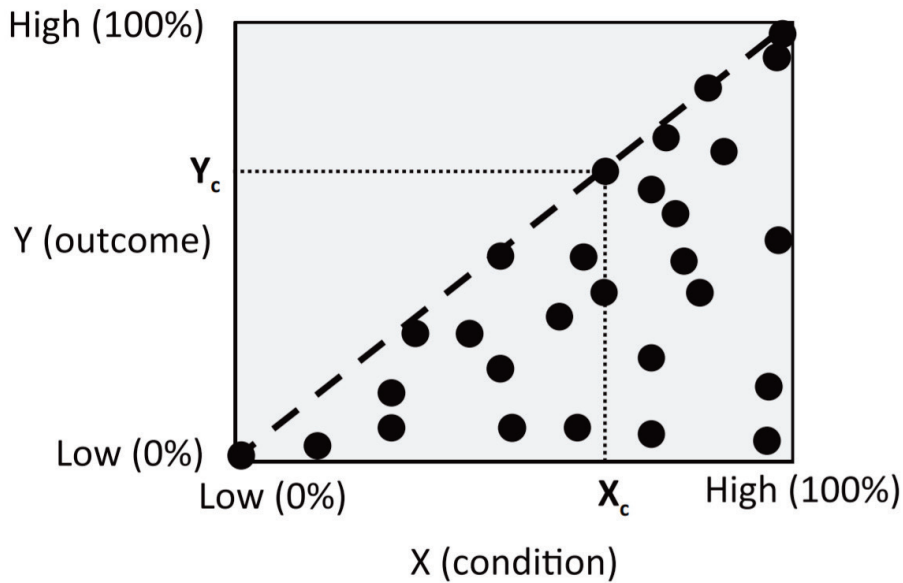
Source: (Dul, 2016b, p. 21).

Two methods for drawing a ceiling line have been recommended by Dul (2016b). The first technique is called Ceiling Envelopment–Free Disposal Hull (CE-FDH). It is "a non-decreasing line function that connects the upper-left observations of the XY plot" (Jabeur, 2019, p. 6). CE-FDH is the default ceiling line because it is a flexible and simple technique that can test continuous as well as dichotomous and discrete necessary conditions. Moreover, it does not require many underpinning parametric assumptions. In Figure 3-4 the CE-FDH is shown as a red dash-dotted line. The second technique, Ceiling Regression Free Disposal Hull (CR-FDH), is based on CE-FDH but it draws a straight OLS regression line that connects the points where the vertical part of the CE-FDH line ends and continues - when X further increases - as a horizontal line (Dul, 2016b). CR-FDH is preferable when data is more likely to be subject to measurement errors and outliers, yet, this method results in a smaller size of the ceiling zone. The CR-FDH is shown in Figure 3-4 as a continuous orange line. The green line represents the traditional regression line that evaluates sufficient condition between the observed variables.

The thesis followed the guidelines that were proposed by Dul (2018a). NCAs were run to test the necessity of a certain level of grit, perseverance and passion for high task, extra-role and innovative performance. This study used the package 3.0 for R developed by Dul (2018b). Lastly, necessary condition analyses (NCA, Dul, 2016b) were run to test whether grit was a necessary requirement to experience a reduced level of stress in the workplace. It followed the same procedure as for testing the necessary conditionf for job performance, in which NCA was run for overall grit and both dimensions separately for overall stress, challenge and hindrance.

Figure 3-4 Visualisation of different NCA Ceiling Techniques
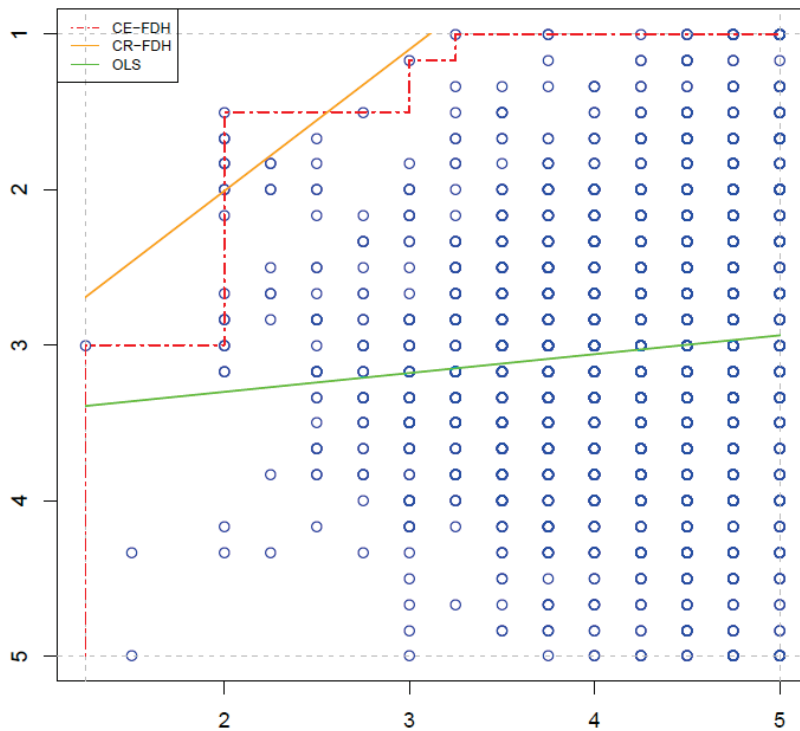
3.6.3.3 Testing the altternative Person-Centred Model of Grit

As discussed in Chapter 2, Section 2.2.3 one of the key issues in current research in grit is the lack of clarity around the higher-order conceptualisation of passion and perseverance. Some authors claim that the two adopted and operationalised dimensions, perseverance and consistency, do not represent grit as introduced by Duckworth *et al.* (2007). Others argue that the whole conceptualisation into a higher-order factor model is not justified as presented or requires additional dimensions, such as goal-attainment or goal-setting (Credé *et al.*, 2017; Jordan *et al.*, 2019b). Even if the higher-order model was suggested by Duckworth *et al.* (2007) and adopted by almost all studies that empirically explored grit, the methods used for this have recently been questioned. There is recent criticism on the suitability of using CFA as the single tool to assess the suitability of a higher-order model that consists of only two dimensions (Credé and Harms, 2015; Credé *et al.*, 2017; Crede and Harms, 2019). The authors argued that a CFA alone is not appropriate because:

> "a proposed higher order construct is supported under three broad conditions: (1) the facets are strongly and relatively uniformly correlated with each other, (2) a higher order model exhibits fit that is better (or at least no worse) than all plausible alternative models of how the facets are related to each other" (Credé, 2018, p. 607).

Researchers argued that the fit of the observed model "will always be identical to the fit of the most plausible alternative model in which the perseverance and passion are simply kept as separate albeit correlated variables" (for further discussion see: Credé and Harms, 2015; Credé, 2018, p. 607; Crede and Harms, 2019). Therefore, it is argued that a different conceptualisation of grit should be explored that does not lead to issues discussed in Section 2.2.3. One such analysis would be the conceptualisation of grit as a person-centred concept, which describes individuals as high in grit only if they score high in both dimensions, perseverance and consistency. This would mean that a person who scores high in just one dimension would not be considered gritty. Therefore, grit would not exist as a continuum but rather as a trait that either exists or not (Credé, 2018).

In order to test the Person-Centred Model of grit, the grit measures are recoded into a new bi-factor model of grit that is either (1) gritty or (0) not gritty. This in turn can be tested using the previously described approach of NCA (Dul, 2016b; Credé, 2018). Therefore, a NCA analysis was run to test the newly proposed bi-factor conceptualisation of grit as a Person-Centred Model of grit as a necessary condition for job performancce. Considering the theorised predictive validity for work-related stress that assumes a positive effect of perseverance and a negative effect of consistency for challenge stress and a negative effect of perseverance and consistency for hindrance stress the necessary condition for work-related stress was not theorised and tested.

3.7 Summary

This section provided a detailed discussion of the research methodology chosen for this research. The first section outlined the ethical considerations underlying this thesis in order to ensure compliance with University and professional guidelines. All necessary steps were taken at the design stage to ensure safety and ethical compliance were adhered to so that the research project could obtain meaningful data. Due to the positivist stance of the researcher, a quantitative, cross-sectional research design was chosen to answer the research questions and test the research hypotheses developed as part of the theoretical development in Chapter 2. The adopted methods included the stratified sampling process, the measures that were used to assess the key variables, namely grit, resilience, PsyCap, performance, and work-related stress, along with various demographic factors. The chapter also outlined data collection and data analysis procedures (Section 3.5.2 and 3.6). As noted, 2,089 participants were included in this study, answering the questionnaire and providing self-reported information on grit, performance, resilience, PsyCap and work-related stress. Lastly, the statistical that were used to answer

research questions 1-3 and all research hypotheses were described. The next chapter provides a detailed overview of the results of this research including descriptive statistics and a closer examination of the demographic characteristics of the research sample.

Chapter 4 Results

4.1 Introduction

This chapter presents the results of the statistical analyses of this thesis and is divided into three sections. Section 4.2 describes the descriptive statistics for all variables used in this thesis and describes the research samples' demographic variables in detail. Additionally, it provides an overview of the observed basic correlations between the research variables. Section 4.3 presents the statistical results that were obtained from the CFA that tested the conceptual and measurement model of grit. Moreover, results of the CFA using SEM that tested the structural and measurement model of grit against the two psychological concepts resilience and PsyCap are presented. In Section 4.4 the results of the hypothesis testing are presented. The linear and hierarchical regression analyses to test the predictive validity of grit for job performance and work-related stress beyond PsyCap and resilience are provided. Additionally, the NCA that evaluated if grit is a necessary condition for the three assessed dimensions of job performance are presented. Lastly, it describes the results of the NCA that tested the necessary condition of person-centred grit for job performance.

4.2 Descriptive Statistics

At first, descriptive statistics were computed for all variables in this thesis: overall grit, consistency, perseverance, PsyCap, EmpRes, stress (challenge and hindrance), task performance, OCB, and innovative performance. OCB and innovative performance were not answered by self-employed participants, which is why the major part of the data analysis involving these two constructs is reported only for those individuals who were regularly employed. This section also provides an overview and a more detailed description of the demographic variables, which is necessary to evaluate the representativeness of this sample for the UK working population and thus, the generalisability of the findings of this thesis.

Table 4-1 Descriptive Statistics for all Independent and Dependent Research Variables

Variable	N	Min	Max	Mean	SD	Variance
Grit	2089	1	5	3.81	0.59	0.35
Consistency	2089	1	5	3.50	0.76	0.58
Perseverance	2089	1	5	4.12	0.66	0.43
Psychological Capital	2089	2	5	3.99	0.53	0.28
Employee Resilience	2089	2	7	5.74	0.73	0.53
Stress	2089	1	5	2.88	0.69	0.47
Challenge Stress	2089	1	5	3.04	0.85	0.71
Hindrance Stress	2089	1	5	2.69	0.83	0.69
Task Performance	2089	1	5	4.56	0.53	0.28
OCB	1838	2	7	5.61	0.82	0.68
Innovative Performance	1838	1	5	3.62	0.74	0.55

Descriptive statistics in Table 4-1 offer a first overview of the distribution of the sample. As expected, there is a large range of answers for all questions, only PsyCap, EmpRes and OCB did not reach a full distribution of answers, with no participant answering with 1 at the lower end of the scale. The means for task performance and persistence are noticeably high with 4.56 for task performance, 5,61 for OCB, 5.74 for employee resilience, and 4.12 for perseverance. Also, the variance in task performance and PsyCap was relatively low. This is explored in further detail in Chapter 5.

The distribution of gender in the sample, shown in Table 4-2, was 50.3% female and 49.4% male (1.049 female and 1.034 male, 6 participants preferred not to say). Considering the female representation of 46.5% of the workforce in the UK in 2017 (The World Bank,2017; Leaker, 2020), the distribution in this thesis can be considered a balanced representation of the UK's working population in terms of gender.

Table 4-2 Summary of Participants' Gender

	Frequency	Percent	Cumulative Percent
Female	1049	50.2	50.2
Male	1034	49.5	99.7
Prefer not to say	6	0.3	100.0

Table 4-3 provides an overview of respondents' age. The distribution was balanced in terms of age. Most participants were within the age group of 46-55 (30.3%). The rest of the sample was evenly distributed between 36- 45 years of age (22.9%), 26-25 years of age (19.9%) and 56-65 years of age (17.5%. Only the age groups of 16 – 25-year olds and 66 years and older were underrepresented in this thesis. However, based on a current state pension age of 65 for men and 63 for women and in future years of 67 and 65, respectively, this distribution could be considered normal. Also, when considering the official age distribution within the UK, it can be seen that 40.55% of the population are between 25 and 54 years old and about 12% between 55 and 64 (CIA, 2016). Therefore, the age distribution in this thesis was a good representation of the UK working population (Leaker, 2020).

Table 4-3 Age Distribution of the Research Sample

Age Group	Frequency	Percent	Cumulative Percent
16-25	109	5.2	5.2
26-35	416	19.9	25.1
36-45	479	22.9	48.1
46-55	632	30.3	78.4
56-65	365	17.5	95.8
66 or older	71	3.4	99.2
Prefer not to say	17	0.8	100.0

Since the thesis aimed for a representative sample of the working population in the UK, a broad range of educational qualifications was required. Table 4-4 shows a summary of the sample's level of education. The majority of respondents in this sample had completed a Bachelor's (36%) or Master's (25%) degree. However, 425 participants (a total of 20.4%) did not have any University or professional qualification, which reflects a lower representation of this group compared to the official number published by the Office for National Statistics (ONS). A relatively large number (8.8%) had a doctoral qualification, which is significantly larger than the average number found within the population (this issue is discussed in Chapter 5) and 9.8% had a postgraduate diploma (PG) or higher diploma, or a professional qualification. Five participants (0.2%) chose not to report their level of education. Comparing these characteristics to the official numbers published by the ONS, the sample's representation of individuals with a higher education degree is higher than the official statistics, which reported that 42% of all individuals aged between 21 and 64 held a HE qualification. Overall, it is a slightly skewed representation of the population, underrepresenting groups in A* to C grade

GFSE's, "other" not recognized qualifications and no qualifications at all that, according to the ONS, officially represent 37% of the overall working population compared to 20.6% in this sample (Clegg, 2017). However, despite this small deviation from the overall population, the sample still represents the wider working population in the UK.

Table 4-4 Summary of the Sample Level of Education

	Frequency	Percent	Cumulative Percent
Secondary Education	206	9.9	9.9
A-level Qualification	219	10.5	20.4
Bachelor`s Degree	752	36.0	56.5
Master`s Degrees	521	25.0	81.5
Doctoral Level	183	8.8	90.3
PG Diploma	37	1.8	92.0
Higher Diploma / Professional Qualification	166	8.0	100.0
Not answered	5	0.2	

Overall, 18 different sectors were pre-defined for this thesis, consisting of commonly applied descriptions of work sectors by the Office for National Statistics and previous academic research. All 18 work-sectors are represented by at least 30 participants. Table 4-5 shows the summary of the sectors covered in this sample. Noticeable is the large proportion of participants (20.2%) who were working in the education sector, which consists of higher education, primary education as well as childcare and private education institutions. Relatively low levels of representation were found in real estate and accommodation industries ($n = 35$), hotel and food services ($n = 37$) and in the sports or agricultural sectors ($n = 33$). Therefore, it could be argued that the education sector is somewhat overrepresented, yet this needs to be contextualised considering that this is the fourth largest industry in terms of employment in the UK (Williams, 2018). Also, the retail and trade sector, which employs about 15.2% of all working individuals in the UK is somewhat underrepresented.

Table 4-5 Summary of Participants' Work Sectors

	Frequency	Percent	Cumulative Percent
Education	423	20.2	20.2
Manufacturing & Engineering	220	10.5	30.7
Arts, Entertainment, and Recreation	204	9.8	40.5
Finance, Insurance & Legal Services	168	8	48.5
Administrative & Support Service Activities	133	6.4	54.9
Scientific or Technical Services	124	5.9	60.8
Consulting	117	5.6	66.4
Information & Communication	112	5.4	71.8
Health Care and Social Assistance	109	5.2	77.0
Construction	88	4.2	81.2
Retail, Trade	70	3.4	84.6
Government & Public Administration	62	3	87.6
Transportation & Storage	59	2.8	90.4
Utility (Electricity, water, waste)	52	2.5	92.9
NFPO	42	2	94.9
Hotel and Food Services	37	1.8	96.7
Real Estate & Accommodation	35	1.7	98.4
Sport or Agriculture	33	1.6	100
Not answered	1	0	

Even if 'department' is not a commonly used as a demographic variable in management studies, it was included in this thesis as previous research showed that grit has a significant effect on individual performance in the sales department and questioned whether this effect is context specific or not (Dugan *et al.*, 2019). An overview of the distribution of departments where participants were working is shown in Table 4-6. The largest number of participants were based in the HR area with 11.1% ($n = 231$). A lower representation in this sample were freelancers who did not specify their department (7%, $n = 14$) as well as participants who responded with sport or training (0.6%). Research and Development (7.0%), Operations (6.7%) and Marketing and Public Relations (6.0%) were represented in a relatively large number. A portion of the sample (8.6%) specified their department as general management or managing director that did not meet any specific pre-defined department, and these are listed and analysed separately ($n = 181$). Two participants did not report their department (0.2%) or professional area of work.

Table 4-6 Summary of the of Participants Work Departments

	Frequency	Percent	Cumulative Percent
Human Resources	231	11.1	11.1
Research & Development	147	7	18.1
Operations	139	6.7	24.8
Marketing / Public Relations	125	6	30.8
Administration Services	117	5.6	36.4
Accounting & Finance	114	5.5	41.9
Support Services	114	5.5	47.4
Sales	113	5.4	52.8
Self Employed	102	4.9	57.7
Managing Director	99	4.7	62.4
Professional Services	94	4.5	66.9
Information Technology	88	4.2	71.1
Health Services	86	4.1	75.2
Arts / Design	85	4.1	79.3
Management	82	3.9	83.2
Real Estate Services	73	3.5	86.7
Production	69	3.3	90
Education Services	49	2.3	92.3
Consulting	38	1.8	94.1
Legal	34	1.6	95.7
Other	32	1.5	97.2
Purchasing	27	1.3	98.5
Freelance	14	0.7	99.2
Sport / Training	13	0.6	99.8
Not answered	4	0.2	

Table 4-7 shows participants' position or level of position. The distribution was dominated senior managers (33.8%, $n = 706$). On the other side of the spectrum, only 0.8% of participants ($n = 16$) were in an apprenticeship or learning, and only 3% ($n = 63$) were skilled workers. 102 (4.9%) were self-employed and 14 reported to be freelancers (0.6%). Trained professionals were the second largest group (15.5%, $n = 325$) followed by junior managers (11.4%, $n = 239$). 2.4% ($n = 52$) of participants did not specify their position. Overall, the distribution was slightly imbalanced with a major part of the sample being in the area of senior

management and a relatively small number of skilled workers. This reflects a common issue in this type of research using online surveys, which is the lack of participation of shop floor workers (Gill and Johnson, 2010; Bryman and Bell, 2011). Nevertheless, the sample encompassed all important occupation areas with good representation in each group.

Table 4-7 Summary of Participants' Current Positions

	Frequency	Percent	Cumulative Percent
Senior Management	706	33.8	33.8
Trained Professional	325	15.5	49.3
Junior Management	239	11.4	60.7
Self-employed / Partner	192	9.2	69.9
Administrative Staff	186	8.9	78.8
Consultant	114	5.5	84.3
Support Staff	103	4.9	89.2
Researcher	93	4.5	93.7
Skilled Worker	63	3	96.7
Other	52	2.4	99.1
Apprentice	16	0.8	99.9

This study sample displayed an average working experience of 23.4 years (M = 23, *SD*. = 12.56), ranging from less than one year to up to 58 years. The mean work experience reported by the sample reflected the aging working population in the UK and emphasized the importance of factors to be implemented in organisational considerations that are involved in prolonged individual performance and success. Table 4-8 shows a summary of participants' reported work experience. In this thesis, more than half of respondents reported having more than 20 years of work experience overall (52.7%). Only 1.9% had work experience of less than one year (*n* = 39) and 6.7% had work experience for less than five years (140). However, these numbers could be related to the majority of participants being in the age group of 46 - 55 years. Considering the learning and development curve in the first few years within a working environment (Schein, 2003; Bauer and Erdogan, 2011), these numbers are sufficient to have a first look into the potential effects accumulation to the job could have on the development of the individual level of grit.

Table 4-8 Summary of Samples' Overall Work Experience

	Frequency	Percent	Cumulative Percent
21 – 35 years	764	36.6	36.6
10 – 20 years	610	29.2	65.8
36 – 49 years	308	14.7	80.5
5 – 9 years	191	9.1	89.6
1 to 4 years	101	4.8	94.4
Not answered	46	2.2	96.6
Less than one year	39	1.9	98.5
More than 50 years	30	1.4	99.9

Table 4-9 shows a summary of the in-role work experience was reported by participants. In-role work experience ranged from less than one year up to 48 years ($M = 8.12$, $SD = 8.12$). Generally, only about half of the participants reported their in-role experience overall (1.181 participants). In this group, 50.7% reported less than 6 years of in-role experience and 49.3% ($n = 582$) reported 6 or more years. The largest group of participants with a representation of 13% ($n = 271$) reported less than one-year of in-role experience and the smallest (3.9% - $n = 81$) had more than 20 years of in-role experience. The rest (42.4%) had between six and twenty years of in-role experience. Despite the fact that 43.5% did not answer this question, the overall distribution is comparable to numbers of currently employed individuals who stay on average 8.5 years in their current organisation, often in a similar role (Macaulay, 2003; CIPD, 2013). Therefore, the distribution could be considered representative of the wider workforce, also representing a trend towards shorter employment by younger generations (CIPD, 2013).

Table 4-9 Summary of Samples' In-Role Work Experience

	Frequency	Percent	Cumulative Percent
1 Year or less	271	12.9	12.9
6 - 10 Years	251	12	25
11 - 20 Years	250	12	37
2 - 3 Years	177	8.5	45.5
4 - 5 Years	151	7.2	52.7
More than 20 Years	81	3.9	56.6
Not answered	908	43.5	100

Leadership experience describes the time in years that a participant did spend in a position being responsible for fellow employees. Therefore, only individuals who reported a senior position were able to include this information. 678 out of 706 senior managers reported their experience and leadership experience of senior management participants ranged from less than one year (starting at 1 month) up to 44 years (528 months) with a mean of 7.3 years ($SD = 7.9$). 18.4% of respondents reported an experience of one year or less ($n = 123$) and 54 having more than 20 years of experience, providing a good distribution of leadership experience in this sample. See a summary of the distribution in Table 4-10.

Table 4-10 Distribution of the Samples' Experience in a Senior Management Position

	Frequency	Percent	Cumulative Percent
3 - 5 years	157	7.5	22.5
6 - 10 years	130	6.2	41.1
One year or less	123	5.9	58.8
1 - 2 years	94	4.5	72.3
11 - 15 years	66	3.2	81.9
More than 20 years	54	2.6	89.7
16 – 20 years	45	2.2	96.3
Not Answered	75	3.6	99.9

The descriptive statistics and intercorrelations of all research variables are presented in Table 4-11. Considering the theoretically possible mean of the grit scores, the participants mean grit level was moderately high with 3.82 ($SD = .59$). The grit dimensions were measured on a five-point Likert scale and with a mean of 4.12 ($SD = .65$) and participants rated their perseverance of effort on average higher than their consistency of interest with 3.51 ($SD = .76$). Individual performance ratings for task performance were on average very high ($M = 4.56$, $SD = .53$). Similarly, OCB that was measured on a 7-point Likert scale and was on average also rated high ($M = 5.61$, $SD = .82$).

The mean level of innovative performance was rated moderate by the research participants ($M = 3.62$; $SD = .74$). Stress ratings for overall stress ($M = 2.88$, $SD = .69$) and for both subscales were moderate, with challenge stress being rated slightly higher ($M = 3.04$, $SD = .85$) than hindrance stress ($M = 2.69$, $SD = .83$). Resilience and PsyCap were at the mean level rated moderately high. Resilience was measured on a 7-Likert scale and showed a mean level of $M = 5.74$ ($SD = .73$). PsyCap was measured on a 5-point Likert scale and showed a mean level of $M = 3.99$ ($SD = .53$).

An interesting observation of the basic correlations between the study variables in Table 4-11 is that almost all dependent and independent variables are correlated on a statistically significant level. However, considering the theoretical relationships of the observed variables and the empirical findings from previous research (see Chapter 2) already indicated a statistically significant correlation between these. In line with expectations, grit showed a statistically significant positive correlation to the three dimensions of job performance, task performance (r = .36, $p < .01$), OCB (r = .21, $p < .01$) and innovative performance (r = .17, $p < .01$), and to PsyCap (r = .27, $p < .01$) and resilience (r = .34, $p < .01$). Also, it was negatively correlated with overall (r = -.21, $p < .01$), challenge (r = -.16, $p < .01$) and hindrance stress (r = -.18, $p < .01$). Similarly, PsyCap and resilience were positively correlated to the three job performance dimensions and negatively related to all three measures of stress on a statistically significant level.

Grit was also statistically significantly correlated to the demographic variables: age (r = .09, $p < .01$), current position (r = -.07, $p < .01$), overall work-experience (r = .10, $p < .01$), and in-role experience (r = .08, $p < .01$). The findings also showed that all three performance dimensions were positively correlated with each other. One interesting finding is the negative correlation between task performance and challenge stress (r = .11, $p < .01$), which was contrary to previous research. Hindrance stress showed negative correlations to all three dimensions of performance. The new conceptualized person-centred grit model, revealed that 28.6% of the overall sample were described as gritty (n = 597) and 1,492 participants as not gritty. The observed correlations of person-centred grit with the overall grit score were moderate with an r = .69 ($p < .01$). The correlations to the individual grit dimensions were lower but moderate, with r = .66, $p < .01$ for consistency and r = .47, $p < .01$ for perseverance. The correlations with the three performance measures are positve but lower than for the overall model of grit (r_{task} = .26, r_{OCB} = .14, r_{Innov} = .12, $p < .01$).

As discussed in Section 3.6, before commencing the hypothesis testing, an independent sample t-test was performed to compare the results of the group of regularly employed and the group of self-employed and freelancing participants for statistically significant differences in their levels of grit and task performance. If no statistically significant differences are observed, the following analyses can be conducted as one dataset for the whole sample. As discussed in Section 3.5, the two dimensions of job performance, OCB and innovative performance, were only assessed for regularly employed participants, therefore, findings including these two measures exclude the group of self-employed/ freelancing individuals, and are reported for this group only (n = 1838).

Table 4-11 Variable Means and Bivariate Inter-Correlations of all Research Variables

		M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	Overall Grit	3.82	0.59																			
2	Perseverance	4.12	0.65	.80**																		
3	Consistency	3.51	0.76	.86**	.37**																	
4	Task Performance	4.56	0.53	.36**	.36**	.25**																
5	OCB[1]	5.61	0.82	.21**	.26**	.10**	.23**															
6	Innovative Performance[1]	3.62	0.74	.17**	.21**	.09**	.20**	.38**														
7	Stress	2.88	0.69	-.21**	-.11**	-.22**	-.12**	-.08**	-.05*													
8	Challenge	3.04	0.85	-.16**	-.07**	-.19**	-.11**	-.00	-.03	.85**												
9	Hindrance	2.69	0.83	-.18**	-.12**	-.18**	-.08**	-.15**	-.06*	.77**	.33**											
10	PsyCap	3.99	0.53	.27**	.29**	.17**	.33**	.40**	.49**	-.32**	-.25**	-.28**										
11	EmpRes	5.74	0.73	.34**	.36**	.22**	.35**	.48**	.32**	-.16**	-.11**	-.16**	.42**									
12	PC Grit	0.29	0.45	.69**	.47**	.66**	.26**	.14**	.12**	-.18**	-.14**	-.16**	.23**	.22**								
13	Age	-	1.23	.09**	.04	.10**	.07**	.15**	.16**	-.07**	-.05*	-.06**	.16**	.02	.08**							
14	Gender	-	0.50	-.03	-.03	-.02	-.03	-.01	.14**	-.08**	-.06**	-.08**	.16**	-.06**	.01	.18**						
15	Educational Level	-	2.57	.01	-.01	.02	.01	-.04	.01	.01	-.01	.02	.00	.01	-.00	.06**	.01					
16	Work Sector	-	5.74	.02	.03	.01	-.01	.03	.06**	-.00	.03	-.04	.09**	-.05*	.02	.05*	.09**	-.01				
17	Department	-	6.61	-.02	-.04	-.00	-.08**	-.00	.05*	.01	.02	-.01	.02	-.04	-.02	.01	.16**	-.04*	.08**			
18	Position	-	3.83	-.07**	-.09**	-.03	-.06**	-.21**	-.30**	.10**	.01	.17**	-.26**	-.15**	-.03	-.09**	-.14**	.00	.07**	.02		
19	Experience	23.45	12.56	.11**	.06**	.11**	.08*	.17**	.16**	-.12**	-.09**	-.10**	.20**	.06**	.10**	.90**	.19**	.03	.03	.02	-.15**	
20	In role Experience	8.12	8.12	.08**	.05	.08**	.06	.07*	.11**	-.05	-.03	-.05	.11**	-.02	.09**	.57**	.20**	-.05	.03	.03	-.05	.58**

Notes: [1] = Only for regularly employed employees, OCB = Organisational Citizenship Behaviour, EmpRes = Employee Resilience, PC Grit = Person-Centred Grit, $^*p < .05$, $^{**}p < .01$

Table 4-12 shows the results of the t-test, and provides evidence that there are no statistically significant differences in the distribution of grit levels (M_E = 3.81, SD = .58; M_{SE} = 3.82, SD = .63; t(2087) = -0.17, p = .86), the two sub dimensions of grit consistency (M_E = 3.50, SD = .76; M_{SE} = 3.55, SD = .79; t(2087) = -1.01, p = .30) and perseverance (M_E = 4.13, SD = .64; M_{SE} = 4.09, SD = .74; t(2087) = .80, p = .43), and task-performance (M_E = 4.56, SD = .51; M_{SE} = 4.53, SD = .63; t(2087) = .71, p = .48) between the two groups. Thus, the findings suggest that the mean scores of the assessed measures did not differ between the two groups and therefore, all following statistical analyses, including regressions and NCA are run for both groups of working individuals together and findings are not reported separately. This is done in order to enhance comprehensibility and readability of the results.

Table 4-12 Summary of t-test Analysis

	Employed n = 1838		Self-Employed / Freelancer n = 251			
	Mean	*SD*	Mean	*SD*	*t*	*Sig.*
Grit	3.81	0.58	3.82	0.63	-0.17	.86
Consistency	3.50	0.76	3.55	0.79	-1.01	.30
Perseverance	4.13	0.64	4.09	0.74	0.80	.43
Task Performance	4.56	0.51	4.53	0.63	0.71	.48

This section provided a detailed description of the demographic characteristics of the study sample. Additionally, it provided an overview of the descriptive statistics and for all independent, dependent and control variables. It showed the intercorrelations between all study variables and provided evidence for the comparability of the data for regular employees and self-emplyed individuals and freelancers. The following sections of this chapter provide detailed outlines of the results of the analzses that aimed to answer the three research questions and the hypotheses testing.

4.3 Results of testing the Research Questions

This section presents the results of the data analysis that set out to answer the three research questions. The aims of this part of the research were to test the validity of the higher-order conceptualisation of grit, the preciseness of the Grit-S Scale, and to test the uniqueness of the

grit construct, in comparison to two conceptually related personality traits PsyCap and resilience.

SEM was used to test the first three research questions that evaluated the applicability of the second-order model of grit, its distingtiveness to the concepts PsyCap and resilience, and the Grit-S Scale operationalisation in the business context. To answer RQ1 and RQ2 that explored whether grit is indeed a higher-order model that is suitably represented by the two dimensions perseverance and passion and appropriately measured by the Grit-S Scale, the structural and the measurement model were evaluated. The measurement model in this case included the two latent variables perseverance and consistency and the corresponding manifest indicators. The concepts are represented by latent variables as they are not directly measured by a certain measurement, but because they are estimated by their direct indicators (Tabachnick *et al.*, 2019). Indicators are the individual items that are answered by the participants and thus are directly observed. Additionally, so called error terms (e) are added to each indicator variable to indicate that there is a potential for other than the latent variables that could affect the result of the measurement (Blunch, 2013, p. 5).

The measurement model is tested by evaluating various model fit indices and the two main types of validity using the whole sample of this dissertation ($n = 2089$). The CFA model allows inferential testing not only of the overall model, but also the significance of the factor loadings. Another set of CFA's was run to answer the third research question. Following a similar procedure. First, the alternative models of grit that included PsyCap and resilience as additional dimensions were tested to explore if would be a better model than the current conceptualisation of grit as perseverance and passion. In a second step, a factor analysis was run to check for discriminant validity of the measured concepts and to establish unidimensionality of the grit concept.

4.3.1 CFA Results for the Structural and Measurement Model of Grit

This section provides a detailed evaluation of the key CFA results for testing the higher-order model of grit. Initially, the second-order model is tested and compared with the alternative model that describes perseverance and consistency as two distinct but correlated grit facets. Figure 4-1 shows the second-order model that was used for the CFA analysis and the alternative first-order model of grit. In a first step, model fit indices of the second-order model and the alternative first-order model were compared. As shown in Table 4-13, there are only minor differences in the proposed higher-order model of grit and its alternative first-order conceptualisation. Two of the four indices indicated a better fit for the second-order model, two

indices suggested that the first-order model is a better representation of the data. Therefore, the values of the comparison suggest that the alternative model of grit does not provide a more plausible conceptualisation of the data. Therefore, the following CFA data is analysed using the second-order conceptualisation of grit.

Table 4-13 Summary of the Model Fit Indices
***Comparison between the Higher-Order Model of Grit and the First-Order Alternative Model***

Model fit indices	Second-Order	First-Order	Criteria
	Values	Values	
CMIN	226.608	239.197	the lower the better
RMSEA	0.080	0.079	< 0.08, ideally < 0.05
TLI	0.906	0.904	> 0.9
CFI	0.932	0.928	> 0.9 acceptable

4.3.1.1 Chi-Square Statistic

To confirm the current higher-order model of grit, a non-significant χ^2 fit statistic is expected and desired. This would be represented by a low χ^2 value and a large p-value (Hair *et al.*, 2018). The present higher-model model of grit was χ^2 (19): 226.61 (*p* = .001) revealing an undesirable statistically significant difference and suggesting a poor model fit.

However, Hair *et al.* (2010, p. 661) argued that caution needs to be taken when interpreting chi-square results from model testing that applied large sample sizes (n > 400). The authors demonstrated that the method becomes highly sensitive and detects almost any difference, and therefore suggests poor fit for common goodness-of-fit measures. Hair *et al.* (2010, pp. 665-6) pointed out that "even if the differences in the covariance matrices (i.e., residuals) remained constant, the $\chi2$ value is reported to inflate with increasing *n*." Therefore, the $\chi2$ results should not be used as the only indicator of model fit when running SEM with larger sample sizes.

Figure 4-1 CFA Model Comparing the Higher-Order Model of Grit with the Alternative First-Order Model of Grit
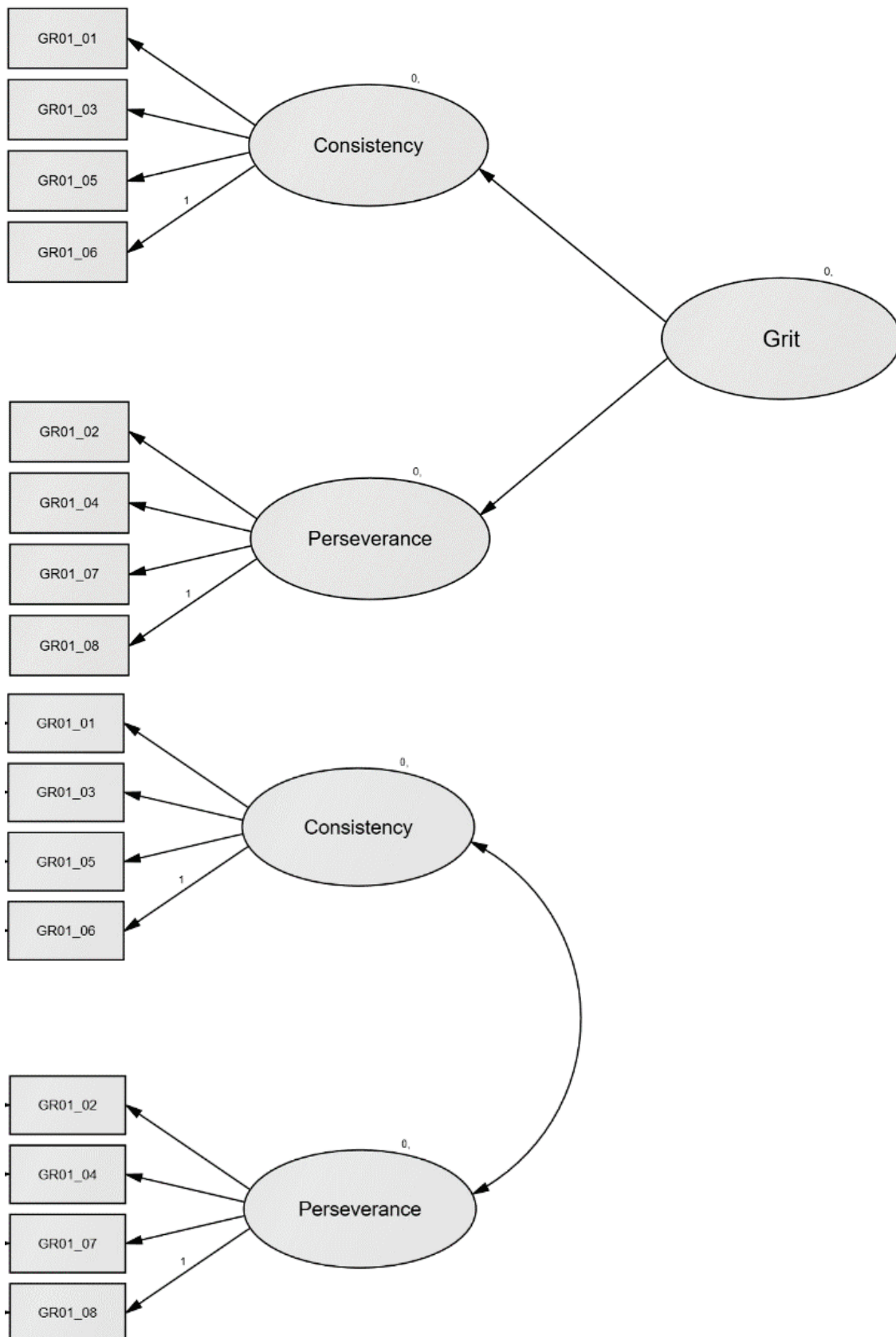
Note: Error and Disturbance Terms were Omitted in the Model for the Sake of Clarity and Readability.

4.3.1.2 Sample Covariance and Correlation Matrix

The results of the sample correlation matrix of reasonably high correlations between the items of each scale (the matrices can be found in Appendix R). For perseverance, all inter-item correlations fall in the range from .307 to .591. These are mostly in the acceptable range, except for the correlation between item GR01_07 and GR01_08. The indicators of consistency of interest were correlated in the range of .340 and .447. Therefore, all items on this scale showed good to acceptable correlation levels and, despite the two items in the perseverance scale, this measure suggests that the items are appropriately measuring the two dimensions of grit. However, an interesting observation is the relatively high inter-correlations between the perseverance indicator GR01_07 and all four items of the consistency scale (GR01_01 = .252, GR01_03 =. 370, GR01_05 = .359, GR01_61 = .346). These are not alarmingly high but, considering the intercorrelations between GR01_07 and the other perseverance indicators are in a similar range, there seems to be a lack of clarity in terms of the desired measurement model and distinguishability of the two sub-dimensions.

4.3.1.3 Model Fit Indices

Following recommendations by Hair *et al.* (2018) and Kline (2015), various absolute and incremental model fit indices were assessed. Included were the $\chi 2$ CMIN, $\chi 2$ CMIN/DF, RMSEA, CFI and TLI.

As reported above, the CMIN measured for this model was $\chi 2$ (19): 226.61 (*p* = .001). The CMIN/DF observed was 14.5 and therefore far beyond the suggested acceptable threshold of 5. However, similar to the CMIN, the test is subject to a high sensitivity if assessed on large sample sizes. Therefore, it has been suggested to not exceed 500 individuals (Hair *et al.*, 2018). As a result, the following additional statistics also need to be taken into account when evaluating the model fit. The observed RMSEA for the tested higher-order model of grit was .080, which is basically at the borderline of being acceptable according to both Hair *et al.* (2018) and (Kline, 2015). The same was observed for the CFI, which reported a model fit of .932. This indicates an acceptable-to-good model fit of the data. Finally, a value of .906 for the TLI suggests that the model fits the data well, being above the threshold of .9 and below 1.0, which could indicate a model over-specification or a limited model parsimony (Hair *et al.*, 2018). As shown in the summary of findings presented in Table 4-14, the majority of the model fit indices report acceptable model fit for the high-order model of grit. Despite the high and statistically

significant numbers for the χ^2 statistics that might be due to the large sample, all other values are at or better than the suggested threshold and thus indicate an overall model fit.

Table 4-14 CFA Model Testing – Summary of the Model Fit Indices

Model fit indices	Values	Criteria
CMIN	226.608	the < the better
CMIN/DF	14.528	< 2 – ideal, 2 – 5 – acceptable
RMSEA	0.080	< 0.08, ideally < 0.05
TLI	0.906	> 0.9
CFI	0.932	> 0.9 – acceptable, > 0.95 – good

To check the unidimensionality of the concepts, the factor loadings are tested. When checking the factor loadings (standardized regression weights) the values for all observed indicators should be higher than 0.5 to be considered acceptable and representing only one underlying trait (Hair *et al.*, 2018). As shown in Table 4-15, this is not the case for all perseverance of effort items.

Table 4-15 Standardized Regression Weights for the Grit-S Scale

Item	Factor	Estimate
GR01_06	F1	.650
GR01_05	F1	.652
GR01_03	F1	.701
GR01_01	F1	.544
GR01_08	F2	.800
GR01_07	F2	.737
GR01_04	F2	.560
GR01_02	F2	.461

The factor loading estimate for GR01_02 is .461 and thus falls below the threshold of 0.5. Also, the items GR01_01 (consistency of interest) and GR01_04 (perseverance of effort) are below the value of 0.6 which, by itself, can be seen as critical. Overall, three out of eight

items are of concern when considering the factor loadings. This is a potential indicator for issues with scale dimensionality and requires further evaluation that is tested in the upcoming sections. In a second step, the modification indices were examined to detect any potential cross loadings between the items. Interestingly the relationship between the error term 6 (e6) and F1 was above the suggested threshold of > 20 (Hair *et al.*, 2018). Moreover, the expected parameter change would be .135 higher if this item would be given up the equality constraint. Generally, this indicates that the item GR__07 "I finish whatever I begin" on the perseverance scale could be considered problematic. Thus, in total, three items show issues due to factor loadings and potential cross-loadings between the two dimensions consistency and perseverance.

Following the testing of the overall model fit of the grit construct, reliability and validity assessments were conducted to evaluate the psychometric properties of the Grit-S Scale in the business context. Therefore, and following suggestions by Hair *et al.* (2018) to assess the internal consistency of grit, four estimates were evaluated: Cronbach's Alpha, inter-item correlations, CR and AVE. First, the Cronbach's Alpha coefficient was calculated for the overall grit score, and for both dimensions individually. Even if there is no strict cut-off threshold, which is mainly because of the potential heterogeneous nature of some concepts, internal consistency is considered adequate or good if $\alpha > 0.7$ (Pallant, 2016). The observed Cronbach's alpha values in this study were $\alpha = 0.77$ for the overall grit score, $\alpha = 0.73$ for perseverance of effort and $\alpha = 0.71$ for consistency of interest. Therefore, all three observed Cronbach's Alpha values were above the threshold level and showed acceptable internal consistency. Overall, the CFA results indicate that the current model of grit is acceptable in the business context but shows weaknesses across all measurements.

In the next step, inter-item-correlations were checked to test if all items reach a desired correlation of > 0.3, which indicates that all indicators represent the same concept (Hair *et al.*, 2018). As expected, the inter-item correlations for all study indicators were above the threshold of $r = .3$ and thus suggested that all indicators measured the same concept. This was the case for both dimensions of perseverance and passion and suggests that inter-item correlations are on an acceptable level.

4.3.1.4 Validity

After evaluating the model fit indices of the higher-order model of grit and the estimation of reliability, the quality of the measurement model was checked in more detail. To evaluate the quality of content validity, the two measures, convergent and discriminant validity are tested. To assess convergent validity, the factor loadings, composite reliability and AVE are explored.

Using the maximum likelihood estimates and observing statistically significant relationships ($p < .05$), it is evident that all observed indicators are indeed measuring the latent variables perseverance and consistency (see **Table 4-16**). Subsequently, factor loadings are used to assess whether there are any cross loadings between the items onto more than one or the opposite dimension (Hair *et al.*, 2018). As shown in **Table 4-15**, except for one item being lower than 0.5 (.461), all other values have satisfying scores. These are necessary to estimate convergent validity by determining AVE. AVE is calculated by using the formula:

$$AVE = \frac{\sum_{i=1}^{n} L_i^2}{n}$$

Following guidance by Hair *et al.* (2018), L_i represents the observed standardized factor loadings for the *i*th measured variable. This term is divided by the total number of indicators for the represented construct, represented by *n*. For perseverance the observed level of AVE was 0.409 and thus < 0.5. For consistency the observed AVE was 0.427, also < 0.5. The findings indicate that there might be an issue in terms of the convergent validity of grit.

Table 4-16 Summary of Grit Facets Factor Loadings, AVE, CR and r^2

	λ_{F1}	λ_{F2}	λ^2	e	AVE	CR	r	SIC (r^2)
Perseverance	.650		0.423	0.58				
	.652		0.425	0.57	0.409	0.733		
	.701		0.491	0.51				
	.544		0.296	0.70			0.504	0.254
Consistency		0.800	0.640	0.36				
		0.737	0.543	0.46	0.427	0.741		
		0.560	0.314	0.69				
		0.461	0.213	0.79				

Note: λ = regression weights, e = error terms of regression weights, AVE = Average Variance Extracted, CR = Composite Reliability, SIC = Squared Correlation Estimates

In a subsequent step, composite (or construct) reliability was calculated from the squared sum of factor loadings, using the formula:

$$CR = \frac{(\sum_{i=1}^{n} L_i)^2}{(\sum_{i=1}^{n} L_i)^2 + (\sum_{i=1}^{n} e_i)}$$

In this case, e_i represents the error variance terms for the observed construct. For perseverance a CR of 0.73 was observed and for consistency 0.74. Both of these values lie above the suggested threshold 0.7 and are therefore considered acceptable (Hair *et al.*, 2018).

In order to establish discriminant validity, the AVE values are compared to the constructs' corresponding squared correlation estimates (SIC). In a first step, correlation values are squared and in the next step are compared to the observed AVE values. Generally, in order to satisfy the assumption of discriminant validity, observed AVE values need to be higher than the squared correlation estimates. Only then is discriminant validity is established, describing the distinctive measurement of only one latent variable of the indicators. The observed SIC in this study was 0.25 and the AVE = 0.41 for perseverance and 0.43 consistency. Therefore, the measurement model passes the test and provides good evidence of discriminant validity. Additionally, criterion validity was assessed in the form of concurrent validity and predictive validity, of which the analysing process is described in detail in the following sections. In summary, the Grit-S scores displayed a good predictive validity for individual task-performance and thus, establish evidence for the existence of criterion validity.

By reviewing the findings of the CFA analysis, the structural model and the measurement model were subject to thorough testing of model fit, reliability and validity. Overall, the findings of the conducted CFA analysis revealed an overall adequate fit of the structural model, providing evidence that confirms RQ1, which hypothesised that the current higher-order model of grit is an appropriate conceptualisation of grit in the business context. However, not all indices are within the suggested thresholds, and further theoretical evaluation and discussion is needed. Overall, the findings of the CFA suggest that RQ2, which asked if the Grit-S Scale is an adequate measure of grit in business, could be answered with a yes. The CFA findings supported the two factors that are measured by four items each by the Grit-S Scale and thus provide sufficient evidence to support the use of the Grit-S Scale in the business context. Nevertheless, several issues in the measurement models reliability and validity scores were observed that need further critical inspection.

To answer the third research question that asks, if despite their theoretical similarity, grit is an empirically distinct construct to PsyCap and resilience, a second set of CFA's was run. The SEM testing was conducted in two steps. In a first step, the alternative models of grit that included PsyCap and resilience as additional dimensions were tested. Figure 4-2 (p. 150) shows the first alternative model of grit, which consists of perseverance, consistency and PsyCap. The second alternative model is shown in *Figure 4-3* (p. 151) and includes resilience

as a third dimension of grit. ***Figure 4-4*** (p. 152) shows the third alternative first-order model of grit that consisted of the four dimensions: perseverance, consistency, PsyCap and resilience.

However, as shown in Table 4-17, none of the observed model fit indices were within the acceptable range. This is a first indication that the current conceptualisation model fits the data better than any of the alternative models including PsyCap and resilience.

Table 4-17 Summary of the Model Fit Indices between the Higher-Order Model and Alternative Models of Grit

Model fit indices	CMIN	RMSEA	TLI	CFI
Second-Order Model	226.608	.080	.906	.932
Alternative Model 1 Including Resilience	1862.326	.084	.807	.836
Alternative Model 2 Including PsyCap	2478.186	.081	.762	.791
Alternative Model 3 Including Resilience and PsyCap	4549.942	.073	.748	.770
Criteria	the < the better	< 0.08, ideally < 0.05	> 0.9	> 0.9 acceptable

In a second step of the CFA, the measurement model of Alternative Model 3, which in this case included the four latent variables perseverance, consistency, PsyCap, and resilience and the corresponding – in total 29 – manifest indicators was further evaluated. The two main types of validity were explored, along with a testing of the factor loadings.

Two more models were run that included a first-order solution in which aggregated scores of all the grit and resilience scores, and all 29 items of grit, resilience and PsyCap were loaded on grit. However, none of the model fit indices was close to the acceptable range. Therefore, they were not included in any further analysis. In the following step, a factor analysis was run to establish the uniqueness of grit compared to PsyCap and resilience.

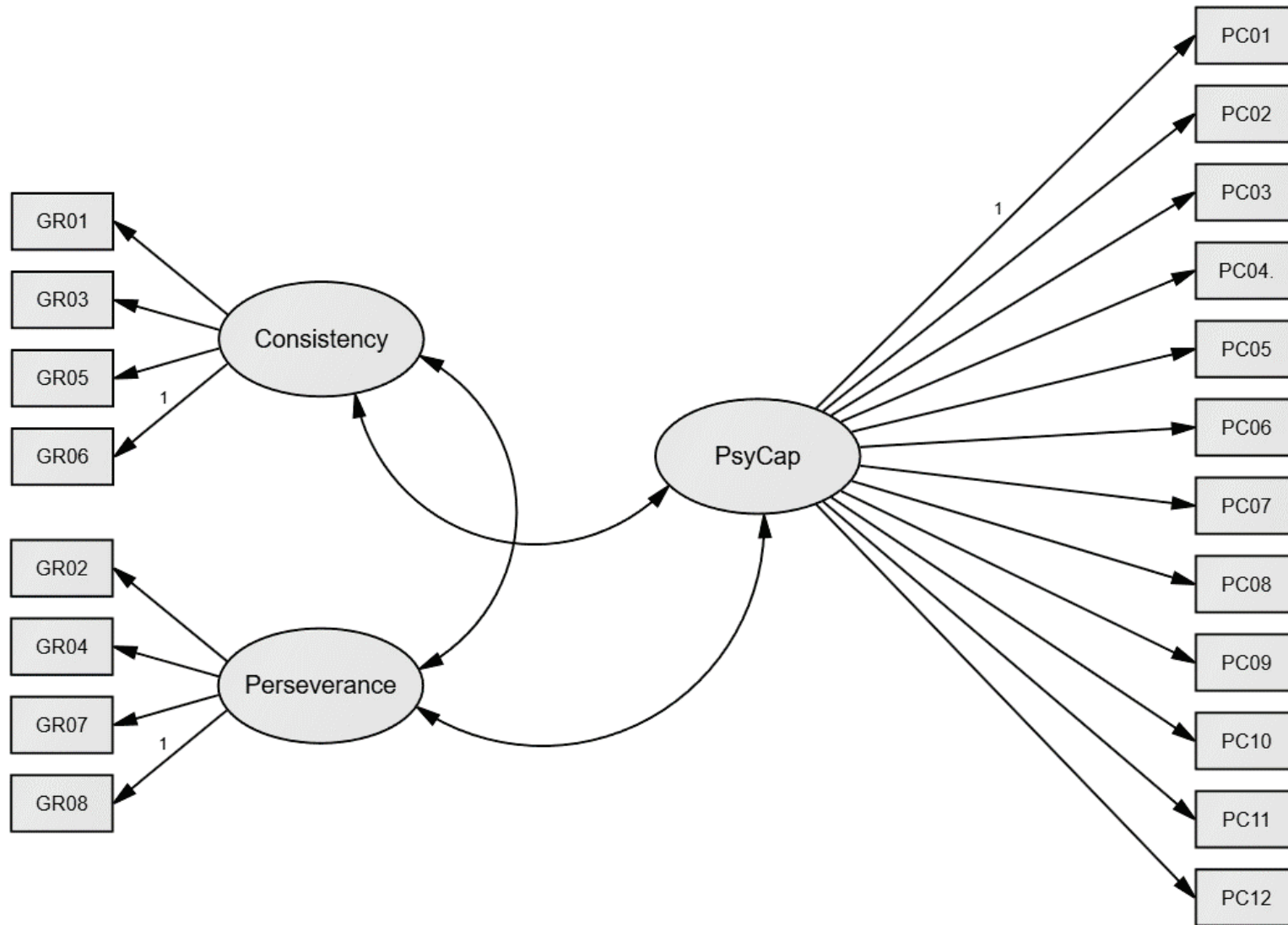*Figure 4-2 Alternative Model 1 – Consistency, Perseverance and PsyCap*

Figure 4-3 Alternative Model 2 – Consistency, Perseverance and Resilience
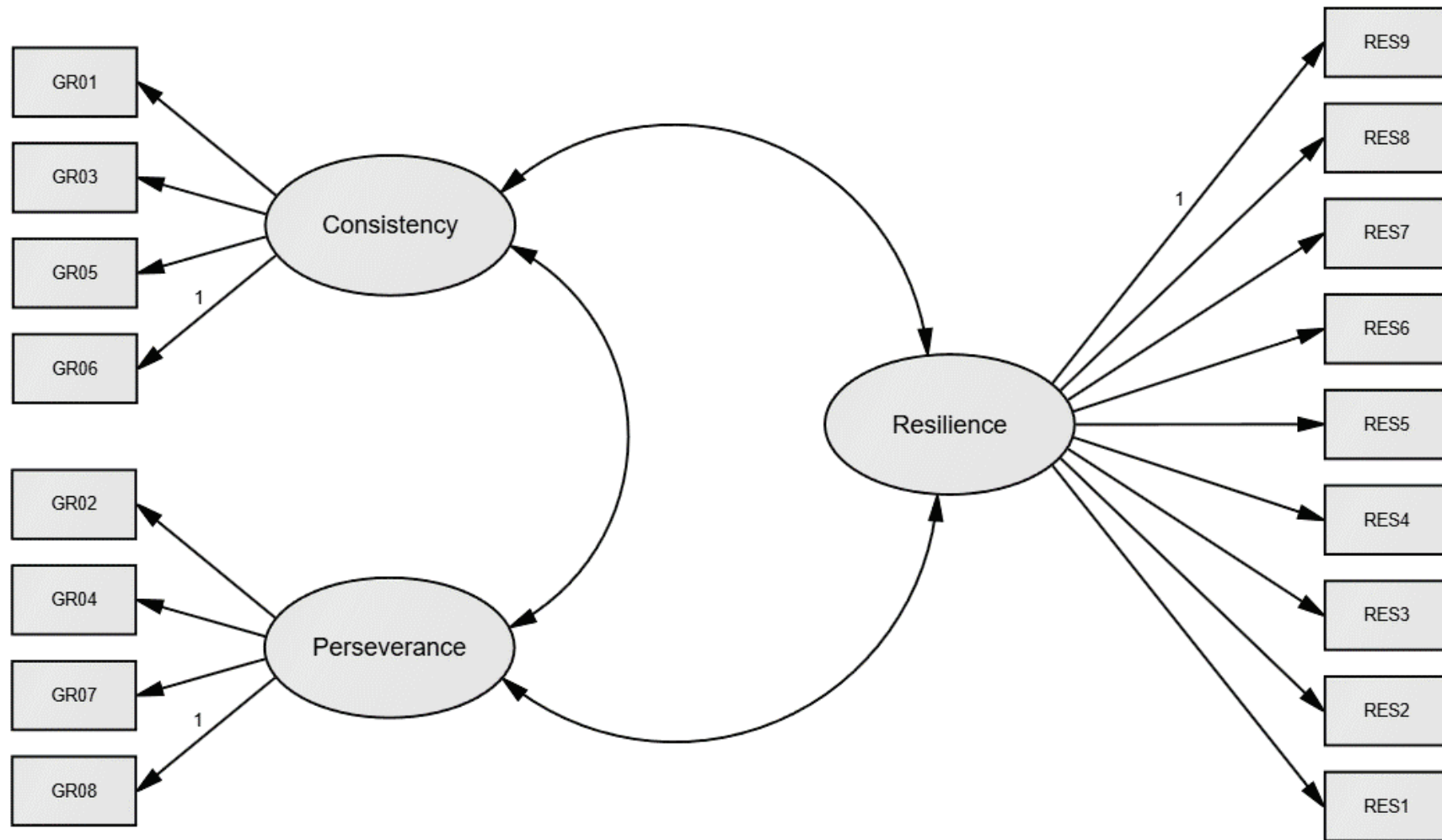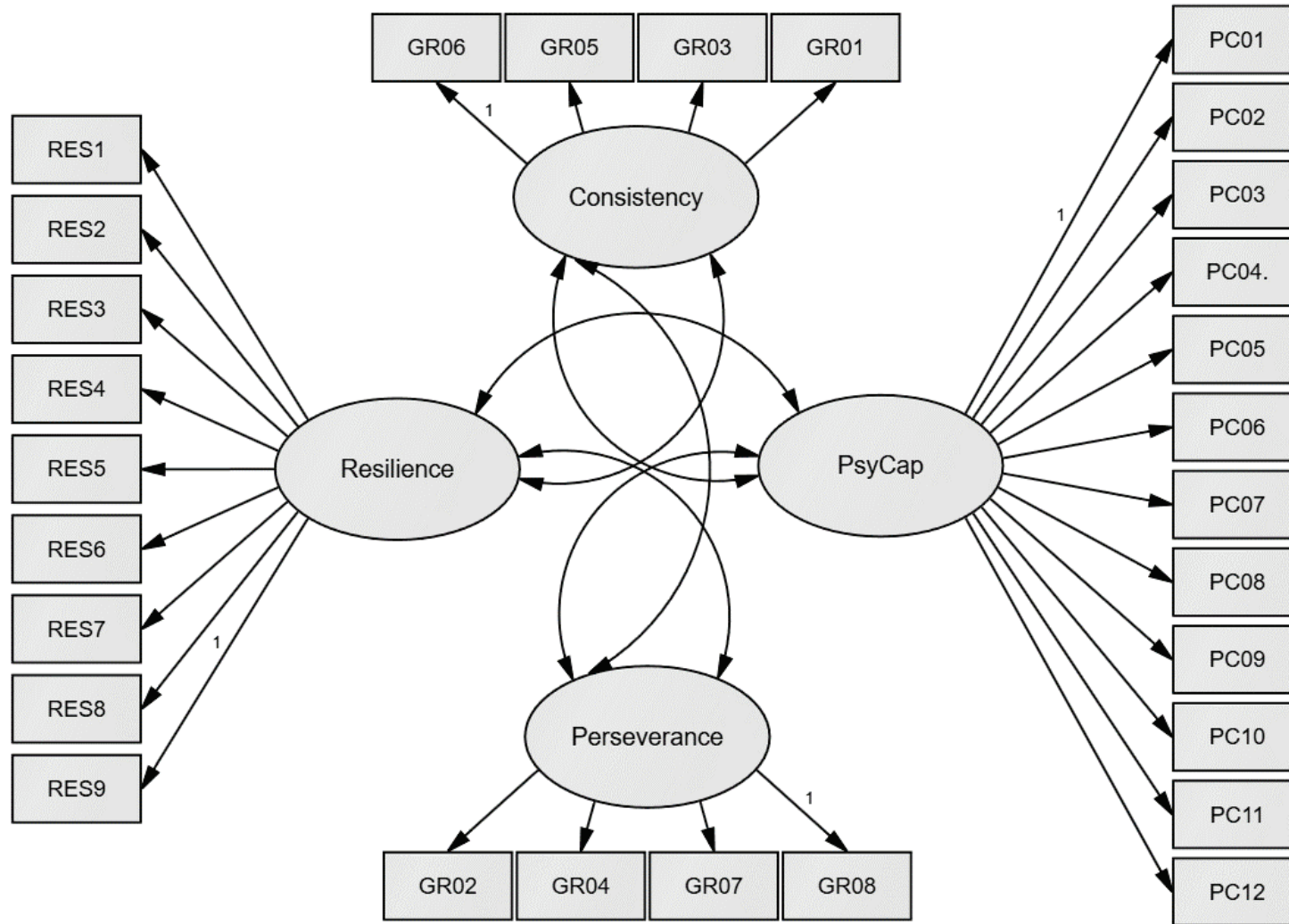
Figure 4-4 Alternative Model 3 – Consistency, Perseverance, PsyCap, and Resilience

4.3.2 Factor Analysis

A factor analysis was run to evaluate the factor loadings of the individual items of the three scales: grit, PsyCap and Resilience. This was done to check for discriminant validity of the measured concepts and to establish unidimensionality. As expected, the loadings of this model were divided onto seven main components as shown in Figure 4-5.

Figure 4-5 Scree Plot for the Factor Analysis
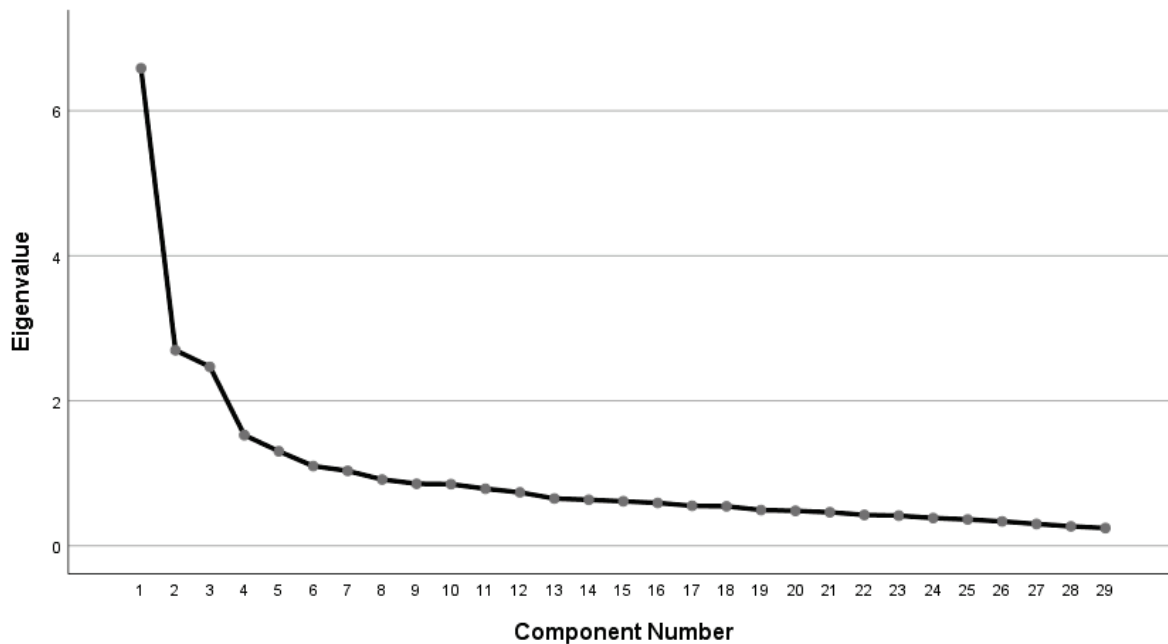
Table 4-18 (p. 155) provides an overview of the factor loadings for each measured item. A general rule provided by Hair *et al.* (2018) suggests that the values for all observed indicators should be higher than 0.5 to be considered an acceptable representation of the desired underlying component. Further, the items should only load onto one single component in order to indicate construct validity. As shown in Table 4-18, this is not the case for all perseverance of effort items. Generally, the two grit dimensions do not show any cross loadings to the PsyCap and resilience components. However, as observed in Section 4.3.1, there is a cross loading of GR_PE7 onto the consistency dimension (.433). Interestingly, there are several lower cross loadings of PsyCap and resilience items. This indicates that even if the overall distinction between the constructs is established, as expected, there are overlaps in the conceptualisation. PCQ_HO4 does not show a desirable factor loading for any of the observed components. This is also an interesting finding, as it suggests that this item ("If I should find myself in a jam at work, I could think of many ways to get out of it") that intends to measure hope does not measure any of the observed concepts or facets.

In order to establish discriminant validity, each AVE value is compared to the corresponding construct's squared correlation estimates (SIC). Correlation values are squared and in the next step are compared to the observed AVE values. Generally, in order to satisfy the assumption of discriminant validity, observed AVE values need to be higher than the squared correlation estimates. However, none of the tested alternative models showed higher SIC than AVE's. Moreover, the grit dimension consistency revealed an AVE of 0.72 and a SIC of 0.50, and perseverance an AVE of 0.69 and a SIC of 0.442. Thus, discriminant validity of the two dimensions of grit was established.

Overall, the results of the CFA and the subsequent factor analysis suggest that the two dimensions perseverance and consistency represent grit as a unique construct that is not conceptually related to the established constructs, PsyCap and resilience. Therefore, established that the grit concept is correctly conceptualised by the two dimensions of perseverance and consistency and distinct to resilience and PsyCap and thus, answering Research Question 3.

Table 4-18 Factor Analysis of all 29 Items of Grit, PsyCap and Resilience

	Component						
	1	2	3	4	5	6	7
GR_CI1	.072	.704	-.049	.059	-.040	.091	-.020
GR_PE2	.068	.087	.173	.180	.560	.118	.195
GR_CI3	.075	.740	.041	.018	.162	.056	.026
GR_PE4	.143	-.004	.044	.034	.762	.061	-.005
GR_CI5	.043	.741	.051	.015	.113	.019	-.001
GR_CI6	.058	.705	.053	.066	.153	.071	.003
GR_PE7	.056	.433	.011	.019	.655	.061	-.011
GR_PE8	.122	.166	.008	.058	.817	.018	.001
PCQ_EF1	.120	.028	.820	.111	.097	.132	.020
PCQ_EF2	.092	.002	.803	.128	.046	.174	.034
PCQ_EF3	.074	.065	.768	.170	.050	.138	.086
PCQ_HO4	.104	-.048	.267	.334	.025	.276	.188
PCQ_HO5	.108	.120	.342	.102	.083	.607	.229
PCQ_HO6	.031	.037	.165	.132	.037	.727	.178
PCQ_HO7	.073	.164	.132	.102	.088	.712	.065
PCQ_RE8	-.018	.043	-.005	.517	.045	.103	.091
PCQ_RE9	.065	.067	.208	.696	.021	.078	.248
PCQ_RE10	.052	.051	.191	.708	.044	.052	.162
PCQ_OP11	.103	-.033	.052	.265	.072	.139	.706
PCQ_OP12	.118	.027	.129	.187	.061	.337	.673
EmpRes 1	.639	-.012	.156	.108	.106	.015	-.122
EmpRes 2	.356	.079	.135	.473	.300	.084	-.191
EmpRes 3	.469	.010	.173	.493	.214	.207	-.246
EmpRes 4	.573	.061	-.092	.346	.178	.312	-.230
EmpRes 5	.507	.034	-.079	.275	.186	.401	-.160
EmpRes 6	.564	.147	-.028	.072	.094	.099	.179
EmpRes 7	.743	.085	.048	-.090	.015	-.084	.136
EmpRes 8	.790	.070	.106	-.142	.020	-.059	.151
EmpRes 9	.604	.009	.187	.222	.070	.215	.139

Note: GR = Grit, CI = Consistency of interest, PE = Perseverance of effort, PCQ = Psychological Capital Questionnaire, EF = Efficacy, HO = Hope, RE = Resilience, OP = Optimism, RES = Employee resilience, Extraction Method: Principal Component Analysis using Varimax with Kaiser Normalization Rotation.

4.4 Results of the Hypothesis Testing

The aims of this thesis were to evaluate the effects of grit on individual job performance and the experience of work-related stress in the UK working context across a variety of industries and occupations. More specifically, it aimed to test the predictive validity of grit for the three dimensions of job performance, namely task performance, OCB and innovative performane, and the two distinctive dimensions of work-related stress, challenge and hindrance stress.

The first part of this section presents the findings of the hypothesis testing, starting with the linear and hierarchical regression analsyses that evaluated the impact of grit on the perception of job performance and work-related stress. These were run to test the incremental predictive validity of grit beyond the demographic variables and the two personality characteristics PsyCap and resilience. Moreover, they include the findings of hierarchical regressions that test the difference in predictive validity for job performance and work-related stress of the overall grit score and the individual dimensions of grit. The third part includes a series of post-hoc moderated regression analysis to fully understand the relationship between grit, the two work outcomes, the demographic variables and PsyCap and resilience. Section 4.4.2 reports the findings of the NCA analysis that explored if grit, perseverance and consistency are not only sufficient but also necessary conditions for job performance and work-related stress. Lastly, Section 4.4.4 provides the results of the NCA that tested the necessary condition of the Person-Centred Model of grit for job performance.

4.4.1 Regression Analyses

To test the first set of hypotheses H1 - H3 that hypothesised a predictive validity of grit for the three measures of job performance, a set of regression analyses was run. H1 hypothesised a positive effect of overall grit on task performance. As shown in ***Table 4-19*** a statistically significant regression equation was found for grit in Model 2 ($F\varDelta$ (1,2088) = 162.65, $p < .001$), with an $\varDelta R^2$ of .121 beyond the demographic variables. Thus, the data suggests that 12.1% of the overall observed variance in task performance is explained by the level of grit. Following previous discussions (Credé, 2018), a subsequent hierarchical regression was performed to explore the predictive validity of perseverance and passion for task performance as two distinct concepts. As expected, the explained variance of the accumulated scores of perseverance and consistency for performance were higher than that of the overall grit score, explaining 14.1% of the variance in task performance ($p < .001$). This suggests that the two distinct dimensions of grit have a stronger predictive validity for task performance than the overall grit score, indicating that using the overall grit score results in a loss in predictive validity.

When exploring the unique predictive power of the two dimensions of grit, it shows that even if both dimensions accounted statistically significant for variance in task performance, perseverance is the stronger predictor. The regression coefficient of .128 suggests that when considering task performance at the mean level, a one-point change in perseverance results in a 12.8% change in task performance ($F = 305.02$, $p < .001$). To explore the unique contribution of consistency to the explanatory power in Model 3, it suggests that at the mean level of task performance, consistency accounted for an additional 1.5% ($\Delta F = 146.10$, $p < .001$) variance in task performance beyond Model 2 (***Table 4-19***).

To test H2 a regression analysis was performed in which a positive effect of grit for OCB was postulated. The regression coefficient of .086 in Model 1, as shown in ***Table 4-19***, suggests that 8.6% of the variance in OCB can be explained by the demographic variables, mainly current position ($\beta = -.16$, $p < .001$) and overall work experience ($\beta = -.18$, $p < .05$). By adding grit in Model 2, an additional 3.8% of the variance observed in OCB was explained ($R^2 = .038$), This suggests that with each change of one point in grit, a 3.8% change in OCB can be observed. Therefore, the findings provide support for H2. However, similar to H1, the regression showed that the validity of perseverance and consistency as individual determinants was higher than for the overall grit score ($\Delta R^2 = .063$, $F\Delta$ (2,1837) $= 39.90$, $p <.001$). Interestingly, the findings reveal that consistency does not add any additional explanation of variance to the model. When evaluating the individual explanation of variance of the grit demnsions, perseverance showed a statistically significant predictive validity ($F = 135.94$, $p < .001$), while consistency did have no statistically significant impact on OCB when added in Model 3 ($\Delta F = 0.01$, $p = .93$). Overall, the findings confirm that the two dimensions individually provide a better explanation of variance than the overall grit score.

The regression analysis that was run to test H3 that theorised a predictive validity of grit for innovative performance, provided support for the hypothesis (***Table 4-19***). Model 1 for innovative performance showed a regression coefficient of .135, indicating that 13.5% of the observed variance is explained by the demographic variables. Current position was the demographic variable that explained the largest amount of variance ($\beta = .26$, $p < .001$), followed by gender ($\beta = .26$, $p < .001$). When adding overall grit in Model 2, the finding suggests that at the mean level of innovative performance, with each one-point change in grit, a 3.3% change in innovative performance can be observed ($R^2 = .033$).

Table 4-19 Controled Hierarchical Regression Results for Performance

Variable	Task Performance			OCB			Innovative Performance		
	M1	M2	M3	M1	M2	M3	M1	M2	M3
Age	-.01	-.01	.01	-.06	-.04	-.02	.04	.06	.07
Gender	-.03	-.02	-.02	-.03	-.03	-.02	.09*	.10**	.10*
Educational Level	.03	.02	.03	-.04	-.04	-.03	.03	.03	.04
Work Sector	.03	.02	.02	-.01	-.01	-.01	.00	.00	.00
Department	-.01	-.02	-.01	-.03	-.03	-.02	-.00	.00	.01
Position	-.02	.00	.01	-.19***	-.18***	-.16***	-.29***	-.27***	-.26***
Experience	.13	.09	.08	.21**	.18	.18*	.03	.01	.00
In-role Experience	-.01	-.02	-.02	-.04	-.05	-.06	.01	.00	-.00
Grit		.35***			.20***			.18***	
Perseverance			.32***			.26***			.21***
Consistency			.11***			-.01			.02
R^2	.014	.135	.155	.086	.124	.149	.136	.169	.184
ΔR^2	-	.22	.141	-	.038	.063	-	.033	.047
F	2.02*	20.12**	21.17***	12.66**	16.93**	18.84**	21.36**	24.43**	24.28**
ΔF	-	162.65***	96.43***	-	46.82**	39.90**	-	42.42**	31.21**

Note: M1 = all demographics, M2 = including overall grit, M3 = including perseverance and consistency, ***$p < .001$, **$p < .01$, *$p < .05$

By adding the grit dimensions in Model 3 individually, an additional 4.7% ($\Delta F = 31.21$, $p < .001$) of variance in innovative performance were explained beyond the demographic variables. However, the results also show that perseverance had not only the higher predictive validity for innovative performance but that consistency did not explain any statistically significant amount of additional variance in innovative performance ($\beta = .02$, $p <$ n.s). Again, this suggests that the aggregation of the two scores results in a loss of predictive validity.

Overall, the findings show that grit does have a unique predictive validity for the three measures of job performance beyond the observed demographic variables. However, the largest explanation of variance is for task performance. Results show that with each point of change in grit the level of task performance increases by 14%. Thus, these results support the findings of H1 to H3, indicating a statistically significant effect of grit on job performance beyond other observed variables. Moreover, they emphasize that the individual components of grit have a better predictive validity for all three measures of performance than the overall grit score.

After testing the relationship of grit with resilience and PsyCap and providing evidence that grit is an empirical distinctive concept, the next step was the identification of the predictive validity of grit beyond the two established measures of personality. This is necessary to determine if grit offers any additional explanation of work-related outcomes beyond those measures. Then only it would prove to provide an additional benefit for individuals and potentially organisations that helps to identify and develop individuals in the workplace. Therefore, hierarchical regressions for job performance - including task-performance, OCB and innovative performance - were run.

Hypothesis H4 theorised that grit contributes unique explanation of the observed variance in job performance beyond PsyCap and resilience. Therefore, a hierarchical regression was run in which the demographic variables were added in Model 1, PsyCap and resilience were added in Model 2, overall grit in Model 3, and the two dimensions of grit in Model 4 (see Table 4-20). The regression coefficient of $\Delta R^2 = 0.21$ suggests that at the mean level of task performance, a change of one point in PsyCap and resilience would result in a 21% change in task performance. When adding the grit dimensions to the model, an additional 4.1% ($\Delta F = 32.38$, $p < .001$) of the variance in task performance was explained. This results in an overall explanation of 26.5% of variance in the degree of task performance ($F = 34.58$, $p < .001$).

In total, 32.6% of variance in OCB and 31.5% in innovative performance was explained by Model 2. PsyCap as the single predictor explained 15.9% of the variance observed in OCB ($F = 348.24$, $p < .001$) and 24.4% for innovative performance ($F = 592.82$, $p < .001$).

Table 4-20 Summary of Controlled Hierarchical Regression for Grit and Job Performance

	Task Performance				OCB				Innovative Performance			
	M1	M2	M3	M4	M1	M2	M3	M4	M1	M2	M3	M4
Age	-.01	.01	.01	.02	-.06	-.01	-.01	.00	.04	.09	.09	.10
Gender	-.03	-.05	-.04	-.04	-.03	-.03	-.03	-.03	.09**	.06*	.06*	.06*
Educational Level	.03	.02	.02	.02	-.04	-.05*	-.05	-.05	.03	.03	.03	.03
Work Sector	.03	.02	.02	.01	-.01	-.01	-.01	-.01	.00	-.00	-.00	-.00
Department	-.01	-.02	-.02	-.02	-.03	-.04	-.04	-.03	-.00	.00	.00	.00
Position	-.02	.07*	.07*	.07*	-.19***	-.10**	-.10	-.09*	-.29***	-.17***	-.17***	-.17***
Experience	.13	.00	.00	-.00	.21**	.09	.09	.09	.03	-.08	-.08	-.08
In-role Experience	-.01	.03	.02	.01	-.04	-.00	-.00	.001	.01	.03	.03	.03
PsyCap		.29***	.25***	.24***		.20***	.19**	.18***		.36***	.35***	.34***
Resilience		.28***	.22***	.21***		.40***	.39***	.38***		.17***	.16***	.15***
Grit			.21***				.01				.04	
Perseverance				.19***				.08*				.07*
Consistency				.08**				-.05*				-.02
R^2	.014	.223	.259	.265	.086	.326	.326	.331	.136	.315	.317	.319
ΔR^2	-	.210	.036	.041	-	.241	.000	.005	-	.179	.001	.003
F	2.02*	33.21***	36.68***	34.58***	12.66***	52.26***	47.48***	44.49	21.36	49.73***	45.39***	42.79***
ΔF	-	155.82***	55.65***	32.38***	-	192.71***	0.07	4.12*	-	31.21***	1.67	2.68

Note: M1 = demographics, M2 = PsyCap and resilienceM3 = overall grit, M4 = perseverance and consistency, ***$p < .001$, **$p < .01$, *$p < .05$

In Model 3, grit did not accounted for an additional explained variance in OCB. The incremental explanation of variance of grit beyond PsyCap and resilience in innovative performance was 0.1% and also not statistically significant. Therefore, even if grit adds incremental variance beyond PsyCap and resilience for task performance, this is not the case for the two measures of OCB and innovative performance. Contrary to overall grit, that provided no significant explanation of variance for OCB and innovative performance beyond PsyCap and resilience (β = .01, p = n.s.), perseverance and consistency separately accounted for an additional 0.5% (ΔF = 4.12, p < .05) of variance. When perseverance and consistency were added as separate predictors into the model beyond the demographic variables. resilience and PsyCap, they did not offer additional explanation of variance in innovative performance (ΔF = 2.68, p = n.s.). Therefore, H4 was partially supported.

Similar to the first set of hypotheses, multiple regression analyses were run to test the predictive validity of grit for work-related stress and its two dimensions. Hypothesis H7 theorised a negative effect of grit on the adverse dimension of work-related hindrance stress. In the hierarchical regression, Model 1 included only the demographic variables, explaining 5.1% of the observed variance in hindrance stress. In Model 2, overall grit was added to the regression, resulting in an additional 3.4% explanatio of variance (β = -.19, p < .001). In Model 3 grit was removed and the individual effect of perseverance on hindrance stress was tested. The regression coefficient was statistically significant (R^2 = .013, $F(1,2087)$ = 15.82, p < .001; β = -.11, p < .001). When consistency was added to the regression in Model 4 it was found that it accounted for an additional 2.4% (ΔF = 30.05, p < .001). Interestingly, findings suggest that when consistency was added to the regression, the observed effect of the grit dimensions on hindrance stress was only statistically significant for the consistency dimension (β = -.17, p < .001; β_{per} = -.05, p = .019). These results support the assumption and H7 was confirmed.

H8 hypothesised a positive effect of perseverance on challenge stress in the workplace. However, contrary to our expectations, the regression analysis revealed that perseverance actually did have a statistically significant negative effect on challenge stress (ΔR^2 = .008, $F(1,2087)$ = 8.87, p < .01) (β = -.09, p < .01). Therefore, H8 was rejected. Hypothesis H9, postulating a negative effect of consistency on challenge stress, was confirmed (ΔR^2 = .034, $F(1,2087)$ = 74.22, p < .001) (β = -.19, p < .001). It suggests that at the mean level of challenge stress a change of one point in consistency would result in a change of 3.4% in challenge stress.

Table 4-21 Controlled Hierarchical Regression for Work-Related Stress

	Overall Stress				Challenge Stress				Hindrance Stress			
	M1	M2	M3	M4	M1	M2	M3	M4	M1	M2	M3	M4
Age	.14*	.14*	.13	.15*	.08	.07	.07	.08	.16*	.16*	.15*	.16*
Gender	-.02	-.03	-.03	-.03	-.00	-.01	-.01	-.01	-.04	-.05	-.04	-.04
Educational Level	.02	.03	.02	.03	-.01	-.01	-.01	-.00	.05	.05	.05	.06
Work Sector	-.03	-.02	-.03	-.02	-.01	-.01	-.01	-.01	-.04	-.04	-.04	-.04
Department	-.04	-.04	-.04	-.04	-.02	-.02	-.02	-.01	-.05	-.05	-.06	-.05
Position	.04	.02	.03	.03	-.05	-.06	-.06	-.05	.12***	.11***	.12***	.12***
Experience	-.27***	-.25***	-.26***	-.26***	-.22***	-.20**	-.21**	-.21**	-.22**	-.20**	-.21**	-.21**
In-role Experience	.04	.05	.05	.05	.06	.06	.06	.06	.00	.01	.01	.01
Grit		-.22***				-.17***				-.19***		
Perseverance			-.12***	-.05			-.09**	-.02			-.11***	-.05
Consistency				-.21***				-.18***				-.17***
R^2	.034	.081	.049	.087	.016	.044	.024	.050	.051	.085	.064	.087
ΔR^2	-	.047	.015	.038	-	.028	.008	.027	-	.034	.013	.024
F	5.11***	11.29***	6.60***	11.04***	2.36*	5.98***	3.10**	6.10***	7.72***	11.86***	8.71***	11.04***
ΔF	-	58.70***	17.90***	48.59***	-	34.33***	8.87**	32.36***	-	42.72***	15.82***	30.05***

Note: ***$p < .001$, **$p < .01$, *$p < .05$

In a follow-up hierarchical regression, the predictive validity of both dimensions of grit and challenge stress was tested (**Table 4-22**). Interestingly, when controlled for the demographic variables, the observed explanation of variance was only attributable to the consistency of interest dimension ($\beta = -.18$, $p < .001$). In Model 3, perseverance explained 0,8% of the variance observed ($\beta = -.09$, $p < .01$). When adding consistency in Model 4, the two dimensions accounted for 2.7% ($\Delta F = 32.36$, $p < .001$) of the variance. However, the predictive validity of perseverance changed from significant $\beta_{per} = -.09$ to not significant ($\beta = -.02$, $p =$ n.s.).

In a third hierarchical regression, it was tested if grit provides unique explanation of variance beyond resilience and PsyCap in overall, challenge and hindrance stress (see **Table 4-22**). In Model 1, the regression coefficient of resilience was .026, suggesting that at the mean level of overall stress, a one-point change in resilience would result in a 2.6% change in the level of overall stress. In Model 2, overall grit was added and contributed an additional 2.6% of the variance in overall stress ($\Delta F = 57.89$, $p < .001$), resulting in an total explanation of 5.2% explanation of overall stress by resilience and grit ($F = 57.66$, $p < .001$). In Model 4 the second dimension, consistency, was added to the Model. The two individual dimensions together provided an additional 3.7% ($\Delta F = 41.74$, $p < .001$) explanation of the variance in overall stress. In total, Model 4 explained 6.4% ($F = 47.86$, $p < .001$) of the observed variance in overall stress. Thus, the overall explanation of the two dimensions individually was higher than for the summative overall grit score. However, it was found that consistency was the only dimension that showed a statistically significant effect on the level of overall stress in Model 4 and perseverance turned insignificant ($\beta = -.20$, $p < .001$; $\beta_{Pers} = .01$, $p =$ n.s).

Hypothesis H9 theorised that grit contributes unique explanation of the observed variance in work-related stress beyond PsyCap and resilience. Therefore, a hierarchical regression was run in which PsyCap and resilience were added into Model 2. **Table 4-22** presents the results of the hierarchical regression. It shows that the grit dimensions in Model 3 accounted for an additional 1.6% ($\Delta F = 21.80$, $p < .001$) explanation of variance beyond the demographic factors, resilience and PsyCap in overall stress. At the mean level of overall stress, a total of 15.1% of the variance was explained by all predictor variables. Similar results were found for challenge stress, where overall grit explained an additional 1.1% of the variance, and hindrance stress, where grit contributed 1.0% to the explanation of variance beyond PsyCap and resilience.

Table 4-22 Summary of Controlled Hierarchical Regression for Grit and Work-Related Stress

	Overall Stress				Challenge Stress				Hindrance Stress			
	M1	M2	M3	M4	M1	M2	M3	M4	M1	M2	M3	M4
Age	.14*	.12	.13*	.14**	.08	.06	.07	.08	.16*	.15*	.15*	.16*
Gender	-.02	.01	.01	.01	-.00	.03	.03	.03	-.04	-.01	-.02	-.02
Educational Level	.02	.02	.03	.03	-.01	-.01	-.01	-.00	.05	.05	.05	.06*
Work Sector	-.03	-.02	-.01	-.02	-.01	.00	.00	.00	-.04	-.03	-.03	-.03
Department	-.04	-.04	-.04	-.04	-.02	-.02	-.02	-.01	-.05	-.05	-.05	-.05
Position	.04	-.03	-.03	-.03	-.05	-.10**	-.10**	-.10**	.12**	.07*	.07*	.07*
Experience	-.27***	-.19**	-.19**	-.20**	-.22***	-.16*	-.16*	-.16*	-.22*	-.15*	-.15*	-.16*
In-role Experience	.04	.03	.04	.03	.06	.05	.06	.05	.00	-.01	-.01	-.01
PsyCap		-.32***	-.30***	-.31***		-.29***	-.27***	-.28***		-.24***	-.22***	-.23***
Resilience		-.04	.01	-.01		.01	.05	.03		-.08*	-.05	-.06
Grit			-.14***				-.11***				-.11***	
Perseverance				.05				.04				.03
Consistency				-.19***				-.16***				-.15***
R^2	.034	.135	.151	.166	.016	.084	.095	.106	.051	.119	.13	.138
ΔR^2	-	.101	.016	.031	-	.068	.011	.022	-	.069	.010	.018
F	5.11***	18.07***	18.71***	19.15***	2.36*	10.62***	11.03***	11.44***	7.72***	15.64***	15.60***	15.32***
ΔF	-	67.57***	21.80***	21.34***	-	42.98***	13.85***	14.30***	-	44.96***	13.54***	12.20***

Note: ***$p < .001$, **$p < .01$, *$p < .05$

However, when adding the two dimensions of grit individually into Model 4, it could be observed that the overall explained variance in all three stress measures is higher than for Model 3 (***Table 4-22***) in which the overall grit score was used. The regression coefficient for M3 in overall stress was $R = .151$, compared to $R = .166$ in Model 4. The contribution of perseverance, when added as the second predictor after PsyCap in Model 4, was not statistically significant for any of the three measures of work-related stress. As a consequence, the following regressions only report the results for M4, in which perseverance and consistency are added together as individual predictors into the model. Altogether, the results not only suggest that grit is a distinct psychological construct but support the hypothesis that it adds unique predictive validity beyond PsyCap and resilience for the experience of work-related stress. Therefore, H9 was accepted.

Overall, 10,6% of variance in challenge stress was explained by Model 4. However, only consistency added to the explanation of variance on challenge stress ($\beta = -.16$, $p < ,001$). When perseverance and consistency were added in Model 4 for hindrance stress, consistency ($\beta = -.15$, $p < .001$) accounted for an additional 1,8% ($\Delta F = 12.20$, $p < .001$) variance in the degree of reported hindrance stress, while perseverance was not statistically significant. Overall, these findings provide evidence for the unique contribution of grit as a predictor of job performance and work-related stress, beyond PsyCap and resilience. This confirms H9, which postulated an incremental predictive validity of grit for stress beyond these measures.

To test the potential interaction effects of the two demographic variables age and overall work experience and the two concepts PsyCap and resilience on the relationship between grit, performance and work-related stress, multiple moderated regression analyses were run. Following suggestions by Hair *et al.* (2018) and MacKinnon *et al.* (2004) direct and interaction effects were calculated using 95% confidence intervals based on 5000 bootstraps. This was done using the PROCESS macro extension in SPSS. The observed interaction effects of both variables age ($p = .53$) and work experience ($p = .35$) on the grit-work-related stress relationship were not statistically significant. Also, visualised in Figure 4-6 and Figure 4-7, the interaction effects of grit and PsyCap for task performance ($\beta = -.05$, $p = $ n.s) and grit and resilience for hindrance stress ($\beta = -.03$, $p = $ n.s) were not statistically significant. Thus, the findings indicate that none of the observed variables moderate the relationships between grit and the outcome variables.

Figure 4-6 Interaction Plot of the Moderation Effect of PsyCap
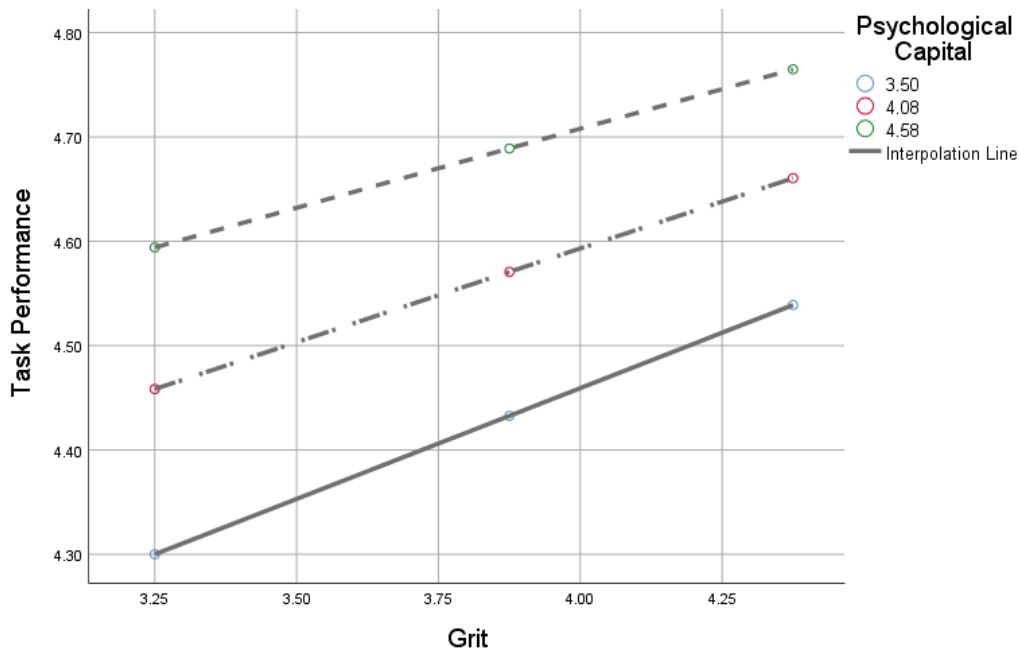
Figure 4-7 Interaction Plot of the Moderation Effect of Resilience
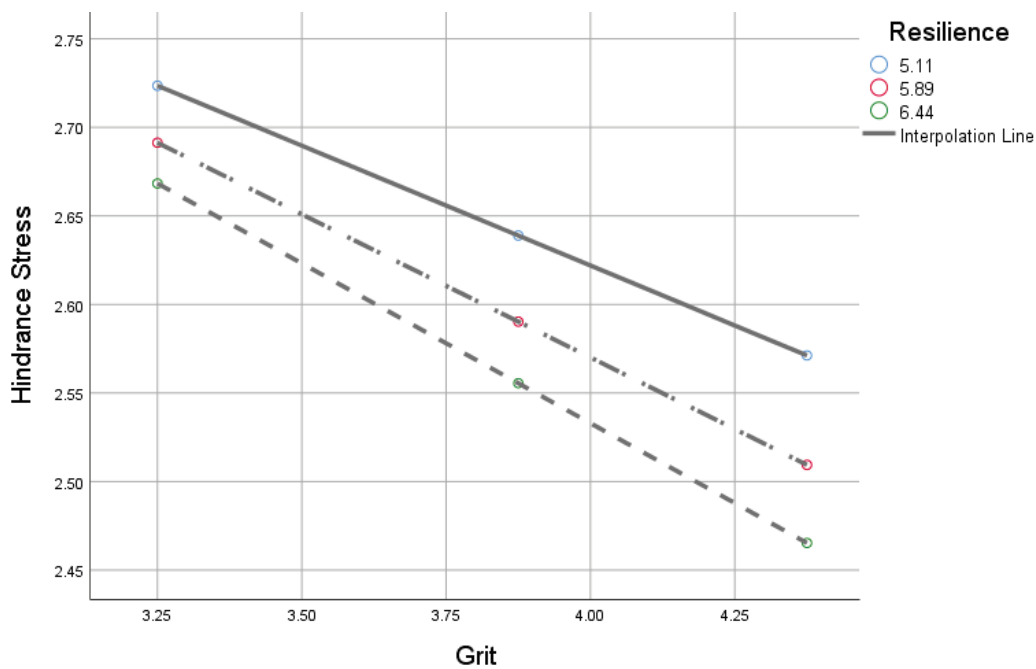
The results of the regression analyses presented in this section provided support for research hypotheses H1-H4, H7, and H9. The results suggest that grit is a predictor of job performance. Moreover, it predicts lower levels of hindrance stress. They also show that consistency of interest is a predictor of lower levels of challenge stress. The provide evidence for the unique predictive validity for these organisational outcomes, above PsyCap and resilience. Interestingly, the findings confirmed previous criticism that suggested that the predictive validity is higher if the grit dimensions are used as individual predictors and not as

an overall grit score. One research hypothesis that theorised that perseverance will have a positive effect on the experience of challenge stress was rejected. The findings revealed a statistically significant negative effect. Lastly, the post-hoc moderation analyses revealed no statistically significant moderation effect of demographic variables, PsyCap or resilience on the relationships between grit and job performance, and grit and work-related stress.

4.4.2 Necessary Condition Analyses

This Section summarises the findings of the NCA that explored if grit is not only a sufficient, but also a necessary condition for the three measures of job performance and work-related stress, a series of NCA were run. The guidelines suggested by Dul (2016b) were followed to calculate the ceiling lines. *Figure 4-8* shows the NCA scatterplots for grit, perseverance and consistency and task performance for all participants in this study. The space in the upper left corner of the plot above the observations is present when a necessary condition is present. It indicates that grit and perseverance might indeed be a necessary condition for higher levels of task performance.

In a next step, the associated ceiling parameters were calculated to statistically evaluate the visual findings. Ceiling parameters consists of the parameter accuracy, the ceiling zone by applying the CE line, scope, the effect sizes and the level of significance for the findings (Dul *et al.*, 2020). When applying the CE line (red line in *Figure 4-8*), the ceiling zone is always left completely empty. Therefore, CE always has a 100% accuracy, which in turn can result in smaller ceiling zones than when the CR line is applied. As shown in *Table 4-23* the observed effect size was < 0.1. This was expected after exploring the visual findings in *Figure 4-8*. The observed ceiling zone is extremely small and additionally, the effect size is not statistically significant ($p > .23$). Therefore, we applied the CR line as a smoothing technique, which is the orange line in *Figure 4-8* which is a non-decreasing line that typically contains some data points and thus is rarely 100% accurate. However, the CR can be used for additional calculations and can potentially spot a necessary condition where the CE fails to do so (Dul, 2016b).

Overall, there was no significant change in any of the predictor parameters in describing grit, perseverance, and consistency as necessary conditions for task performance. Following Dul's (2016b) recommendations, the effect size can vary from 0 to 1 and follows the categorization of $0 < d < 0.1$ (small effect), $0.1 < d < 0.3$ (medium effect), $0.3 \leq d < 0.5$ (large effect), and $d > 0.5$ (very large effect).

Figure 4-8 NCA Scatterplots of (a) Grit, (b) Perseverance, and (c) Consistency for Task Performance

(a)

(b)
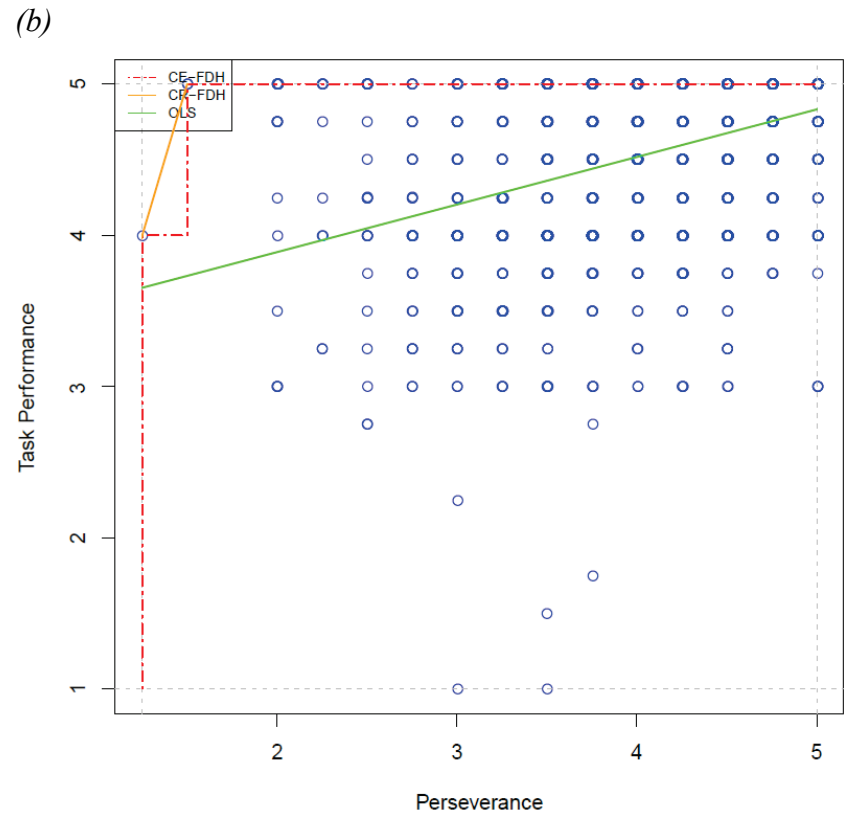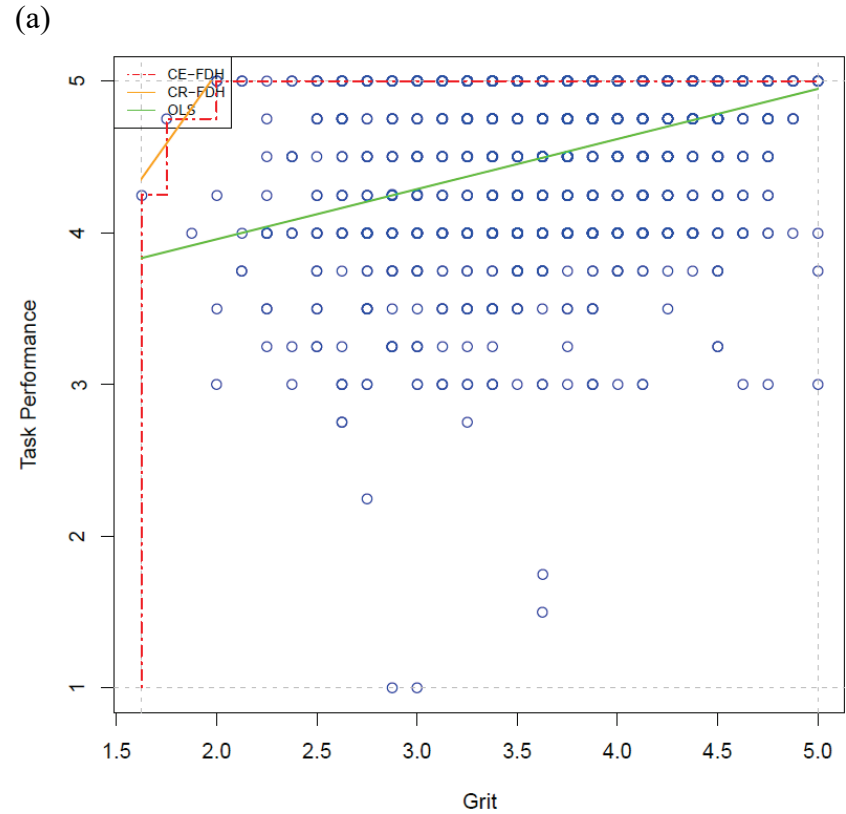
(c)
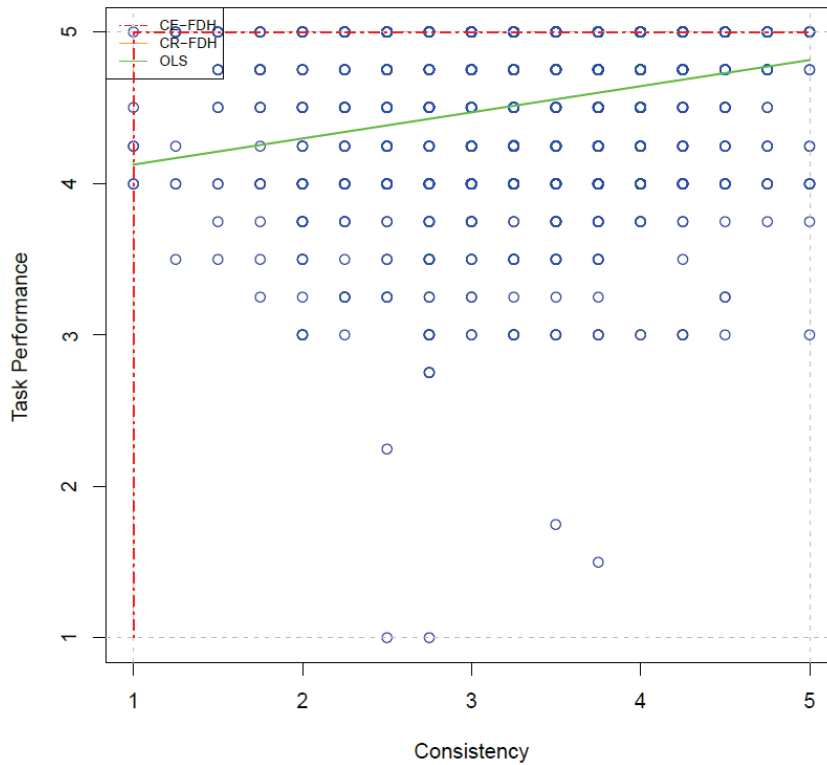
Dul suggested using $d = 0.1$ as the threshold limit for the necessary condition. The ceiling bar parameters accuracy, scope and ceiling zone were calculated (see ***Table 4-25***). Accuracy in NCA is defined as the percentage of the overall number of observations that fall in the upper ceiling zone, divided by the total number of observations. (Dul, 2016b) suggests relying on an observed accuracy of greater than 95%, to statistically confirm the necessary condition. The observed effect size of grit was 0.012 (p = .23, ceiling scope = 13.50), for perseverance it was 0.029 (p > .84, ceiling scope = 15.00), while consistency was 0.040 (p > 24, ceiling scope = 16.00). Therefore, the NCA findings do not support H5, which described that grit is a necessary condition for task performance.

Table 4-23 NCA Matrix of Grit, Perseverance and Consistency for Task Performance

Condition	Method	Effect Size	*Sig.*	Accuracy	Ceiling Zone
Grit	CE-FDH	0.012	.23	100%	0.156
	CR-FHD	0.008	.17	100%	0.111
Perseverance	CE-FDH	0.029	.84	100%	0.389
	CR-FHD	0.025	.50	99.9%	0.415
Consistency	CE-FDH	0.040	.24	100%	0.680
	CR-FHD	0.025	.50	99.9%	0.415

Similar results were found for the NCA that was run to test if grit, perseverance and consistency are necessary conditions for OCB (Figure 4-9) and innovative performance (*Figure 4-10*). The NCA plots show that the empty space in the upper left corner is not empty and contains various observations, thus indicating that neither grit, nor the two dimensions individually are to be considered a necessary condition for the two dimensions of performance. The Graphs only show the observations for the overall grit scores, the graphs for perseverance and consistency indivually have been omitted for clarity reasons.

Figure 4-9 NCA Scatterplots of (a) Grit, (b) Perseverance, (c) Consistency for OCB
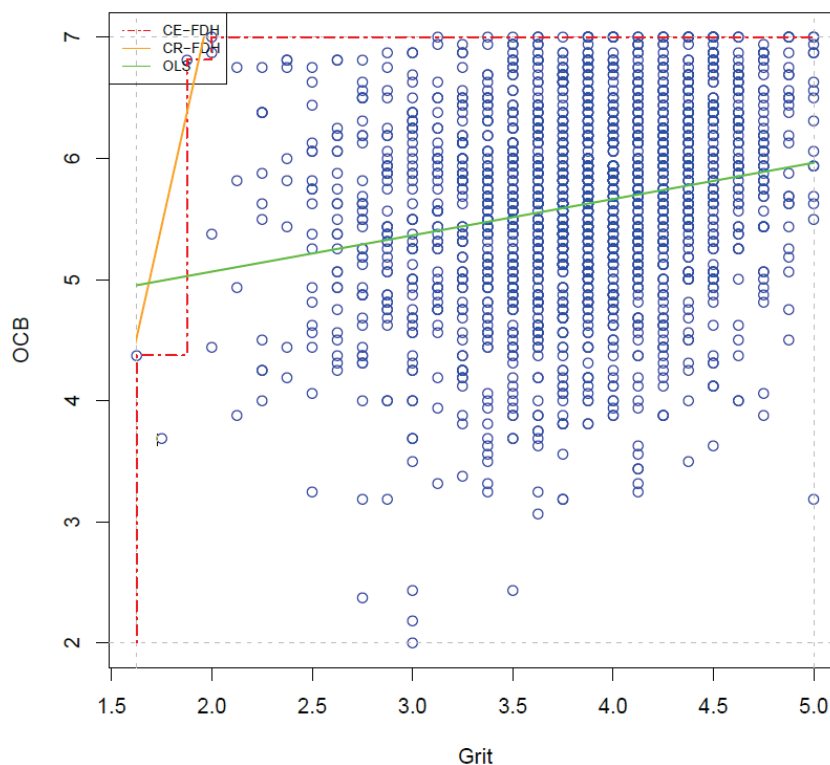
The statistical analysis of the results supported the initial observations in the scatterplots. None of the three concepts was found to be a statistically significant necessary condition for OCB or innovative performance. As presented in Table 4-24, the observed effect sizes of grit for OCB was 0.040 ($p = .24$, ceiling scope $= 16.88$), for perseverance 0.012 ($p = . 93$, ceiling scope $= 18.75$), and for consistency 0.000 ($p = 1.0$, ceiling scope $= 0.00$).

For innovative performance there was only observable empty space for overall grit with an effect size of 0.029 $p = .68$). Therefore, based on both the visual observations and the statistical summary, it can be said that grit, and its two dimensions, are not necessary conditions for higher levels of OCB or innovative performance. Overall, the findings of the NCA's that were run – using the current conceptualisation of grit for job performance – suggest that grit is

not a necessary condition for any type of performance measured in this sample. Therefore, H5 was rejected.

Figure 4-10 NCA Scatterplots of Grit, for Innovative Performance
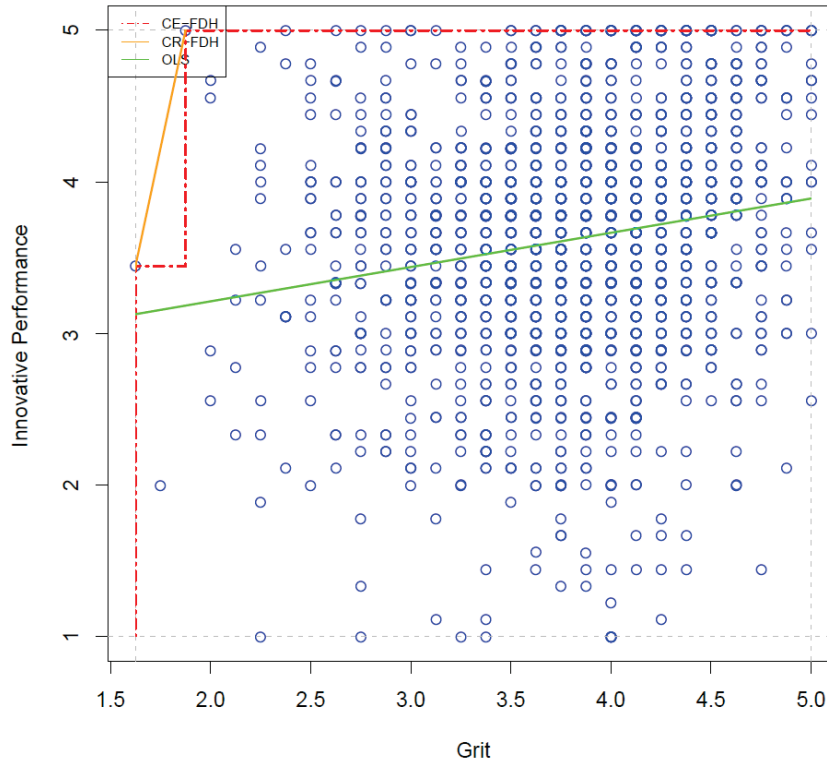
Table 4-24 Necessary Condition Matrix of Grit

Condition	Construct	Method	Effect Size	*Sig.*	Accuracy	Ceiling Zone
Grit	OCB	CE-FDH	0.040	.24	100%	0.680
		CR-FHD	0.025	.50	99.9%	0.415
	Innovative	CE-FDH	0.029	.68	100%	0.389
		CR-FHD	0.014	.78	100%	0.194
Perseverance	OCB	CE-FDH	0.012	.93	100%	0.234
		CR-FHD	0.009	.90	100%	0.176
	Innovative	CE-FDH	0.000	1.00	100%	0.000
		CR-FHD	0.000	1.00	100%	0.000
Consistency	OCB	CE-FDH	0.000	1.00	100%	0.000
		CR-FHD	0.000	1.00	100%	0.000
	Innovative	CE-FDH	0.000	1.00	100%	0.000
		CR-FHD	0.000	1.00	100%	0.000

To test H11, that explored the hypothesis that grit is a necessary condition for the reduction of the experienced levels of stress, another set of NCA analyses was run. First, the ceiling line was determined with the help of the NCA plot graph for grit and overall stress (see Figure 4-11). The independent variable grit is plotted along the X-axis and overall stress as the depended variable on the Y-axis. Checking the scatterplot in Figure 4-11, an empty space is visible for all three conditions in the upper left corner, which indicates a potential necessary condition. The CE ceiling line (shown in red) differentiates the full zone of observations and the zone with no observations (also referred to as the empty zone). In a next step of the NCA the effect sizes were calculated to explore the relationship between the variables.

The smoothing technique CR-FDH was applied subsequently, which is shown in Figure 4-11 as the orange, non-decreasing line. As observable in this NCA plot, there are several data points in the upper ceiling zone, resulting in an accuracy of the results of less than 100%. This, however, is not necessarily an issue in itself but require the evaluation of both ceiling techniques (Dul, 2016b). The first NCA that was run to test the necessary condition of grit for stress revealed a small effect size of $d = .112$. This finding supports the previous findings of the regression analysis that suggested that grit is a sufficient condition for stress. More importantly, this finding indicates that grit is also a necessary condition for a reduced experience of stress. This is visualised in the bottleneck *Table 4-26* on Page 175 and the scatterplot in Figure 4-11.

Table 4-25 describes the threshold level of grit as a necessary condition to experience a certain level of work-related stress. The percentage levels represent the conditions in the data set from the lowest to the highest observed values. As shown by Dul (2016a), these threshold levels can also be expressed as percentages based on the condition's range of observed values from the lowest to the highest. These are derived from the CE ceiling line functions. What can be seen in *Table 4-26* is that to reduce the level of work-related stress down to 50% of its maximum level, grit is not a necessary condition. Thus, it could be argued that grit does not play a significant role if a 50% level of work stress is considered to be acceptable.

Figure 4-11 NCA Scatterplot of Overall Grit for Overall Work-Related Stress
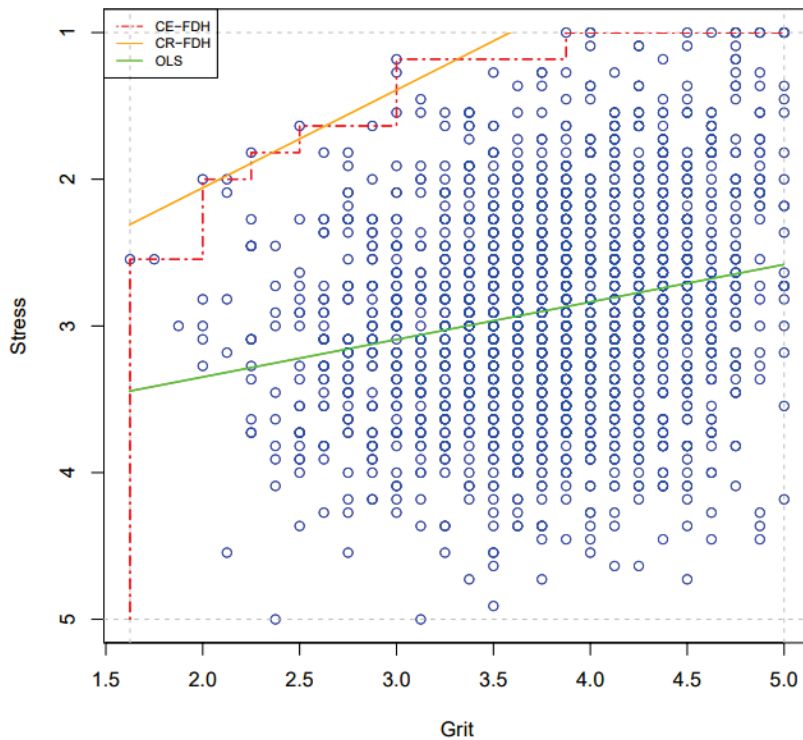
However, as indicated in ***Table 4-26***, if the level of stress is to be reduced down to 20% of its theoretical maximum, individuals require at least 25% of overall grit. And in order to experience no work-stress at all (Stress = 0), 66.7% of grit is a necessary condition. Additionally, following Dul's recommendations to interpret effect sizes of an NCA, the effect size of grit as a necessary condition for work-related overall stress falls between $0.1 < d < 0.3$ and thus is to be considered a medium effect (Dul, 2016b). A subsequent statistical analysis was run to test the likelihood of this effect occurring by chance (Dul *et al.*, 2020). The observed p-value was .03 and thus was statistically significant. Therefore, a moderate effect was detected, which is not likely to occur by chance, and overall grit is to be considered a necessary condition for low levels of work-related stress. Therefore, H9 was supported.

Table 4-25 Necessary Condition Matrix for Overall Stress

Condition	Construct	Method	Effect Size	*Sig.*	Accuracy	Ceiling Zone
Grit	Stress	CE-FDH	0.11	.03	100%	1.511
		CR-FHD	0.10	.08	99.8%	1.283
	Challenge	CE-FDH	0.07	.48	100%	0.958
		CR-FHD	0.06	.42	99.9%	0.821
	Hindrance	CE-FDH	0.07	.20	100%	0.900
		CR-FHD	0.06	.10	99.8%	0.859
Perseverance	Stress	CE-FDH	0.17	.02	100%	2.523
		CR-FHD	0.14	.04	99.9%	2.058
	Challenge	CE-FDH	0.14	.13	100%	0.417
		CR-FHD	0.11	.17	99.7%	0.208
	Hindrance	CE-FDH	0.12	.05	100%	1.800
		CR-FHD	0.08	.09	99.9%	1.266
Consistency	Stress	CE-FDH	0.08	.03	100%	1.205
		CR-FHD	0.06	.06	99.9%	0.944
	Challenge	CE-FDH	0.06	.09	100%	0.958
		CR-FHD	0.04	.12	99.9%	0.672
	Hindrance	CE-FDH	0.03	.28	100%	0.450
		CR-FHD	0.02	.23	100%	0.312

Figure 4-12 shows an empty space for both conditions in the upper left corner, again, indicating a potential necessary condition. The observed calculated effect sizes for the two conditions were $d_{pers} = 0.17$ and $d_{cons} = 0.08$, revealing a medium effect of perseverance for

overall stress. The effect of consistency fell below the threshold of $d > 1$ for a necessary condition. Considering the CE-FDH line the accuracy was 100% and thus above the required threshold of 95%. If perseverance and consistency are considered necessary conditions for stress, a certain threshold level of each of them is required for a specified level of work-related stress. *Table 4-26* shows that it is not necessary to possess any perseverance or consistency at all to reduce the experience of work-related stress to 50%. However, if the level of stress should be not higher than 10%, than a level of 46.7% perseverance and 31.2% consistency are necessary. To experience no stress at all, 93.3% of perseverance and 50.0% of consistency are necessary.

Considering all findings for the two sub-dimensions of grit, there is evidence that perseverance could be considered a necessary condition for overall work-related stress. The effect size of consistency, however, falls below the recommended threshold of $d = 1$, and thus is not a necessary condition. However, there is support for H9 that predicted that overall grit, and particularly the perseverance dimension, are necessary conditions for the experience of low levels of work-related stress.

Table 4-26 Bottleneck Levels of Overall Stress and Hindrance Stress and the Conditions Grit, Perseverance and Consistency (in %) using CE-FDH

Stress	Grit	Perseverance	Consistency	Hindrance Stress	Perseverance
100	NN	NN	NN	100	NN
80	NN	NN	NN	80	NN
60	NN	NN	NN	60	NN
40	11.1	20.0	NN	40	20.0
30	25.9	20.0	NN	30	20.0
20	40.7	33.3	18.8	20	20.0
10	66.7	46.7	31.2	10	26.7
0	11.1	93.3	50.0	0	46.7

Note: NN = not necessary, in % using CE-FDH

A subsequent analysis of grit being a necessary condition for each of the two stress dimensions revealed that overall grit is not a necessary condition for lower levels of work-related challenge and hindrance stress.

Figure 4-12 NCA Scatterplots of Perseverance and Consistency for Overall Stress
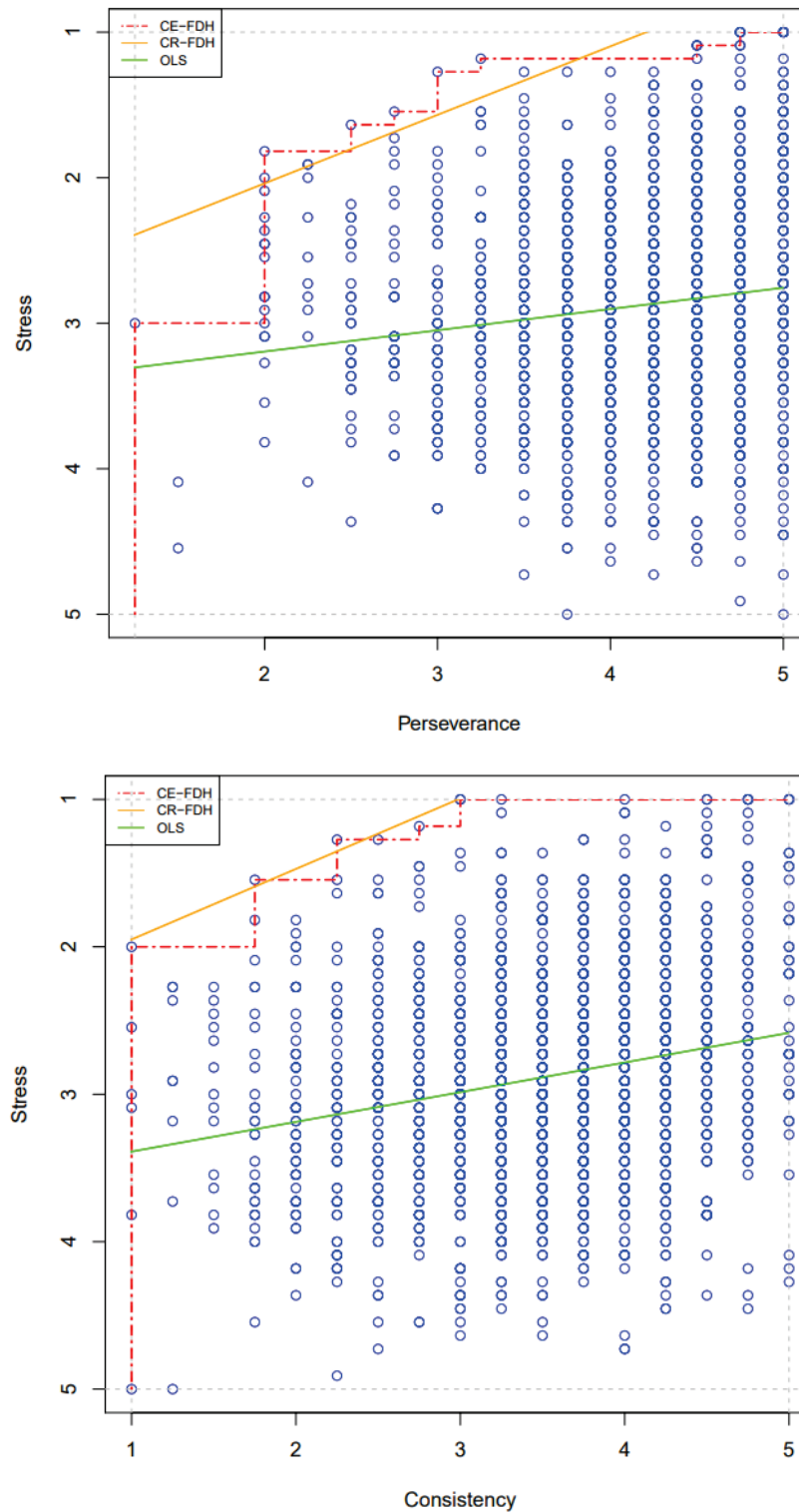
The potential individual necessary conditions of perseverance and consistency for challenge and hindrance stress were explored in four subsequent NCA's. The scatterplots shown in Figure 4-14 and *Figure 4-14* reveal larger empty spaces in the top left corner of perseverance than consistency for both stress dimensions.

Figure 4-13 NCA Scatterplots of Consistency for (a) Challenge and (b) Hindrance Stress

(a)
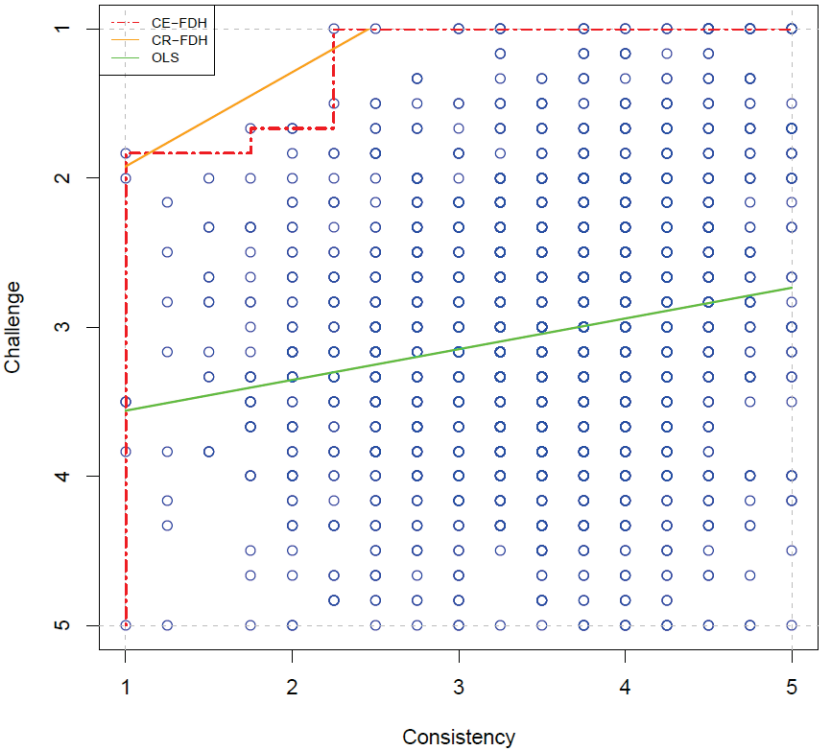
(b)
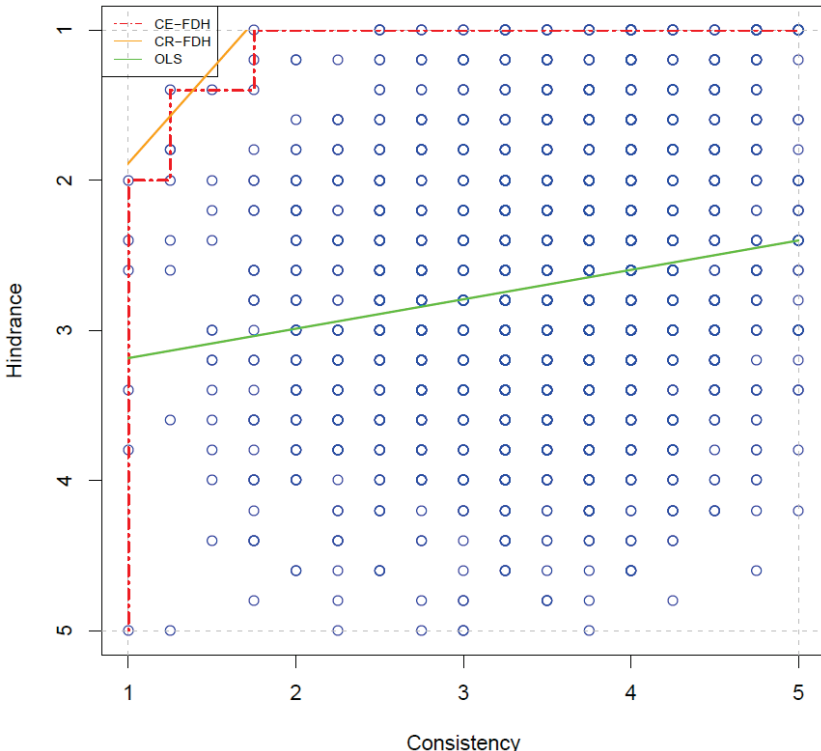
Figure 4-14 NCA Scatterplots of Perseverance for Challenge and Hindrance Stress
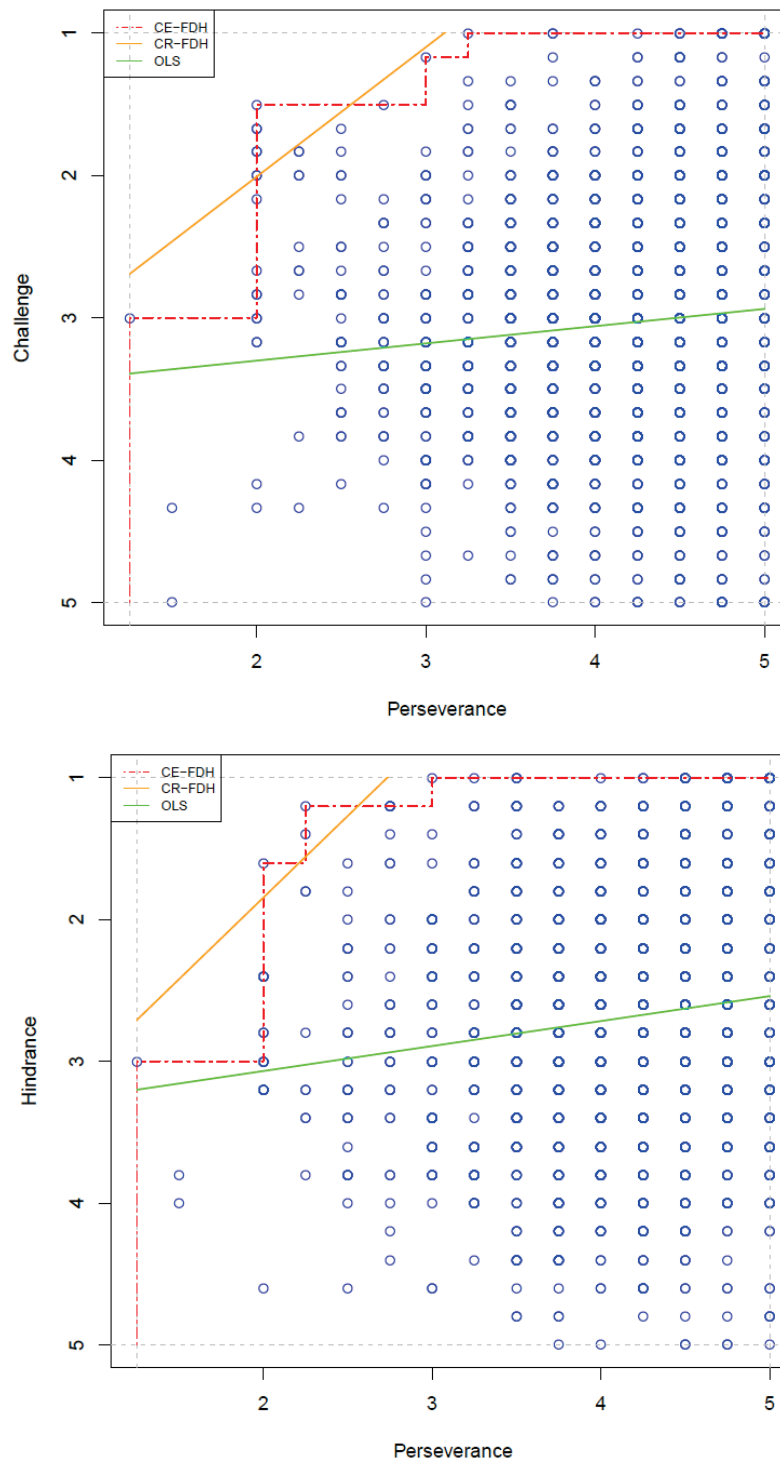
Presented in *Table 4-25* on page 174 are the observed effect sizes of perseverance and consistency for both outcomes. Perseverance showed moderate effects on both challenge ($d = 0.14$) and hindrance ($d = 0.12$), while consistency fell below the threshold of ($d = 1$) indicating no necessary condition for challenge ($d = 0.06$) and hindrance ($d = 0.03$) stress.

The subsequent statistical analysis that was run to test the likelihood of the observed effects occurring by random revealed that except for perseverance and hindrance stress, all significance levels were $p > .05$ and thus not statistically significant. This finding indicates that

the effects are likely due to random chance (see **Table 4-25** on page 174). Only perseverance was a statistically significant condition for hindrance stress (p = .05).As the results have shown that consistency is not a statistically significant necessary condition, **Table 4-26** shows only the the threshold level of perseverance as a necessary condition for hindrance stress. Similar to the findings above, perseverance is not a necessary condition for stress levels between 50% and 100%. However, to reduce the experience of stress levels down to 40% or even to 20%, 20% of the theoretical maximum level of perseverance is a necessary condition. In order to reduce the level of stress to less than 10%, 46.7% perseverance are necessary.

4.4.3 NCA of the Person-Centred Model of Grit for Job Performance

Following the suggestions that were proposed by Credé (2018) and discussed in Section 2.4.4, a new grit score was generated that only defined individuals as gritty if they scored high in both dimensions, perseverance and consistency, simultaneously. The newly developed categorisation of grit is therefore only high in grit (coded as 1) and low in grit (coded as 0) and is referred to as a Person-Centred Model of grit. To follow Credé's (2018) suggestions, a necessary condition of the Person-Centred Model of grit was run, to test if it is a necessary condition for job performance. Due to the previous NCA findings, results are only shown for the NCA for task performance. However, As shown in the NCA plots, there is no empty space observable in the upper left corner, indicating that grit as a Person-Centred Model is not a necessary condition for high levels of task performance (**Figure 4-15**). Therefore, H5 was rejected.

However, looking at **Figure 4-15** it appears that there is an observable condition, which is grit = 1 is sufficient for the presence of task performance of at least 3. Because of this sufficient condition of person-centred grit for the presence of task performance, it could be argued that the absence of high person-centered grit is necessary for the absence of high task performance (Dul, 2020), meaning that if high grit is not there, there is no high performance. By flipping the Y and the X axis of the plot, the empty space moves in the upper left corner, indicating a significant effect (Figure 4-16).

Therefore, a subsequent statistical test revealed that the observed CE effect size was 0.500 (.250 for CR), which supports the previous assumption of a significant effect, showing that there is indeed a large effect based on Dul's (2020) suggestions. In line with this, the other observed ceiling parameters showed that the ceiling zone was large (CE = 2.000, CR = 1000) with 100% accuracy. However, the statistical significance test showed a p = .68, indicating that

the effect size occurs by random chance. Consequently, the NCA findings are not clear and provide no statistically significant support for the Person-Centred Model of grit.

Figure 4-15 NCA Scatterplot of Person-Centred Grit as a Necessary Condition for Task Performance
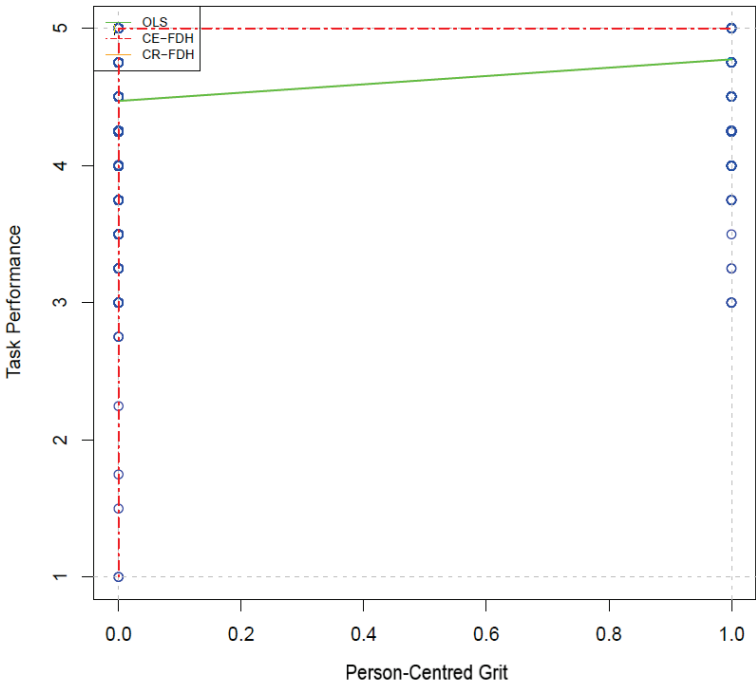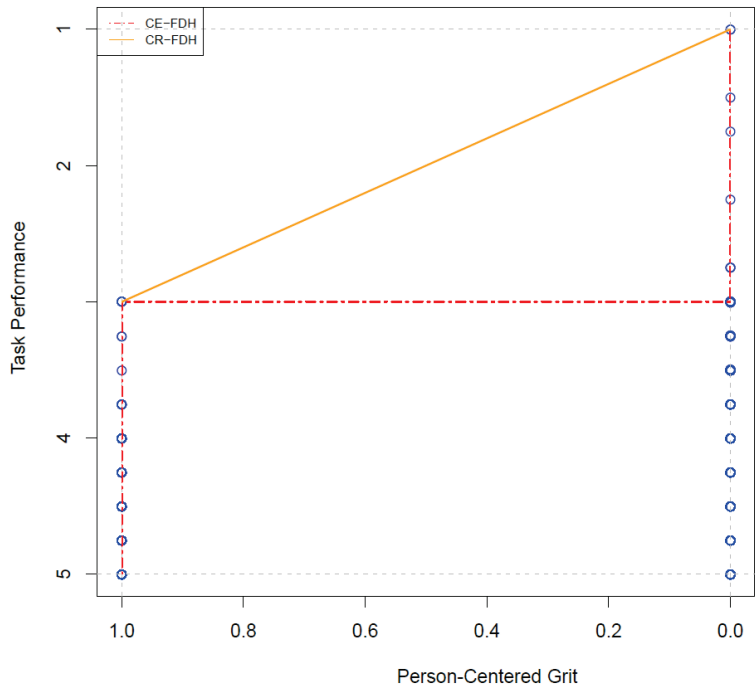

Figure 4-16 NCA Scatterplot of the Flipped Person-Centred Grit and Task Performance

This is additional evidence that grit is not a necessary condition for performance, neither in the traditional conceptualisation, nor using the Person-Centred Model that has been

suggested by Credé (2018). Therefore, H6 that hypothesised that person-centred grit (high perseverance and high consistency) is a necessary condition for job performance was not supported.

4.5 Summary of Results

Overall, this chapter was designed to provide an overview of the results that were obtained during the statistical testing and assessment of the research questions and research hypotheses of this thesis. In total, this research set out to answer three research questions and test 11 research hypotheses. A summary of the hypotheses testing can be found at the end of this section in *Table 4-27*.

Section 4.2 provided an overview of the descriptive analysis of all research variables along with a detailed summary of the research sample's demographic factors and employment characteristics. The representativeness of the research sample for the UK working population was discussed, arguing that the main demographic factors are sufficiently represented in the research sample. The basic correlations between the research variables grit, job performance, work-related stress and all demographic factors were discussed, revealing statistically significant relationships between the independent and dependent variables. Additionally, the results from the t-test were evaluated, indicating that there are no statistically significant differences between regularly employed and self-employed / freelancing individuals. Therefore, all analyses were conducted for the overall research sample.

Section 4.3 provided a detailed evaluation of the findings of SEM tests that were run to answer the three research questions. It explored the current conceptualisation and operationalisation in form of the Grit-S Scale and its applicability in the business context in comparison to related personality characteristics. Firstly, it was shown that the alternative first-order model of grit did not provide a better fit for the data than the current conceptualisation. In contrary, the findings of the CFA partly confirmed the current higher-order model of grit. However, it also revealed significant shortcomings in its current conceptualisation and operationalisation.

Secondly, CFA's were applied to test the currently applied higher-order model of grit to alternative models that included the two additional personality constructs PsyCap and resilience. However, after extensive testing, the results show that grit is indeed a unique and distinct concept that can empirically be distinguished from PsyCap and resilience. The findings of the CFA provided sufficient information to answer RQ1, RQ2, and RQ3. However, the

results revealed issues in psychometric properties of the current structural and measurement model of grit.

The subsequent regression analyses offered insights into the predictive validity of grit for the three measures of job performance - task performance, OCB and innovative performance. The findings provided support for H1, H2, and H3 showing that grit is indeed a predictor for all three performance dimensions. However, the regressions also revealed that even if grit was a predictor of performance, consistency only contributed to a small extent to the explanation of variance in task performance and did not contribute to the explanation of variance of OCB and innovative performance. Therefore, only perseverance possesses significant predictive validity for these performance indicators.

The regression analyses to test the relationship between grit and work-related challenge and hindrance stress supported H6 and showed that grit is indeed negatively related to the level of experienced stress. Contrary to the expectations, perseverance did not positively predict challenge stress while consistency reduces the experience of challenge stress on a statistically significant level. In lign with previous suggestions, it was found that for predicting both outcome variables the use of an overall grit score instead of the individual grit dimensions results in the loss of predictive validity. Additionally, the hierarchical regressions showed that grit adds unique predictive validity for work-related stress and job performance beyond PsyCap and resilience. This provides evidence that grit is indeed an important predictor of the two work-related outcomes above demographic and established personality measures. The results of the post-hoc moderation analyses indicated that there are no observeable interaction effectsbetween the research variables.

Section 4.4.2 showed the results of the NCA analysis, which revealed that, even if grit is a sufficient condition for task performance, OCB or innovative performance, it is not a necessary condition for higher levels of any of these job performance dimensions. Contrary to the findings for performance, the overall grit score was found to be a necessary condition for overall work-related stress. However, it was not found to be a necessary condition for the two dimensions challenge and hindrance stress individually. Interestingly however, despite the findings from the regression analyses, perseverance was found to be a statistically significant necessary condition for lower levels of overall work-related stress and hindrance stress, revealing moderate effect sizes. Consistency, when considered individually was not a necessary condition for any dimension of stress.

Lastly, Section 4.4.3 showed that the Person-Centred Model, which was developed in response to previous suggestions is not a necessary condition for job performance. Thus, the usefulness of drawing on this Person-Centred Model of grit is questionable.

Overall, three research questions were explored, and 11 research hypotheses were tested. The results that were discussed in this chapter provided strong support for eight hypotheses, suggesting that grit is a unique construct that is a sufficient condition for higher job performance and lower levels of work-related stress. However, three hypotheses were not supported by the present findings. The three research questions were:

RQ1: *Is the two-factor structure the best way to conceptualise grit in the business context?*

RQ2: *Is the Grit-S Scale a psychometrically sound measurement tool to assess grit in the business context?*

RQ3: *Is grit a distinctive construct to the personality characteristics PsyCap and resilience?*

The findings of this research show that there is generally sufficient evidence to answer all three questions with a yes. Therefore, the findings suggest that grit is a unique construct in comparison to PsyCap and resilience and is applicabile to the business context. However, there are various issues in the current structural model of grit as a higher-order model and the Grit-S measurement Scale that require a further discussion. A summary of the results of the hypotheses testing are found in ***Table 4-27***. The findings that were obtained during the hypothesis testing and presented in this chapter will be evaluated and discussed in Chapter 5. These are set in context to previous literature and the conceptual development presented in Chapter 2.

Table 4-27 Summary of the Results of the Research Hypotheses Testing

Hypothesis	Predictor / Outcome	Result
H1	Grit has a positive effect on task performance in the workplace	Support
H2	Grit has a positive effect on extra role performance in the workplace.	Support
H3	Grit has a positive effect on innovative performance in the workplace.	Support
H4	Grit explains unique variance in job performance beyond PsyCap and resilience	Support
H5	Grit is a necessary condition for job performance in the workplace.	No Support
H6	A high level of person-centred grit is a necessary condition for task performance in the workplace, that is, high levels of grit are necessary for high levels of task performance.	No Support
H7	Grit, consisting of perseverance of effort and consistency of interest, has a negative effect on hindrance stress, that is, increase in grit will lead to decrease in hindrance stress.	Support
H8	Perseverance of effort has a positive effect on challenge stress, that is, increase in perseverance will lead to increase in challenge stress	No Support
H9	Consistency of interest has a negative effect on challenge stress, that is, increase in consistency will lead to decrease in challenge stress.	Support
H10	Grit explains unique variance in work-related stress beyond PsyCap and resilience.	Support
H11	Grit is a necessary condition for a lower level of work-related stress.	Support

Chapter 5 Discussion

5.1 Introduction

This thesis had three overarching research objectives. First, it aimed to test the higher-order conceptualisation of grit and the current measurement model and applicability of the Grit-S Scale in the business context. Additionally, it tested the conceptual and empirical uniqueness of grit and its relationship to the two personality traits PsyCap and resilience. Second, this thesis explored the effect of grit on job performance beyond PysCap and resilience across a representative sample of the UK working population across industries and occupations. The third objective of this thesis was to explore the effect of grit on work-related challenge and hindrance stress beyond PsyCap and resilience in a representative sample of the working population in the UK. Moreover, the study followed suggestions by Credé (2019) and applied the newly developed NCA analysis to test (a) if the higher-order grit is a necessary condition for job performance and work-related challenge and hindrance stress, and (b) if the person-centred conceptualisation of grit is a better representation of the overall construct and a necessary condition for work related performance.

This chapter discusses the findings of the thesis that were presented in the previous section. Section 5.2 discusses the findings of the SEM that tested the current higher-order model of grit and explored the model fit of five alternative models of grit that included (0) a first-order model of grit, (1) resilience, (2) PsyCap and (3) both resilience and PsyCap. Second, the discriminant validity of grit was assessed using factor analysis to formally establish the distinctiveness of grit. Section 5.3 evaluates the findings of the regression and NCA analysis that found evidence that grit is a statistically significant predictor of job performance byond PsyCap and resilience. Section 5.4 discusses the findings of the regression and NCA analyses that found a statistically significant predictive validity of grit for work-related stress.

5.2 Structural and Measurement Model of Grit

One of the key aims of this thesis was the evaluation of the higher-order structural and measurement model of grit that was promoted in recent years (Duckworth, 2016). Moreover, it aimed to test if this model and its operationalisation is appropriate to measure grit in the organisational context. The observed model fit indices in the CFA indicate that the second-order conceptualisation of grit observed in this thesis is acceptable. While there has been an increasing number of criticism on the current conceptualisation of grit, none of the observed

model fit indices was far beyond the suggested threshold values, indicating that the model fit was acceptable. Only the χ^2 of 226.61 was off the suggested threshold. However, this might be due to the large sample size, as discussed by Hair *et al.* (2018). Therefore, this research additionally explored other model fit indices, such as the RMSE, CFI and TLI. These values (see Table 4-13) are similar to the ones reported by Duckworth *et al.* (2007) and Duckworth and Quinn (2009). In comparison, the alternative first-order model of grit did not show better model fit index values than the second-order conceptualisation. This suggests that the empirical part of the conceptualisation is justifiable, even if various researchers argued that if the alternative first-order model shows similar model fit indices it is preferable to choose the first-order conceptualisation (Koufteros *et al.*, 2009; Credé and Harms, 2015). Therefore, considering the traditional approach of testing a empirical construct, the findings of this thesis suggest that the proposed model is suitable to appropriately represent grit also in the business context.

Additionally, this thesis was also the first to test the empirical relationship between PsyCap, employee resilience and grit in depth. As discussed in Chapter 2, there was a lack of clarity in the past about the extent to which grit is distinguishable from resilience and PsyCap (Perkins-Gough, 2013; Vinothkumar and Prasad, 2016; Stoffel and Cain, 2017). As discussed before, Duckworth *et al.* (2007) argued that even if gritty individuals might represent some characteristics of resilience and PsyCap, grit is an empirically distinct concept. The results of this thesis support the empirical distinctiveness of each of the three concepts. The findings of the conducted CFA show that the structural model fit indices are not acceptable when resilience, PsyCap, and both PsyCap and resilience simultaneously were added to the grit model (Table 4-17). And as expected, none of the alternative models (see Figure 4-2 to Figure 4-4) exhibited a better model fit of our data than the traditional grit scale that is represented by the two dimensions, perseverance and consistency. As expected and discussed in Section 2.3.5 and Section 2.3.7, the 29 items loaded onto seven different factors that represent the four dimensions of PsyCap, employee resilience, perseverance, and consistency. No cross-loadings were observed, indicating that perseverance and consistency are indeed measuring an individual and distinctive construct. The subsequent checking of discriminant validity also revealed that the AVE values for all observed constructs were higher than the SIC. Thus, the findings indicate that discriminant validity is established. The combination of findings that showed good discriminant validity and unacceptable model fits for the tested alternative models of grit indicate that the current conceptualisation measures a unique construct. Despite the above discussed issues with the current model of grit in general, the findings shed light on the debates around the uniqueness of grit.

Similar to Duckworth's justification for the distinctiveness between the two concepts, it is theorised that while resilience helps individuals to bounce back from negative experiences, gritty individuals draw on this positive characteristic to prevent the experience of high levels of stress in the workplace (Perkins-Gough, 2013). Moreover, gritty individuals develop a resistance to negative situations and stressful events as well but go further by combining it with the emotional element of passion with a strong long-term focus that enables them to sustain through setbacks and challenging times (Duckworth *et al.*, 2007; Perkins-Gough, 2013; Duckworth, 2016). Similarly, distinguishing between grit and PsyCap was difficult in previous work due to the used terminology in previous grit research (see Section 2.3.5). However, the findings show that grit is a conceptually distinct construct to PsyCap. Even if it there are considerable conceptual overlaps between the two concepts, this study provides evidence that grit is not merely a recreation of PsyCap and resilience but describes a personality trait that is more than hope, self-efficacy, resilience, and optimism.

Therefore, this thesis rejects previous claims, which argued that grit is merely a sub-component of already existing measures and should not be treated as an induvial trait. Moreover, it supports Duckworth (2016) and Dugan *et al.* (2019) in their argumentation that grit should be considered an independent and unique positive personality characteristic. One important note for grit researchers might be to refrain from using similar terminology when addressing different personality characteristics. This has been and is the case for the grit dimension perseverance, which is often referred to as resilience, and thus, increasing confusion for researchers and practitioners. Even if Duckworth argues that grit entails the sustaining of difficult times and even the presence of hope to reach the long-term goals (see Section 2.3.5), grit is a distinct empirical concept (Perkins-Gough, 2013; Duckworth, 2017). Moreover, the findings of this research and the fact that it was shown to provide incremental predictive validity beyond PsyCap, and resilience emphasises the importance of treating them as different and distinct concepts. Only if the terminology that is used to describe grit is aligned and the definition clearly evaluated, research will be able to provide guidelines for practitioners to adopt grit in the organisational context.

However, the findings of this thesis show that despite the theoretical overlap and the misuse of terminology, the dimensions that are brought together in grit are uniquely important for individual outcomes in the workplace and can foster individuals skills and abilities that are important in the modern workplace.

However, similar to the issues in the distitinctive structural model, various authors criticised the current measurement model of grit that revealed various issues in terms of item terminology, potential cross loadings and differentiated correlation patterns (Datu *et al.*, 2015; Credé, 2018; Jachimowicz *et al.*, 2018; Guo *et al.*, 2019). The findings of the CFA and subsequent factor analysis showed that in addition to the structural model issues (second-order or first-order model, model fit indices), three of the factor loadings were relatively low and cross loadings between the two dimensions were observable. Therefore, the findings of this study support recent criticism by Jachimowicz *et al.* (2018) and Credé (2018), suggesting that there are shortcomings in the current measurement model of grit as assessed by the Grit-S Scale. Even if the main criteria for suggesting a model fit for the measurement model of the Grit-S Scale in this study were acceptable, there were issues in the Grit-S scale observed in this study.

As the findings show, there is reason to believe that particularly the consistency of interest dimension is not only measuring what it intends to measure. Moreover, the current conceptualisation of the consistency dimension seems to be ambiguous and does not appropriately reflect the emotional concept of passion which was a central part of Duckworth's definition of grit. This argument is based on the findings that suggest that grit is not an important chracteristic for innovative perfromance. Similarly, This aligns to previous debates, which argued that another important facet of grit, (long-term) goal setting, is similarly not covered in the current measurement model (Jachimowicz *et al.*, 2018; Jordan *et al.*, 2019a; Jordan *et al.*, 2019b). This validity issue in sufficiently assessing all grit dimensions is not a unique issue in grit research. A recent study by Hussey and Hughes (2020) revealed that among 15 commonly applied measures in social and personality psychology only one self-report measure (4%) showed good psychometric properties across the different types of validity and reliability assessed. All other measurements showed issues in the one or more of the more comprehensive validity assessments that included "immediate and delayed test-retest reliability, factor structure, and measurement invariance for age and gender groups" (Hussey and Hughes, 2020, p. 1). The authors argue that these surprising findings are potentially partly due to an issue in the conceptualisation of the of the construct or the poor item-development. The findings of the present research show that similar issues could be observed in the currently adopted measures of grit.

This is due to several reasons. First, the item wording can be somewhat misleading This might be due to the fact that one facet, consistency, is only being measured by negatively worded items and perseverance being measured by positive items only. Jachimowicz *et al.* (2018) argued that this leads to "a spurious multiple factor structure" (p. 3942), which only

exists because of the reversed coding and thus being a methodological research artifact. Participants in the pilot study of this this study reported confusion about the item wording of the item "Setbacks don't discourage me". Moreover, previous research debated about the impact of faking and social desirability bias in self-reported measures inside and outside the workplace (Martin *et al.*, 2002; Hogan *et al.*, 2007; Van de Mortel, 2008; Sackett, 2012). A recent study by Landers *et al.* (2011) that was based on more than 30.000 participants, argued that faking of personality assessments in employee selection is indeed an issue for organisations. This might be a potential issue that would arise when using the Grit-S Scale in assessment settings. The used item terminology in this measure is potentially prone to be subject to the social desirability bias and alternative terminologies might help to mitigate this issue. One potential alternative way to frame questions would be an implicit grit questionnaire. Implicit personality tests have been shown to be less prone to faking and reflect the psychological constructs potentially better than the explicit measurement tools (Asendorpf *et al.*, 2002; Fazio and Olson, 2003; Hofmann *et al.*, 2005; Harms and Luthans, 2012; Harms *et al.*, 2017).

Overall, using a grit scale for personal selection would only be a useful approach for organisations if the previously reported positive impact of grit on performance was observable in the business context as well (Haist, 2015; Credé *et al.*, 2017; Credé, 2018; Jordan *et al.*, 2019b). Due to this lack of studies exploring the predictive validity of grit on performance in the business environment this study tested the predictive validity of grit for job performance and work-related stress was assessed.

5.3 Grit and Job Performance

Various authors (e.g. Credé *et al.*, 2017; Ion *et al.*, 2017; Schmidt *et al.*, 2018) raised concerns about the contribution of grit as an individual personality trait predicting individual outcomes in the workplace stating for example that:

> "we argue that including Grit in the personality and work-related outcomes landscape is redundant. Our findings suggest that Grit's relevance and impact in the workplace is reduced. To avoid transforming Grit into just another "hype", robust evidence in favour of its utility in predicting work-relevant outcomes must be provided" (Ion *et al.*, 2017, p. 167).

As a response, this study collected data from a representative sample of the UK working population to test the added predictive validity of grit beyond PsyCap and resilience. The

findings of this study contribute to current debates in HRM research by suggesting that grit, and other personality characteristics, are crucial for high performance and low levels of stress in the organisational context. In doing so, it challenges common perceptions in HRM that such effects are largely based on HR structures and policies (Alfes *et al.*, 2013; Sterling and Boxall, 2013). Moreover, this study shows that personality can be crucial for desirable outcomes at the workplace and need to be implemented in ongoing debates.

The results of this study supported the assumption that grit is indeed a valid predictor of job performance and work-related stress. The findings of this research suggest that grit is not only a positive factor for higher levels of performance in the educational, military and sport domains, but also in the organisational context. This also reinforces previous claims that suggested this effect based on non-representative samples (Suzuki *et al.*, 2015; Wolfe and Patel, 2016; Credé, 2018; Peleaşă, 2018; Arco-Tirado *et al.*, 2019; Credé, 2019; Guo *et al.*, 2019; Jachimowicz *et al.*, 2019). However, the present findings go beyond previous studies by showing that this positive tendency of performance is not restricted to certain industries, department, or occupations in the business context but across the representative sample of the UK working population. This finding has not been shown in any previous study and shows the potential overarching impact of grit on individual performance at the workplace.

As discussed in Section 2.4.2.2 there has been an increasing attention in OCB over the last three decades. This kind of voluntary commitment of an employee towards co-workers and the organisation is deemed to be essential for an effective organisational functioning and performance (Podsakoff and MacKenzie, 1997; Hoffman *et al.*, 2007). One of the questions in previous literature on grit was the potential effects of grit on help seeking and help providing behaviours, in particular when considering the strong long-term focus of gritty individuals (Akin and Arslan, 2014; Credé *et al.*, 2017). Taking into account the described ability of gritty individuals to be passionate about a certain long-term goal and show consistent perseverance to reach this goal, the question arises how such a personality trait affects the individual behaviour towards others and the organisation in the workplace.

As shown in Section 4.4.1, the findings of this study suggest that grit has a beneficial effect on OCB. Thus, this finding supports the suggested importance of grit to increase not only task performance but also individuals citizenship behaviours. However, the findings of the hierarchical regressions that tested the individual effects of the two grit dimensions showed that OCB was only predicted by perseverance, while consistency did not possess predictive validity on a statistically significant level. And second, the findings showed that when considered individually, the consistency facet changed from an insignificant positive to a non-significant

negative predictor. This finding has important implications for its considerations in the organisational context. It indicates that even if perseverance predicts higher levels of OCB, consistency negatively impacts the extra commitment and extra role work behaviour. This is particularly interesting, as previous research considered the positive influence of grit on job performance, without exploring the potential negative effects of long-term goal orientation.

It could mean that high levels of grit could potentially lead to a reduction of help-seeking and help-providing behaviours due to the strict focus and determination of individuals to reach their goals. As such, they might be more likely to attempt to solve problems that could be solved easier in a team setting or implementing some sort of help instead of persevering despite such challenging situations (Lucas *et al.*, 2015). However, the overall grit score and perseverance were shown to explain 4.5% and 6.9% respectively of the variance in OCB, suggesting that the positive effect might be stronger than the potential negative impact of consistency. Nevertheless, future research should explore this relationship in more depth to analyse the potential negative effect of grit on such desirable extra-role behaviours in the workplace. This is particularly important when considering the call for implementing training and development programs to foster grit in the workplace (Donahue, 2015; Elam, 2015; Geist, 2016; Halliday *et al.*, 2017). Further, the finding could also be additional evidence for the problematic combination of the two grit dimensions in an overall score, since they result in a loss of predictive validity for the outcome variable OCB (Credé *et al.*, 2017).

It has been argued that in the modern and globalised world, most markets require organisations be innovative in order to remain competitive (Betz, 2003). As it has been shown that organisational innovation is largely influenced by innovative performance on the individual level (Shipton *et al.*, 2016a), employees are encouraged to not only perform on their traditional task performance dimensions, but if creative and innovative performance levels are high as well (Harari *et al.*, 2016). Research into the impact of grit in the area of creativity and innovation has only been tested in a small number of previous studies as discussed in Section 2.4.2.3. As reported, three studies reported positive effects of grit on venture success, entrepreneurial success, and entrepreneurial intentions (Mooradian *et al.*, 2016; Mueller *et al.*, 2017; Butz *et al.*, 2018), while one study found that grit was negatively related to entrepreneurial intensions (Arco-Tirado *et al.*, 2019). However, the relationship between grit and innovative performance at the workplace was not explored before.

Contrary to the research hypotheses, the findings of this study showed that grit is not such an important factor for higher levels of innovative performance as reported for other innovation-related outcomes in prior work. There are different potential reasons for this. First,

there are important differences between the measured variables and factors that facilitate these. Entrepreneurial intentions and entrepreneurial actions might be positively linked to the level of grit that acts as a reinforcement for pursuing passion driven and innovative ideas This could be based on an individual's continuous interest and the ability to persevere through challenges that are common in entrepreneurial contexts (Zhao *et al.*, 2010; Mooradian *et al.*, 2016).

However, in the workplace, it might be that individuals who posess higher levels of grit are not necessarily as much focused on the development and introduction of new concepts and projects, but rather the continuous effort in the subject of interest (Sparks, 2014). Thus, the reaching of a long-term goals, such as a promotion or recognition might be more important to gritty individuals than searching for new ideas or alternative solutions to problems that are not directly linked to those long-term desires (Arco-Tirado *et al.*, 2019). This is reflected in the results of the controlled regression model for innovative performance as presented in ***Table 4-19***, which showed that consistency of interest, even if not statistically significant, was a negative predictor of innovative performance.

Another reason that grit is not a good predictor of innovative performance could be a general tendency of gritty individuals to lose sight of other opportunities and directions. This was found in previous research in individuals scoring high in a certain type of passion, referred to as obsessive passion (Vallerand *et al.*, 2003; Mageau *et al.*, 2009; Gorgievski-Duijvesteijn and Bakker, 2010; Forest *et al.*, 2011; Lalande *et al.*, 2017). The authors noted that there is not only one dimension of passion, which is considered a positive resource for various outcomes, but that there is a second, more negative dimension to it. Obsessive passion describes a controlled internalization of activities or topics of interest and connected to a person's identity, which creates an internal pressure to engage in the corresponding activities. Thus, while passion has been shown to be a crucial concept for innovative performance in different organisational settings, such as for employees (Vallerand *et al.*, 2007) or entrepreneurs (Cardon *et al.*, 2009). It has been argued that obsessive passion is negatively related to individual outcomes in the workplace and could be an antecedent of addiction or workaholism (Burke and Fiksenbaum, 2009; Deleuze *et al.*, 2018).

Consistency of interest, which according to (Duckworth *et al.*, 2007) is identical to passion, could potentially cover key parts of the obsessive dimension and thus, could explain the negative effect of consistency on innovative performance (Ho *et al.*, 2011). As such, grit could entail a certain negative characteristic that would manifest in an obsessive behaviour towards a certain long-term goal, without readjusting and analysing alternative solutions. This could also mean that individuals who are higher in grit are more prone to stick to a certain idea

to reach a goal and potentially become obsessive towards it. As a result, innovative performance might be reduced.

Another reason for the lack of predictive validity of grit for innovative performance might be that the findings could be linked to the differentiated predictive validity and thus, reflects on the previously discussed issue of the multidimensionality of grit. As noted by Butz *et al.* (2018), who reported similar findings for entrepreneurial success, it is necessary to consider the two facets of grit individually in order to reveal the true impact of grit. Moreover, the influence of consistency of interest is likely to be different than the influence of true passion for a subject of interest (Mueller *et al.*, 2017) as discussed above. Overall, the study suggested that only the perseverance of effort dimension predicts higher levels of innovative performance in this thesis. Overall, even if the overall grit score showed a positive effect on innovative performance, there are indicators that managers and HRM departments should be cautious when attempting to raise individual levels of grit. It should first be evaluated how these relationships are affected and are affecting innovative behaviour in more depth.

One of the issues with sufficient conditions in the organisational context can be that even if such processes or abilities can be considered as a nice-to-have, they can be insufficient to convince organisations to invest into changes in their processes. When researchers suggest changing training and hiring practices and to include programmes that allow to select and develop individual personality traits, it is difficult to justify such recommendations based on observed sufficient conditions. It is much more likely to suggest these changes if such traits are proven to be necessary conditions to result in desirable outcomes. Therefore, it was argued that necessary conditions would be crucial for organisations to start investing in programmes to develop and promote grit in the work context (Hauff *et al.*, 2019). As a result, this thesis was the first to use necessary condition analyses to test if grit is not only a sufficient but also a necessary condition for higher levels of performance in the workplace.

However, the findings suggested that grit is not a necessary condition for job performance. Both the visual and statistical findings of the NCA show that there is no sign of grit being a statistically significant condition for any of the three performance measures. This is an interesting finding, given that the regression analysis revealed a statistically significant predictive validity of grit for the performance measures. However, this indicates that contrary to the interest into grit and despite the promotion of grit as an important contributor for various outcomes, it needs to be considered as a sufficient but not a necessary condition for job performance. This means that even if there is a positive relationship between the two concepts, higher levels of performance can also be reached by individuals with lower levels of grit, which

has not been explored before (Peleaşă, 2018; Jordan *et al.*, 2019b). However, it needs to be considered that this study adopted a self-reported performance measure approach to assess job performance, which could have affected the findings. As discussed in Section 3.5.2, the scale that was used revealed a relatively high average score of task performance and thus a major part of participants rated their own performance as high. This resulted in a reduced variance, and thus potentially impacts the visibility of the observed potential differences in the findings of the NCA. The effects of grit on OCB and innovative performance were generally low and thus, a necessary condition was not expected. Nevertheless, these findings shed a different light on recent discussions of grit (Bashant, 2014; Duckworth, 2016; Credé *et al.*, 2017), arguing that at least in the organisational context, grit is not necessary to for high levels of individual job performance. Moreover, these insights need to be shared with practice to increase transparency and inform organisational decision making about the potentials of grit affecting performance at the workplace. Nevertheless, the findings of this thesis show that grit is not only important in relation to performance but even more so in light of the experience of work-related stress.

5.4 Grit and Work-Related Stress

To further develop the understanding of grit and its relationship with indidivuals outcomes in the workplace, this study explored the relationship between grit and stress by testing its effect using an overall grit score and both grit dimensions individually. Overall, negative correlations between grit, and the overall level of stress. However, the results also show that overall grit and consistency have a stronger negative relationship with overall work-related stress than perseverance of effort individually. The effects of grit were evaluated for individuals working across 18 different work sectors, departments and occupations, and grit was shown to be a statistically significant stress reducing factor across the whole sample. Thus, similar to the previous section, this thesis further adds evidence to reject a recently developed theory that claimed a domain specific effect of grit (Cormier *et al.*, 2019). Thus, grit is not only an important factor to reduce levels of stress in certain areas of the organisational context, but a personality trait that that has positive implications across workplaces across the UK.

Even if previous findings provided a wide range of correlations from insignificant relationships (Ceschi *et al.*, 2016; Wong *et al.*, 2018) to significant correlations ranging from r = -.17 up to -.42 (Meriac *et al.*, 2015; O'Neal *et al.*, 2016), they did not provide a consistent understanding of grit in the working context. The slightly smaller correlation coefficients observed in the present study might be explained by the applied challenge-hindrance framework that assesses the multidimensional nature of stress.

Additionally, most previous studies that explored the relationship between grit and stress reported only the effects on stress for the overall grit score. However, in line with the argumentation that predictive validity is lost when using the aggregated grit score (Guo *et al.*, 2019; Jordan *et al.*, 2019b), the predictive validity of grit for overall work-related stress in this thesis was indeed higher when perseverance and consistency were assessed individually. Perseverance as a single predictor was found not to add statistically significant predictive validity beyond the consistency dimension. Even more interesting is the finding that consistency as a single predictor explains a larger amount of variance in work-related stress than an overall level of grit ($R^2 = .051$, see Section 4.4). This finding is surprising, considering that previous research argued that grittier individuals are less likely to experience higher levels of stress due to the combination of the two dimensions (O'Neal *et al.*, 2016; Lee, 2017). However, as shown in this thesis, this is not the case.

One explanation for these findings might be that by loving what they do, gritty individuals have a stronger goal attainment than individuals lower in grit and thus, perceive job demands more favourably. This would suggest that work stressors would be interpreted as challenges to overcome rather than as hindering factors (Jordan *et al.*, 2018; Jordan *et al.*, 2019b). This would also indicate that consistency of interest provides individuals with the ability to reinterpret stressors. As a result, the experience of these stressors would be different for those individuals that score lower in grit. Moreover, the findings could be explained by grit having a reducing effect on the perception of the severity of the individual stressors. Alternatively, it could also be that grit acts as a protective and supportive resource that reduces the stressor-strain relationship itself (Ceschi *et al.*, 2016; Jordan *et al.*, 2018).

A second explanation could be that perseverance of effort is in itself not a characteristic that helps to reduce the experience of stress. Even if previous research suggested that such a strong focus on working towards one's own long-term goals might help to experience stressful events differently, this effect might not account for different occupations and industries (Jordan *et al.*, 2019b). This would support a recent discussion in organisations psychology research that argued that passion for ones work is a generally underrated characteristic that can positively influence individuals motivation, engagement and eventually the experience of stress (McAllister *et al.*, 2017; Zigarmi *et al.*, 2018).

However, it is not only important to consider the multifaceted nature of grit, but also take into account the two-dimensional nature of stress (Cavanaugh *et al.*, 1998). Therefore, this was the first research to introduce the challenge-hindrance stressor framework into the grit literature. The reason to use the Challenge-Hindrance framework was that a differentiated effect

of grit was predicted for the individual experience of work-related stress. More precisely, it was expected that individuals scoring higher in grit – and particularly perseverance – experience challenge stressors differently than their non-gritty counterparts. Further, it was expected that those individuals scoring higher in grit generally experience lower levels of hindrance stress.

Contrary to the research hypotheses, consistency of interest was the stronger predictor, and perseverance did not provide additional explanation of variance in hindrance stress beyond consistency. These findings might indicate that only consistency of interest provides individuals with the ability to change the perceptions of a stressor. Thus, even if the stressor might be experienced as negative, due to the consistent interest of a gritty individual towards the long-term goal, this person might interpret the stressor as part of the challenge that needs to be overcome (Jordan *et al.*, 2019b).

Duckworth et al's (2007) description of perseverance led to the assumption that it would be a potential predictor of higher levels of work-related challenge stress. This is because gritty individuals were expected to work towards a specific long-term goal that is connected with the ability to set challenging goals to develop personally and reach these goals. As a result, it could be argued that individuals who are setting challenging goals might experience an additional amount of work-related challenge stress. Even if this stress might not be perceived as a hindrance, but rather as a challenging situation that could result in personal growth and a feeling of mastery (Perkins-Gough, 2013; Silvia *et al.*, 2013; Duckworth, 2016). Consequently, it was expected that the reported levels of challenge stress would be higher for those individuals scoring higher in grit, and higher for the perseverance of effort dimension. However, contrary to these assumptions, the findings found no predictive validity of perseverance but for consistency. This finding is particularly interesting, as Jachimowicz *et al.* (2018) argued that the current grit scale represents mainly perseverance but not consistency of interest. However, this proposition was not observed in these results. In line with the research hypothesis, consistency was the main predictor of a reduced experience of work-related challenge stress (see Chapter 4 Section 4.4). However, contrary to the research hypothesis, the commonly positively associated challenge stressors (Piccoli *et al.*, 2019) were found to be negatively affected by both facets of grit.

There are two potential explanations of this negative effect of perseverance on challenge stress. Firstly, it might be that even if perseverance of effort describes the individuals striving towards challenging situations in order to experience the aforementioned personal development and growth (Duckworth *et al.*, 2007), the experience of such challenge stressors might not be experienced as something stressful but rather desirable. In this sense, the challenge stress scale

would not necessarily capture it as something stressful, as gritty individuals are in a sense not immersed in this experience of stress (Silvia *et al.*, 2013). Nevertheless, it needs to be noted that the findings, despite the negative correlation, did not predict lower levels of challenge stress in a statistically significant way.

Another potential explanation is that even if the challenge-hindrance framework was shown to be a more conclusive model of stress than the traditional definition of stress as a negative factor, it still has one major problem. The model does not take individual differences into account. This is a major drawback because it has been shown that there is a strong difference in the subjective perception and appraisal of contexts and situations (Mazzola and Disselhorst, 2019). This could mean that the findings reflect the potential missing implicit and very individual primary appraisal of the situation. Nevertheless, there might also be differences in gritty individuals in which way they experience different stressors at work. Therefore, it might be that the obtained findings simply mirror the individual appraisal of the situation or stressor. While for some people time pressure or job responsibility might be perceived as something beneficial and result in better work-related outcomes, for others these factors might be perceived as hindrance variables and hence lead to increased individual stress-levels and reduced well-being. Therefore, even if the challenge-hindrance stressor framework is a better conceptualisation of stress than traditional conceptualisations, a two way definition of stress is not enough to explain the individual experience of stress at work (Webster *et al.*, 2011; Mazzola and Disselhorst, 2019).

Overall, the research findings provided evidence for the negative effect of grit on the individual perception of the two dimensions of work-related stress, challenge and hindrance. For the overall grit score, these findings are consistent with previous research that reported a stress-reducing effect of grit on the experience of stress in different fields of study (Meriac *et al.*, 2015; Ceschi *et al.*, 2016; Duckworth, 2016; O'Neal *et al.*, 2016; Halliday *et al.*, 2017; Jin and Kim, 2017; Lee, 2017; Wong *et al.*, 2018). However, the observed effect sizes are small. One explanation of these could be that it might be due to the somewhat unclear conceptualisation and operationalisation of grit in this study as discussed in the previous section. While consistency of effort has been shown to possess a certain amount of predictive validity for stress, it is also very likely that the more emotional component of passion – which is not assessed in the Grit-S Scale – has a much stronger effect on the experience and evaluation of stressors in the workplace (Jordan *et al.*, 2019b). The fact that the impact of grit is higher when both dimensions are considered individually and in a combined measure, questions the current operationalization and definition of grit (Ion *et al.*, 2017; Credé, 2018; Guo *et al.*, 2019).

The findings suggest that in the current conceptualisation the two dimensions show differentiated correlation and regression patterns for work-related stress and thus, should be treated as two distinct facets that should not be aggregated to an overall score.

Another potential explanation for the small effect sizes that were observed for the impact of grit on work-related stress might be the cumulative number of factors that generally affect the experience of stress in the organisational context. Such factors were evaluated in Section 2.4.2 and include job demands, work design, other organisational factors, or even other personality traits, such as PsyCap or resilience (Gill *et al.*, 2006; Nieuwenhuijsen *et al.*, 2010; Nixon *et al.*, 2011; Ganster and Rosen, 2013). As such, the added benefit of other intervening factors might be smaller. Nevertheless, based on this study it can be argued that the observed effect sizes do indicate that grit has a stress reducing effect that can help to reduce employee stress at work, by affecting the perception of stressors and the long-term goal dedication.

This is closely connected to the claims of several authors that there is currently no evidence that justifies the usage of grit as an additional concept to predict individual performance in the working context (Credé *et al.*, 2017; Ion *et al.*, 2017). This is, since one of the key requirements for personality traits that are newly established is that they provide evidence to be beneficial for the prediction of outcomes beyond established measures. If they do not proof to add predictive validity above such well-known concepts, they can be considered as redundant and are generally not useful in practical settings (Credé *et al.*, 2017). Previous research has shown that both concepts, PsyCap and resilience, have a good predictive validity for various desirable outcomes in the workplace (see Chapter 2.3). Considering such known measures and their well-researched effects in the workplace, Ion *et al.* (2017) and Schmidt *et al.* (2018) argued that grit does not add any additional value beyond existing measures to the prediction of individual outcomes in the workplace. However, there was only limited research that explored the potential incremental validity of grit beyond PsyCap and resilience for job performance and the experience of work-related stress.

The findings of this thesis provide evidence of a predictive validity of grit beyond the two psychological constructs. This is an interesting finding as previously PsyCap and resilience have been promoted as crucial factors in the reducing of the experience of stress in the workplace (Avey *et al.*, 2009; McCraty and Atkinson, 2012; Abbas and Raja, 2015; Shatté *et al.*, 2017). Even if previous research argued that particularly resilience is an important personality characteristic to reduce the levels of work stress, this study revealed that PsyCap and consistency of interest were the only statistically significant predictors of hindrance stress. There are several potential explanations for this explanation of variance in all three measures

of work-related stress beyond resilience. First, it might be due to the fact that grit offers the long-term outlook and emotional attachment that is represented by passion in its original conceptualisation (Perkins-Gough, 2013; Duckworth, 2016). Second, this consistent interest into a topic and simultaneous emotional attachment to it enables gritty individuals to reduce stress by appraising stressors more favourably as development opportunities (Duckworth, 2016). As suggested by Jordan *et al.* (2018) and Ceschi *et al.* (2016) gritty individuals value what they do, which enables them to perceive work demands as less challenging in order to attain their desired goals than they would be for individuals scoring lower in grit (Jordan *et al.*, 2019b).

Overall, the findings of this study suggest that there are no statistically significant interaction effects and neither of the two established measures affect the predictive power of grit for stress and performance. This indicates that even if all three personality traits individually affect certain outcomes in the workplace, they do so independently from one another. This emphasises the importance of grit as a unique predictor of work-related stress.

However, one of the advantages of PsyCap and resilience is that various interventions have already been developed that aim to increase these two personality traits inside and outside the workplace (Luthans *et al.*, 2006a; Luthans *et al.*, 2008b; Abbott *et al.*, 2009; Demerouti *et al.*, 2011; Sood *et al.*, 2011; McCraty and Atkinson, 2012; Carr *et al.*, 2013; Robertson *et al.*, 2015). Such interventions have not been designed yet for grit. However, in the light of the present findings, such interventions might help to increase the positive effect of grit on the experience of work-related stress and job performance even further. Such approaches can help to reduce the impact of stress, that is experienced by employees, by strengthening not only grit but all tested personality characteristics. Thus, this study adds to current debates in business and management research by showing that personality is indeed an important factor for various individual outcomes across workplaces (Swider and Zimmerman, 2010; Zhang *et al.*, 2019). Moreover, the findings show that grit is more than just old wine in new bottles and can affect individual well-being and performance at the workplace positively and beyond established personality measures.

Opposed to previous work that argued that implementing grit in the workplace would be unnecessary (Ion *et al.*, 2017), the findings of this study provide evidence that there is reason to include grit in the business context. The findings support previous studies that suggested that organisational training and development programs and potentially even in employee or talent selection processes could potentially benefit from its implementation (De Vera *et al.*, 2015; Elam, 2015). Moreover, these findings of the present study suggest that the strongest predictive

validity for higher job performance and lower vulnerability for the experience of work-related stress is achieved by implementing such assessments alongside traditional personality assessments such as for resilience and PsyCap.

However, regression models do not provide evidence for the necessity of the condition for the outcome (in this case work-related stress). However, as discussed above, for businesses and organisation to consider grit in their HRD and TM programmes, a sufficient condition would potentially not be enough to justify an inclusion into current practices. Since it has been found that grit is not a necessary condition for job performance, providing evidence that it is a necessary condition for lower levels of the experience of work-related stress. If this would be the case, it might still be a very interesting characteristic, especially when considering the situation of further increasing societal issues due to high levels of work-related stress (HSE, 2013; Hassard *et al.*, 2018).

The findings of the NCA suggested that overall grit is a necessary condition for reducing the amount of work-related stress. Supporting the hypothesis that grit is a necessary condition for work-related stress (see Section 2.2.5.2), a statistically significant effect was found. This indicates that a certain level of grit is necessary to reduce the experience of overall work-related stress. Particularly the perseverance dimension showed a statistically significant effect size suggesting that perseverance of effort, even if not a statistically significant sufficient condition, is a necessary condition for lower levels of hindrance stress. These results support and go beyond previous research by providing evidence that grit is indeed an essential factor to reduce the experience of overall stress in the working context. The fact that this effect is only the case for overall stress and hindrance stress, but not the experience of challenge stress, might be due to the conceptualisation of challenge and hindrance stress. By excluding the individual appraisal of the stressor, findings might not reflect the actual experience of stressors in the workplace (Mazzola and Disselhorst, 2019; Webster and Adams, 2020).

Even though currently adopted stress management programs can be effective in reducing the level of situational stress in the organisational context, previous research has shown that dispositional personality characteristics can reduce the effects of such programs (Avey *et al.*, 2009). Therefore, by showing that grit is necessary to reduce organisational stress this thesis complements previous efforts to find factors that can decrease the stress vulnerability of employees (Avey *et al.*, 2009; Swaminathan and Rajkumar, 2010; Machado *et al.*, 2013). Even if personality testing in recruitment and selection is a highly controversial topic, considering grit in such practices could help to ensure a better fit between the employee and the

demands of the potential future job (Smith Rachel *et al.*, 2020). Consequently, this could lead to a reduction of experienced stress of newly hired employees.

Overall, this study aimed to provide further insights into the relationship between grit and work-related stress. There was only a small amount of published research that evaluated the impact of grit on stress in the workplace, whereas the majority of previous research was assessing stress within the educational context (O'Neal *et al.*, 2016; Lee, 2017; Wayment and Cavolo, 2019). Moreover, these findings were limited and did not provide enough information on the effect across different occupations and industries. Therefore these studies did not provide generalisable suggestions for the wider working population (Credé *et al.*, 2017; Jordan *et al.*, 2019b).

Confirming previous findings, this research found that the higher the individual level of grit was, the lower the perceived stress at work (Meriac *et al.*, 2015). This was the case for both dimensions of stress, challenge, and hindrance. Moreover, the results show that particularly the consistency dimension is crucial in adverse conditions in this sample. This is striking because perseverance was expected to be the more important factor when dealing with stressors in the workplace (Datu *et al.*, 2015; Jordan *et al.*, 2019b). However, this finding emphasizes the recent debates about the operationalisation of the grit scale, mainly measuring consistency of interest and less perseverance and passion (Credé, 2018; Jachimowicz *et al.*, 2018). Equally interesting are the findings of the NCA that showed that even if consistency was the stronger predictor of stress levels, only perseverance revealed to be a necessary condition for lower stress levels. This indicates that consistency is potentially beneficial, although, perseverance of effort is necessary to reduce the perceived stress at work.

These findings are a key contribution of this study, as they go beyond previous research by providing evidence that grit can act as a stress-reducing resource in the workplace. Moreover, its suggests that this is not restricted to specific areas or occupations but is consistent across the whole representative sample of the UK working population. Contrary to previous research (Cormier *et al.*, 2019; Schmidt *et al.*, 2019), this study did not find domain- or industry-specific differences in the effects of grit on work-related stress. The present findings extend the knowledge of grit and its implications on perceived stress by taking into account the non-universal nature of stress (Cavanaugh *et al.*, 2000; Prem *et al.*, 2017). The results suggest that there is a stress reducing effect of grit on both dimensions of stress. Contrary to previous research that tested the individual impact of the two dimensions of grit (Jordan *et al.*, 2018), perseverance was not found to predict lower levels of stress in a statistically significant way.

201

More importantly, findings suggest that consistency is the only predictor of work-related stress in the overall model of grit.

This is an interesting finding, particularly when considering the subsequent NCA analysis that revealed that the overall grit score represents a necessary condition for lower levels of work-related stress. However, even if consistency was found to be a sufficient condition for lower levels of work-related stress, perseverance was the only facet of grit that was found to be a necessary condition for lower levels of stress. This means that even if high levels of consistency can decrease the level of work-related stress, without perseverance low levels of stress are not possible. However, equally perseverance as a necessary but not sufficient condition implies that when perseverance is high there is no guarantee for lower levels of stress. In this case, to experience no stress at all, each necessary condition must be in place (Dul, 2016b).

This is of interest for current theories in different HR related research areas. One current debate that could focus on these insights could be the area of employee recruitment, selection and assessment centres. As part of current trends in this area, there is an increasing demand for new methods and assessment criteria (Nikolaou and Oostrom, 2015). Since personality testing is still an important part of the recruitment process for many organisations, grit might be a useful addition in the tested characteristics for key positions, which require individuals that are able to sustain high performing in challenging situations.

Additionally, the findings of the different regression coefficients that assessed the predictive validity of the overall grit scale and the two dimensions individually add to the concerns about criterion validity of the grit scale. The is mainly due to the fact that the predictive validity of grit is based on only a single facet of grit. Even more concerning is the finding that perseverance predicts OCB and innovative performance in a statistically significant way, whereas consistency shows a non-significant negative relationship. Such findings have recently been discussed by Guo *et al.* (2019) and Credé (2019) who therefore argued that not only the predictive validity is lost, but that the two facets of grit are predicting in differentiated directions. This in turn reduces the predictive validity of the overall grit score and questions the usefulness of this conceptualisation (Schmidt *et al.*, 2018). In agreement with the conclusion of the authors, this research suggests that the currently adopted structural and measurement model of grit requires major revision.

5.5 Person-Centred Model of Grit

This research found issues that were discussed in previous research on the current practice in grit research of presenting findings for the aggregated overall grit score only, which was found to result in a loss of predictive validity Credé (2018). The findings of this study showed a lower predictive validity for all three performance and both stress dimensions when comparing the overall grit score with the two dimensions individually. This emphasises the earlier discussion about the model fit of the higher-order conceptualisation of grit. Moreover, as indicated in Chapter 2, there might be issues in criterion and discriminant validity. Because of this loss in criterion validity, Credé (2018) argued that an alternative conceptualisation of grit would be necessary. One such conceptualisation could be a person-centred level of grit that is represented by individuals scoring high in both dimensions, perseverance, and consistency, simultaneously. This would mean that grit would not exist on a continuum from low to high, but that an individual would only be gritty or not. This would revoke the discussed issue (see Chapter 2.2.4) of individuals scoring moderately in grit while scoring low in any of the two dimensions.

The findings of the predictive validity of person-centred grit for job performance found that predictive validities for all three job performance measures were lower than for the traditional grit score (see Chapter 4.3.7). This was contrary to the expectations, as it was hypothesised that high levels on both dimensions of grit would lead to higher levels of performance. However, considering the findings of this study that showed a potential negative relationship between consistency and OCB and innovative performance, these findings could be explained by a similar argumentation. To test the dichotomous variable independent from other factors, a NCA was run solely for task performance, exploring if high levels of person-centred grit are a necessary condition for high levels of performance. However, similarly to the traditional conceptualisation, the obtained results indicate that Person-Centred grit is not a necessary condition for high levels of task performance.

Similarly, no statistically significant effect was observed that would indicate that a high level of person-centred grit is a necessary condition for lower levels of work-related stress. Similarly, no statistically significant findings were observed when considering the absence of grit, a necessary condition for higher levels of stress. Overall, contrary to the traditional conceptualisation of grit, the Person-Centred Model did not provide evidence that gritty individuals are experiencing less stress at work or achieve higher level of performance. This suggests for grit researchers that instead of relying on the Person-Centred Model of grit, the conceptualisation of grit needs revision more generally. Research in grit should re-evaluate the higher-order model and not incorporate the Person-Centred Model into further discussion since

it does not provide a convincing alternative model of grit. Moreover, the findings suggest that the differentiated nature of the two adoped grit dimensions is the reason for the loss in predictive validty when aggreated to an overall grit score. Therefore, the new developed conceptualisation of grit would need to ensure to implement those dimensions into the model that are based on the original definition: namely passion, perseverance, and goal setting. This would help grit researchers across all disciplines to develop further insights into the effects of grit on individual outcomes inside and outside the workplace.

5.6 Summary

This research sheds new light on the concept of grit, its predictive validity for job performance and work-related stress. It provides additional information for businesses, pointing out the potential usefulness of grit in the workplace in sustaining high performance and reducing the negative effects of stress in the workplace. Moreover, the results indicate that this is the case beyond the two traditionally assessed concepts resilience and PsyCap. Overall, this thesis show that grit can strengthen the abilities of employees to cope with challenging and hindering work stressors and show higher levels of performance. However, more research is needed to revaluate the structural and measurement of grit and to further explore its importance as a predictor of various business-related outcomes, since contradictory effects of the two grit dimensions were observed. The next chapter concludes this research with a summary of the research findings, highlighting the theoretical contributions of this research and its practical implications for business and management. Lastly, to develop the current knowledge of grit in the organisational context, recommendations for future research avenues are outlined.

Chapter 6 Conclusion

This chapter concludes this research by providing a summary of the findings and an overview of its theoretical and empirical contributions to research. Moreover, it outlines the practical implications of the provided findings for managers and organisations. The focus lies on the debate around the conceptual framework of grit and its potential importance for organisations in the working context. A reflection is provided that critically reviews the chosen research approach and outlines a set of recommendations for future research to enhance the current knowledge of grit. Specific steps are proposed that are necessary to further develop the understanding of grit in the business context.

6.1 Summary of the Research Findings

The promotion of the personality trait grit as a successful and meaningful predictor of outcomes outside and inside the workplace sparked interest in practice and across the research community (Gray, 2016; Credé *et al.*, 2017; Siedle, 2019). One of the reasons for this 'hype' was the indication that higher levels of grit could predict performance and success better than traditional measures such as intelligence (Duckworth *et al.*, 2007; Duckworth and Quinn, 2009) Moreover, research indicated that grit might be subject to change and could be developed through dedicated trainings and development programmes (Bashant, 2014; Robertson-Kraft and Duckworth, 2014; Geist, 2016). Overall, the present thesis provided insights into the previously discussed issues concerning the structural and measurement model of grit and its applicability to the business context. Since grit has not been sufficiently evaluated before in this environment this thesis provides unique insights about the role of grit for business-related outcomes.

Moreover, four alternative models of grit were tested that included the comparison or inclusion of the related personality characteristics PsyCap and resilience. The results suggest that grit is not only a distingtive personality trait in comparison to PsyCap and resilience, but that it is also an acceptable concpetualisation of grit in the business context and no better alternative model was found. However, even if the findings revealed an acceptable discriminant validity of grit and its dimensions for resilience and PsyCap, it can be argued that the theoretical model of grit lacks clarity, preciseness and sufficient coverage of the factors that it intends to represent (Haist, 2015; Credé *et al.*, 2017; Credé, 2019; Jordan *et al.*, 2019b).

This thesis adds to the discussion that started recently, by showing that the two dimensions have different and for innovative performance even contrary predictive validities

for individual outcomes in the workplace. This might be due to the conceptualisation of passion as consistency of interest or because gritty individuals generally lack the ability to see alternative options to do things at work. Consistency of interest only captures a continuous interest and does not represent the emotional component that is commonly associated with passion (Vazsonyi *et al.*, 2019). Moreover, goal setting and goal attainment are not specifically tested in the current higher-order model of grit (Jordan *et al.*, 2019b). Even if this study did not find a better model fit for the bi-factor model as suggested by Vazsonyi *et al.* (2019) or the Person-Centred Model of grit suggested by Credé (2018) it is argued that the current conceptualisation is only an acceptable option to measure grit but is potentially flawed and does not sufficiently represent the intended factors. The theoretical model of grit shows issues, revealing potential contradictory explanations of variance of its two dimensions and requires a critical revision.

As theorised, this research revealed that overall grit and both grit dimensions, are statistically significant predictors of task performance, suggesting that not only perseverance, but also consistency of interest helps to perform better on the required tasks in the workplace (Dugan *et al.*, 2019). However, the finding that perseverance predicted higher levels of OCB and innovative performance beyond consistency, that did not add predictive validity at all, was contrary to the expectations. These findings suggest that even if grit is a positive resource for job performance in the workplace, there might be a latent negative aspect to it. Thus, very high levels of grit could potentially lead to a strict focus on the long-term goal, leading to a reduced ability to see alternative solutions or introducing new ways of working. Further, previous studies reported non-significant relationships between grit and creativity (Sparks, 2014), however, significant negative relationships have not been reported before. It could be argued that this contradicts recent findings that suggested that high levels of grit predict venture success (Mueller *et al.*, 2017) and entrepreneurial intention (Butz *et al.*, 2018; Arco-Tirado *et al.*, 2019). However, it might be that consistency of interest and a perseverant focus towards one's own project could lead to a different outcome than such behaviour in the organisational context. This research contradicts recent criticism by Ion and colleagues (2017), by showing that grit does not only predicts work-related stress, but that it also adds unique contribution to the prediction of lower levels of work-related stress beyond PsyCap and resilience. Even more importantly, grit was shown to be not only a sufficient but also a necessary condition for lower levels of work-related stress.

However, the findings add to the recent criticism, which argued that reporting an overall grit score is problematic due to differentiated directions in the the predictive validity of the two

subdimensions. These are visible when observing the correlation and prediction pattern of perseverance and consistency. These patterns do not support the summative logic and generating an overall grit score, as this can result in the loss of predictive validity, thus indicating an issue in the currently applied higher-order logic of the model. This is not only supporting this research hypothesis, but also the criticism provided by various authors that argued that an overall grit score leads to a loss of predictive validity (Credé, 2018; Credé, 2019; Guo *et al.*, 2019; Jachimowicz *et al.*, 2019). Nevertheless, even if these findings need to be interpreted in the light of the current conceptual unclarities and the consistency dimension that is supposed to measure passion, the predictive validity could increase even further if the emotional attachment of the passion facet would be operationalised and measured appropriately (Datu *et al.*, 2016; Jordan *et al.*, 2019b). In summary this research shows that grit reduces the experience of work-related challenge and hindrance stress. Thus, individuals who are scoring higher in grit are experiencing lower levels of stress at work. Therfore, the findings of this research show that grit is not only a new and interesting concept in the educational domain, but that it is applicable to the business context. Moreover, the findings of this thesis are of high interest for organisations.

Generally, the findings of this research indicate that grit can be considered a potentially important factor in the organisational context that can help to increase the individual performance and work-related stress in the workplace. However, organisations should consider the particularly interesting finding, which showed that when the three personality traits grit, PsyCap and resilience were used as combined predictor variables for task performance together they explained about 25% of the variance observed. This can help organisations to direct their future training and development processes, by aiming to potentially increase their employees grit, PsyCap and resilience levels.

6.2 Theoretical Contributions

The present research was the first study that explored the grit concept in the underresearched organisational context drawing from a generalisable sample. The structural and measurement model of grit were evaluated and its applicability to the business context was clarified. It drew from a multidimensional conceptualisation of job performance and work-related stress to provide evidence for the relationships between these concepts. Moreover it aimed to shed light on the previously reported inconsistent findings of grit by linking it with the two theoretically and conceptually similar personality traits, PsyCap and resilience. Overall, the thesis provides a total of eight theoretical key contributions that add to the current knowledge and

understanding of grit. These theoretical contributions are outlined in this section, starting with the one that is deemed most important, whether grit should be considered as an important personality trait in the business context or not.

First, this research extends the current body of knowledge by showing that grit is an equally important factor in the business context as it has been shown to be in other domains. This is evidenced by the significant impact it has on two of the key concerns in organisational literature and practice: individual job performance (positively) and work-related stress (negatively). Even if previous studies have provided initial evidence for a positive effect of grit on performance and stress (De Vera *et al.*, 2015; Suzuki *et al.*, 2015; Singh and Chopra, 2016; Ion *et al.*, 2017; Peleașă, 2018), this thesis expands these findings by showing that grit influences them across different industries and disciplines. Thus, it extends the current theory on grit by pointing out that, despite acknowledged theoretical issues in its current conceptualisation, it needs to be included in current discussions about the impact of personality at the workplace. In doing so, the thesis refutes the theorised domain specificity of grit, as it was shown that it is an important factor for individual task performance and work-related stress. Therefore, this thesis provides the opportunity for HRM and OB research to develop further research question that explore the effects of grit on other important individual outcomes, such as deviant behaviour, counterproductive work performance, and engagement.

This thesis contributes to a better understanding of the role of grit for high performance at the workplace. It provides unqizue insights that have not been explored in this detail before by, (a) showing that grit is a significant predictor of task performance, not only in certain groups of working individuals, but across industries, departments, and occupations, and that (b) perseverance of effort is the key predictor of this outcome. Thus, this research contradicts previous suggestions that argued first, that the positive effects of grit might be domain specific, and second, that the combination of the two factors provides the unique positive effect on individual outcomes such as task performance (Duckworth *et al.*, 2007; Kim *et al.*, 2019). Moreover, it contributes to the job performance research by adding knowledge to the importance of grit and highlighting that grit, while positively related to task performance is not a necessary condition condition for higher levels of performance. This is contrary to many statements that have claimed that grit is a necessary characteristic to enable individuals to achieve better results and score higher on various performance measures (De Vera *et al.*, 2015; Elam, 2015). These results are important findings for researchers that evaluate the effects of grit on performance in other domains and needs a critical examination of how and when grit

could be considered a necessary condition or if it needs to be seen as a positive resource that can (but not must) increase individual performance.

Second, on the basis of the findings analysed in the previous sections, this thesis contributes in two broad ways to the literatures on grit and stress. First, it extends the theoretical framework of grit in the organizational context by showing that grit is not only positively related to job performance, but that it indeed reduces the level of experienced work-related stress. Only a limited number of previous studies have explored this relationship and they did not establish a sound theoretical framework for grit and stress in the working context. More importantly, previous findings provided no overarching insights on this relationship due to inconsistent findings and a lack of heterogeneity in the study subjects (Ceschi et al., 2016; O'Neal et al., 2016; Wong et al., 2018). Even if previous work grit was suggested to be a positive resource (Jordan et al., 2019b), other scholars such as Jachimowicz et al. (2018) and Ion et al. (2017) refuted this view. Therefore, the present findings strengthes the argument that grit should be treated as a positive personal resource that can help to reduce the experience of work-related stress. The findings of this study show that the experience of stress at work is influenced by the personal level of grit.

This thesis also contributes to current research in business and management that explores protective factors for employees to prevent high levels of stress (Newton and Teo, 2014; Guest, 2017; Stankevičiūtė and Savanevičienė, 2019). It provides evidence that grit significantly affects the experience of challenge and hindrance stress of workers in the UK. Therefore, ongoing debates about how to increase employee health and well-being and reduce work-related stress should shift their focus beyond traditionally assessed personality traits such as the dimensions of the Big Five (e.g. Loretto et al., 2010) and integrate grit into their discussions. These findings emphasize the importance of the incorporation of grit in research that explores potential alternative approaches to the reduction of negative experiences at the workplace. However, this research provided initial evidence that grit, and particularly perseverance, is indeed not only a sufficient condition, but a necessary condition for lower levels of work-related stress. These findings provide unique insights into the effects of grit for positive outcomes in the workplace. They emphasise the importance of the incorporation of grit in the HRM and psychology research discourse that explores potential alternative approaches to reduce negative experiences at the workplace.

Third, this thesis did not only test the effects of grit on task performance but extended the individual performance framework by including OCB and innovative performance as this is a better suited reflection of performance expectations for employees in the modern working

context (Xerri and Brunetto, 2013; Harari *et al.*, 2016; Shipton *et al.*, 2016b; Bos-Nehles *et al.*, 2017). Assessing the effects of grit on these two dimensions of individual performance at the workplace a contribution to the current body of organisational psychology and performance literature as this has not been tested in detail before. In fact, research on grit and innovative performance – and innovative behaviour – is still in its infancy (Mooradian *et al.*, 2016; Arco-Tirado *et al.*, 2019). Therefore, one of the key contributions of the present study is that it provides additional insights into the role of grit for predicting outcomes in the organisational context. Descpite the findings of previous literature this thesis shows that grit is not as important for higher levels of innovative performance in the workplace as theorised (Mooradian *et al.*, 2016; Arco-Tirado *et al.*, 2019). Especially, because consistency of interest was shown to be (insignificant) negatively related to innovative performance and OCB.

Despite the positive effects of grit on work-related stress and task performance that have been found, the present research is the first to provide initial evidence for potential negative effects of grit that adds a unique angle to ongoing debates in this subject. Current debates are only focusing on the positive sides of grit (Section 2.2) and neglect any potential negative effects. However, a previous online article by Morin (2016) and a journal article by Lucas *et al.* (2015) already glagged concerns about this one sided view (Credé *et al.*, 2017). Therefore, this thesis initiates a critical discourse about the potential downsides of high levels of grit. It points out that the current perception of grit research that considers grit as a solely positive trait needs to be revaluated by arguing that the consistency of interest facet could hinder innovative performance and help-providing behaviour. Thus, the black and white discussion that either denies or praises grit in the context of work should be shifted into a critical evaluation of positive and potential negative effects. Therefore, this study extends the ongoing debates on grit and shifts its focus from a positive only personality trait to a more multifaceted one.

Adding to the multifaceted nature, the fourth contribution of this thesis provided evidence for the distinct nature of grit in comparison to the two, conceptually closely related, personality traits PsyCap and resilience. This is a novel and important contribution to current discussions in personality research that has not been tested in detail before. It shows that grit is indeed a unique personality characteristic and not just one of those new traits that have been found to be mere replications or subfactors of existing concepts (Credé *et al.*, 2017; Pfattheicher *et al.*, 2017). Therefore, this research provides grit researchers in psychology and business with the ability to focus their theoretical discussions on the question how grit can be facilitated inside and outside the workplace instead of enquiring its unique nature. Moreover, both personality traits have previously been shown to be important characteristics to achieve lower levels of

stress and higher levels of performance (Luthans *et al.*, 2015; Britt *et al.*, 2016; Shatté *et al.*, 2017) and grit was shown to provide incremental predictive validty beyond these two characteristics. This demonstrates that, even though there is overlap in the theoretical conceptualisation of the three constructs, grit is a unique and important predictor beyond the established characteristics PsyCap and resilience. The thesis provides additional insights in the mechanisms by which grit interacts with other personality traits and influences job performance and work-related stress. For business and management researchers this is of particular relevance as it allows to extend the current theoretical model of personality and its influences on individual outcomes in the organisational context.

A fifth key contribution of this thesis to current debates in grit research (inside and outside the organisational context) is that it exposes the underlying issues in the currently applied conceptualisation of the higher-order model of grit. Even if the issues were mentioned in recent publications (Credé, 2018; Jachimowicz *et al.*, 2018; Guo *et al.*, 2019; Jordan *et al.*, 2019a), this thesis provides additional insights into the problems of the current conceptualisation. The present thesis extends the current understanding of grit by highlighting the shortcomings of the Grit-S Scale by pointing out issues in its criterion and discriminant validity. This research emphasises the importance of treating the two facets of grit as different dimensions. Even though, the definition of grit captures the two components as an overarching construct, this results in a loss of predictive validity as they possess differentiated correlation and prediction patterns. The findings and discussion of this thesis support the call for a revision of the currently applied structural and measurement model of grit to adequately represent the definition of grit provided in the initial research. It emphasizes the importance of critically discussing the current conceptualisation to prevent further studies from generating findings that are based on a problematic theoretical concept. In doing so, it also highlights the tensions in current grit research that promotes the adoption of grit in various settings, without critically reflecting on potential weaknesses in its conceptual structure.

A final unqiue contribution to current research has been the findings of this thesis that suggest that the Person-Centred Model of grit is not a suitable alternative conseptualisation of grit. There is no previous research that has tested this model of grit that has been proposed as an alternative model of grit by, Credé (2018). It defines grit as a dichotomous variable that identifies individuals only as gritty if they score high in both dimensions – perseverance and consistency. However, contrary to the proposition and suggestions made by Credé, the findings of this thesis suggest that the Person-Centred Model is not a better conceptualisation of grit (see Appendix S). Instead, they show that the new model provides a lower predictive validity for

task performance. Moreover, the NCA results indicated that the model does not change grit into a necessary condition for performance. Thus, the Person-Centred Model of grit is not a suitable alternative conceptualisation of grit and should not be used in future research in psychology and organisational research. and new theoretical conceptualisation and operationalisations need to be developed.

Beyond providing theoretical and empirical contributions that extend current knowledge, the findings have practical implications which are discussed in the following section.

6.3 Practical Implications

Results from this research do not only add knowledge to the theoretical and academic considerations of grit but are also of interest for employers and HRM practitioners. Currently applied policies and practices do not sufficiently prevent employees of suffering from work-related stress, reduced health and well-being, or even burnout as shown in recent publications (Health, 2013; HSE, 2013). Thus, considering grit as an additional measure and factor in the development and implementation of new HRM and HRD practices could potentially help to reduce such negative consequences. The knowledge on the impact of grit could be used as a starting point for organisations to develop a system that facilitates the development of personal resources and that allows employees to work towards their long-term goals instead of the current focus on short-term achievements. There is also the possibility that grit could be used as a tool to select or develop high potentials that are highly motivated at work and willing to invest time and effort due to their interest and strong interest for the specific occupation. Identifying these individuals would be beneficial for companies because they are potentially more likely to pursue through difficult times without experiencing increased stress levels at work. Such potential implications have been discussed and reported in previous studies (Wong *et al.*, 2018; Jordan *et al.*, 2019b). However, this research adds three key practical implications for business and organisations to these ideas.

The results of this research add to previous considerations by suggesting that not only individuals in certain departments, such as sales or physicians can benefit from higher levels of grit, but that it could be a useful factor for implementation general HRM programmes to benefit the wider workforce. Current HR practices largely focus on traditional methods to reach certain levels of performance, for example by the means of performance management. While the immediate aim of such HR practices are the increase of individual performance, it has been shown that this is reached through mechanisms that involve other, more proximal, individual

factors such as motivation, engagement and cognitive and personality related factors (Gruman and Saks, 2011). HR programmes, such as trainings to develop skills and abilities, could enhance grit and resources that have been connected with higher levels of grit (e.g. resilience) to increase individual performance in the workplace. Additionally, talent management and talent identification policies could include the strategic search for gritty individuals. Along with other, currently used identification practices, such as the reliance on previous performance or selection for core competencies, assessments that identify gritty individuals could be implemented to foster individual performance and long-term success.

The findings of this study provide practical implications for managers and HR departments. Organizations are trying to improve the work environment to decrease the experienced stress at work by introducing a variety of policies and schemes. These aim to strengthen individual capabilities and abilities to cope with different work stressors (Van der Klink et al., 2001). However, individuals reporting from high levels of stress and suffering from its negative effects on their health and well-being are still rising. This research showed that high levels of grit, and particularly perseverance, are not only sufficient conditions but necessary conditions to experience lower levels of overall and hindrance stress (see Section 4.4.2).

Grit, as a personal resource, could therefore be used by managers and organizations to address the stress vulnerability of employees by implementing programmes that aim to develop characteristics of grit, such as goal-setting abilities, resilience, and coping strategies. There is also the possibility that grit could be used as a tool to select or develop high potentials that are highly motivated at work and willing to invest time and effort due to their interest and strong passion for the specific occupation. Identifying these individuals would be beneficial for companies, because they are potentially more likely to pursue through difficult times without experiencing increased stress levels at work, as discussed and reported in the current and previous studies (Jordan et al., 2019b; Wong et al., 2018). Even if stress at the workplace due to long working hours or work-family conflict can be reduced by alternative working arrangements (Ganster and Rosen, 2013; Bliese et al., 2017), grit needs to considered in current debates as it has been shown to be a necessary condition for lower levels of stress,

Another practical implication is based on the findings that grit provides incremental predictive validity for performance and stress beyond resilience and PsyCap. Organisations that are already using training schemes and personnel development programmes that aim to enhance their employee's skills and abilities (e.g. AMO) should include the development of potential antecedents of grit, such as the ability to set challenging and long-term goals and encouraging deliberate practice, into their current practice. Moreover, such programmes should not only

target antecedents of grit to try and develop this characteristic but continue (or start) to incorporate PsyCap and resilience as well. This suggestion is based on the findings in this thesis that showed that the combination of all three personality traits predict even lower levels of perceived stress and higher levels of performance. Therefore, trainings and interventions at the workplace that aim to increase individual PsyCap or resilience, could implement grit as a second or third factor to develop the long-term focused mindset of employees. Additionally, talent management programmes could select high potentials according to their grit level. When considering the findings of this research, the process of staffing of key positions with talent, high levels of grit could potentially help to further develop talent development approaches.

Additionally, grit could be adopted in the recruitment and selection process as another dimension in assessment centres. Common practice in current assessment centres is the selection for pre-defined criteria and characteristics. Therefore, the selection of gritty individuals for key positions who maintain high performance despite significant levels of stress could help to reduce high absenteeism rates and turnover. Moreover, including grit in the job recruitment and selection process might benefit often disadvantaged individuals on the labour market. This is based on the research findings that there is no difference in grit levels between man and women and younger and older individuals. As such, by implementing grit as one of the key selection criteria, organisations could decrease the structural disadvantage and provide a more balanced selection process for women and workers beyond age 60 (Rau and Adams, 2014).

However, the present thesis showed that the two dimensions of grit predict contextual and innovative performance differently than task performance and stress. While perseverance showed a positive effect, consistency showed a negative (insignificant) effect on both dimensions of performance. Thus, it could imply that it reduces desirable behaviours in the workplace, such as helping behaviours towards co-workers (OCBI), voluntary work that benefits the organisation itself (OCBO), and the generation, promotion, and realization of innovative ideas. This research suggests that organisations should be cautious when implementing programmes that target to develop grit across their workforce. Organisations need to consider the potential benefits and drawbacks of such development processes. Practitioners should reflect on the job characteristics, their workforce, and the aims of employed development programmes before implementation to avoid unforeseen negative effects that might result in the loss of innovative performance or citizenship behaviours (Sparks, 2014; Morin, 2016).

Overall, this research provides additional insights into the relationship between grit and organisational outcomes and presents organisations with the knowledge that grit is indeed an important factor in the business context. Moreover, practitioners are encouraged to evaluate the possibility to include grit into various HRM practices, such as training and development, leadership development, talent management, and recruitment and selection. However, this research also showed that there are various issues in current grit research, such as the structural unclarities, issues in the validity of the Grit-S Scale and a potential negative effect of grit on innovative and help-providing behaviour. Therefore, practitioners should be cautions when introducing grit based HRM programmes into practice without evaluating existing knowledge or awaiting further research in this area.

6.4 Recommendations for Future Research

Despite the various contributions of this thesis, there are some limitations attached to this thesis that future research should take into account when further developing the current understanding of grit in general, and in the business context in particular. Future research should build on the present findings and aim to consider its limitations to develop a research approach that will help to shed further light on the impact of grit in the workplace. This section outlines the proposed streams of research that are necessary to extend the current understanding of grit and raise the knowledge to a level that can help to develop the current level of understanding in grit research and to support organisations in how to implement grit into policies and practices to develop a high performing and more stress resistant workforce.

Consider the Impact of Grit on Organisational Outcomes in the Light of other Personality Traits and Contextual Variables

Even if the findings of this research go beyond previous research and provide new and unique insights into the effects of grit in the business context by using a large number of observations to increase the understanding of grit in business, it acknowledge that the explanations are based on an observation of specific circumstances that need to be replicated and approached using a variety of research methods in order to develop knowledge and gain a broader validity. Moreover, the dataset was gathered in a single, cross-sectional data collection point. The issue, which is shared with many research articles on grit (Duckworth and Quinn, 2009; Von Culin *et al.*, 2014; Hill *et al.*, 2016; Halliday *et al.*, 2017), the research findings need to be interpreted with caution as cross-sectional data findings do not imply causal relationships between the observed variables (Rindfleisch *et al.*, 2008; Bryman and Bell, 2011). Additionally, this

research relied almost entirely on survey data obtained by self-reports to measure grit, PsyCap, resilience, job performance and perceived work-related stress.

Even if the findings are unique and can be considered to provide a strong indication of the general effects of grit on both work outcomes, it creates the opportunity for future research to explore the impact of grit on organisational outcomes. This could be done by using multi-source and longitudinal panel data on grit that uncovers the associations between grit and individual outcomes at the workplace over a period that can infer causality. By incorporating other psychological constructs that have been shown to impact work-related stress, job performance, and other outcomes, a more thorough insight could be provided. This might be particularly useful when considering the multifaceted stress-reduction mechanisms that affect an individual's perception and experience of stress (Grant and Langan-Fox, 2007; Avey *et al.*, 2009; Baron *et al.*, 2013). This would also help organisations to decide what personality traits to focus on when implementing HR processes that aim to select, facilitate, promote and develop psychological abilities to reduce the experience of work-related stress.

Use Longitudinal Data and Intervention Studies to Explore the Stability of Grit and its Responsiveness to Interventions

Grit has been argued to be a non-cognitive construct that can be developed (Duckworth *et al.*, 2007; Goodwin and Miller, 2013; Perkins-Gough, 2013; Donahue, 2015). However, this research did not consider the question whether grit might be a characteristic that is subject to development and change over time. Even if this study provides a momentary observation of the level of grit and its impact on individuals, there is still a lack of clarity how grit is actually developed. Interestingly, and despite the increasing amount of research conducted on grit, there is no other study particularly examining the stability of individual grit scores over time. Even though personality traits are generally understood as relatively stable constructs, in previous findings authors described a positive relationship between age and grit (Duckworth *et al.*, 2007; Eskreis-Winkler *et al.*, 2014). However, this is in line with other personality traits such as conscientiousness or stability of vocational interests that increase over the life span (McCrae *et al.*, 1999; Srivastava *et al.*, 2003).

In her recent book, Duckworth (2016) emphasizes the possibility of developing grit over time. Alan *et al.* (2019a) also reported successful developments of individual grit scores as well as top grades in academic subjects in their recent randomized intervention. In accordance with Duckworth's and other scholar's assumptions and the findings of recent intervention studies (Geist, 2016; Alan *et al.*, 2019a) emphasizing that grit can be developed this study to use

longitudinal data exploring the stability of this construct in combination with its predictive validity in business environments. In particular as talent management and development programs are experiencing increasing interest, it seems to be important to develop graduates or early stage employees in order to develop their full potential and therefore increase the skillset and strength of the whole workforce (Crebert *et al.*, 2004).

As predicted by Duckworth *et al.* (2007) studies also revealed a correlation between grit scores and age. These findings reflect findings from previous studies in consciousness that revealed an increase over life span (Srivastava *et al.*, 2003; Roberts *et al.*, 2006). In this light, it would be interesting to examine which processes are involved in such an increase of non-cognitive measures and if there are factors or situations that lead to a quicker growth of these traits. Recently, in line with research examining the responsivity of non-cognitive traits such as PsyCap, mental toughness or resilience, some studies indicated that grit might be responsive to interventions as well (Geist, 2016; Alan *et al.*, 2019a). As such, even though most literature reported only modest predictor-criterion relations, small to moderate effect sizes can still be highly useful in certain settings, particularly if interventions can increase the outcomes to a higher level (Luthans *et al.*, 2008b; Geist, 2016; Credé *et al.*, 2017; Roberts *et al.*, 2017; Alan *et al.*, 2019a). Therefore, future research should not only collect longitudinal data on grit, but also explore potential antecedents of the non-cognitive personality trait.

Even if there might be interest of managers and organisations to implement a selection system that is based on the detection of grit, as suggested by Elam (2015) there are various steps that need to be taken first. Firstly, the current operationalisation of the grit scale is not suitable for its adoption in the practical workplace. One of the reasons for this is the wording of the items in the Grit-S and the Grit-O Scales that might result in faking, due to a likely social desirability bias (Van de Mortel, 2008; Sackett, 2012). A second issue is the conceptualisation of grit generally. Even if it is promoted as a trait that combines passion, perseverance and a long-term mindset, the current model does not reflect these factors appropriately. It might be that the findings change when using a different conceptualisation of passion as a facet of grit and including the long-term goal setting ability. Therefore, by running longitudinal studies, the causality of the observed effects of grit for organisational outcomes can be tested and potential training and development processes suggested.

Develop a Structural Model and Assessment Tool that Reflects the Key Characteristics of Grit and is Psychometrically Sound

Even if this research provided supportive evidence that the current conceptualisation of grit is generally acceptable, it reveals significant insufficiencies in the theoretical, conceptual and measurement model of grit. However, it does not provide a deeper exploration on how the current model can be developed more precisely and thus, miss to provide a clear solution. However, this is a necessary next step to further strengthen the insights and knowledge in grit research. The findings that only the consistency of interest dimensions significantly predicted stress, and only the perseverance of effort dimensions predicts performance, it would be useful for future research to reconsider the current conceptualisation of grit in general. Previous work discussed the issue around the coverage and conceptualisation of the perseverance scale (Schmidt *et al.*, 2018; Credé, 2019). However, despite different approaches and publications no sufficient alternative has been provided yet (Jordan *et al.*, 2019b).

Closely aligned to this is the issue that has been encountered with the wording of some of the items that are used in the grit scale. One example was the wording of the item number two of the short grit scale ("Setbacks don't discourage me"). Such wordings might create issues and confusion for participants, particularly when being under time pressure to finish the survey. This is a surprising issue, considering the rigour in testing new assessment tools, but also an issue that can easily be fixed. However, as discussed in in Chapter 5, it is not only the wording of the items, but also the content validity of the two subscales that created confusion around the concept of grit more broadly. The discussion has shown that there are shortcomings of the match between the original definition of grit and its measurement model. The reflection of passion in the current measures, the Grit-S and Grit-O scales is not clear as it can be argued to lack the traditional emotional component, that is commonly associated with the experience of passion. Much more, it is argued that the scale consistency of interest reflects more on attentional control than passion (McAllister *et al.*, 2017; Zigarmi *et al.*, 2018).

Even if it has been argued that passion is not a construct clearly and uniquely conceptualized (Mueller *et al.*, 2017), it seems unclear why there is such a small amount of passion-specific domain content in any of the adopted items. This is even more peculiar when considering that passion was the key characteristic that was used as a selling point for grit by the original authors (Duckworth *et al.*, 2007; Duckworth and Quinn, 2009; Duckworth, 2016). Even if as Duckworth argued consistent interest over a longer period of time towards a certain goal is synonymous with passion, recent publications have criticized this assumption and stated

that, when referring to passion, there should be a highly emotional component included (Marsh *et al.*, 2013; McAllister *et al.*, 2017; Zigarmi *et al.*, 2018).

Moreover, Jordan *et al.* (2019a) argued that not only is passion missing to a large extent in the current model, but that grit, despite the definition as "perseverance and passion for long-term goals" (Duckworth *et al.*, 2007, p. 1087), lacks in the accurate assessment of personal goals, active goal setting, and an appropriate adaptation of the set action plan (Jordan *et al.*, 2019b). Given these issues and the evidence found in this research, future research should not only aim to reflect on the conceptual model of grit, but to develop a measurement model that clearly reflects the definition of grit as described by Duckworth *et al.* (2007). This would also help to avoid facing criticism, but also to prevent serious issues in terms of the data generated based on these methods as it has been shown across various psychological measures (Hussey and Hughes, 2020)In light of this, research might want to develop a questionnaire that is not only useable in research settings but can be adopted by organisations to assess the level of grit of their current or potential employees. In order to reduce the risk of faking and social desirability bias (e.g. Borkenau and Ostendorf, 1992; Van de Mortel, 2008) implicit questions could be used in the scale development (Fazio and Olson, 2003).

Explore the Dark Side of Grit

It might be interesting to explore the potential dark side of grit, which has been indicated to exist in recent publications (Zakrzewski, 2014; Lucas *et al.*, 2015; Morin, 2016; Siedle, 2019). Even if this research explored the positive effects of grit on performance and the experience of stress, it misses to address the question if grit can lead to negative behaviour. One indication was found when considering the findings of the impact of the grit dimensions on OCB. Generally, there is a lack of research that explores the idea that there is a possibility of individuals of being too gritty. The reasoning behind this is the assumption that if passion is too strong, it could lead to an obsessive behaviour in the workplace. This is closely linked to the discussions in passion research about the multifaceted nature of the concept, of which one side is described as obsessive passion (Vallerand *et al.*, 2003). This obsessive part has been shown to negatively affect various individual outcomes inside and outside the workplace, such as mental health and well-being (Mageau *et al.*, 2009; Forest *et al.*, 2011; Lalande *et al.*, 2017).

Similar to the issues with strong passion, if a person persists too long on the solution of a single problem or goal which is hardly achievable, then this perseverance could lead to negative effects, as it was shown for the risk of monetary loss (Lucas *et al.*, 2015; Credé *et al.*, 2017). Additionally, it is not clear if this inability to reach such long-term goals could have

negative effects on the psychological and mental well-being. This also links to the debate about the conceptualisation of grit, where Jordan *et al.* (2019a) argued that goal setting and goal attainment would need to be part of the concept based on the original definition. These would also be required to potentially avoid such goal setting issues. If such obsessive or narrow focused behaviours are linked with grit, caution needs to be taken when promoting interventions that are designed to increase the level of grit in the organisational context. Therefore, future research should focus on the potential negative effects of grit such as help-seeking, help-providing and obsessive behaviours, or the effects on the physical and psychological well-being due to a restrained focus and relentless perseverance.

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Appendices

Appendix A Short Grit Scale

The Short Grit Scale adopted from Duckworth and Quinn (2009)

Short Grit Scale

Directions for taking the Grit Scale: Please respond to the following 8 items. Be honest – there are no right or wrong answers!

1. New ideas and projects sometimes distract me from previous ones.*
   - ❏ Very much like me
   - ❏ Mostly like me
   - ❏ Somewhat like me
   - ❏ Not much like me
   - ❏ Not like me at all

2. Setbacks don't discourage me.
   - ❏ Very much like me
   - ❏ Mostly like me
   - ❏ Somewhat like me
   - ❏ Not much like me
   - ❏ Not like me at all

3. I have been obsessed with a certain idea or project for a short time but later lost interest.*
   - ❏ Very much like me
   - ❏ Mostly like me
   - ❏ Somewhat like me
   - ❏ Not much like me
   - ❏ Not like me at all

4. I am a hard worker.
   - ❏ Very much like me
   - ❏ Mostly like me
   - ❏ Somewhat like me
   - ❏ Not much like me
   - ❏ Not like me at all

5. I often set a goal but later choose to pursue a different one.*
   - ❏ Very much like me
   - ❏ Mostly like me
   - ❏ Somewhat like me
   - ❏ Not much like me
   - ❏ Not like me at all

6. I have difficulty maintaining my focus on projects that take more than a few months to complete.*
   - ❏ Very much like me
   - ❏ Mostly like me
   - ❏ Somewhat like me
   - ❏ Not much like me
   - ❏ Not like me at all

7. I finish whatever I begin.
- ❏ Very much like me
- ❏ Mostly like me
- ❏ Somewhat like me
- ❏ Not much like me
- ❏ Not like me at all

8. I am diligent.
- ❏ Very much like me
- ❏ Mostly like me
- ❏ Somewhat like me
- ❏ Not much like me
- ❏ Not like me at all

Scoring:
1. For questions 2, 4, 7 and 8 assign the following points:
   5 = Very much like me
   4 = Mostly like me
   3 = Somewhat like me
   2 = Not much like me
   1 = Not like me at all

2. For questions 1, 3, 5 and 6 assign the following points:
   1 = Very much like me
   2 = Mostly like me
   3 = Somewhat like me
   4 = Not much like me
   5 = Not like me at all

Add up all the points and divide by 8. The maximum score on this scale is 5 (extremely gritty), and the lowest score on this scale is 1 (not at all gritty).

Grit Scale citation

Duckworth, A.L, & Quinn, P.D. (2009). Development and validation of the Short Grit Scale (Grit-S). *Journal of Personality Assessment, 91,* 166-174.
http://www.sas.upenn.edu/~duckwort/images/Duckworth%20and%20Quinn.pdf

Duckworth, A.L., Peterson, C., Matthews, M.D., & Kelly, D.R. (2007). Grit: Perseverance and passion for long-term goals. *Journal of Personality and Social Psychology, 9,* 1087-1101.
http://www.sas.upenn.edu/~duckwort/images/Grit%20JPSP.pdf

Appendix B Research Philosophies

Research Paradigms*

	Pure Positivism	Standard Positivism: Post WWII	Critical Rationalism	Classical Hermeneutics	Interpretivism
Leading exponents			Early foundations = Whewell. Popper.	Schleiermacher, Dilthey, Brentano, Husserl, Heidegger	Weber, Schütz, Winch.
General comments	Aligns with naturalism. Principles and approaches to natural sciences apply to social sciences. Logical positivists (the Vienna Circle) – reason cannot be derived from experience, it is not scientific knowledge. A reductionist view.	Key difference to pure positivism is in the belief that causation can be determined and hence universal laws established.	Post-positivist – rejects empiricism. Natural and social sciences differ in content, but not in the logic (scientific methods). 'All facts involve ideas unconsciously' so induction and 'pure observation' is not possible. All observation is theory-dependent.	Subject matter of social sciences differs to natural sciences hence we need a science of understanding – verstehen. Many strands, including key differences, e.g. 1) search for understanding outside and in spite of history, and 2) interpretivist and true understanding is unattainable.	Unlike nature, social reality is the product of social actors – hence different methods are needed. Positivism and interpretivism are mutually exclusive. Origins are from hermeneutics and phenomenology. Anti-naturalist and anti-positivist.
Ontology	Shallow (or naïve) realist – external reality controlled by natural or social laws. Everything is observable. Independent of social actors.	Shallow (or naïve) realist – external reality controlled by natural or social laws. Everything is observable. Independent of social actors.	Cautious realist – an independent external reality exists, but humans cannot perceive it accurately due to innate imperfections in the senses. Hence researchers need to be cautious/critical.	Variations on idealism. Arguing that a text has meaning independent of the act of understanding (Betti – a Contemporary Hermeneutic) is close to a shallow realist view.	Variations on idealism. Radical Interpretivists deny the existence or relevance of an external world (atheistic idealists). Perspective idealists are more common.
Epistemology	Empiricism - What counts as knowledge is based on the senses – hence partly idealist. Knowledge is true when it represents what is out there.	Empiricism.	Falsification (Popper). Rationalist – logic, reason and mathematics through human thought, is the path to knowledge.	Variations of constructionism.	Variations of constructionism. Social reality has to be discovered rather than filtered by the expert. Social worlds are interpreted before the researchers evaluate them.
Research Strategy	Inductive	Inductive	Deductive	Not clear	Abductive
Methods used	Hypothesis testing mainly on large data sets	Hypothesis testing mainly on large data sets	Hypothesis testing mainly on large data sets. Hypothetico-deductive	The interpretation of texts, including texts of speech	Wide variation
Analysis	Identifying correlation	Event regularity equates to causality. Explanation enables prediction and laws	Conjecture and refutation	The meaning of part of something can only be understood in relation to the whole.	Constructing models of typical meanings used by typical social actors in typical scenarios.
Desired outcomes	Theory confirmation. Universal laws are not possible because they cannot be verified.	Universal causal laws or generalizations	Causal explanation through setting and testing hypotheses.		Understanding more so than explanation. Causality rejected. Aims to find verifiable knowledge of the meanings that constitute the social world.
Axiology – the role of a researcher's values	Value-free. Researcher is independent of data and is objective	Value-free. Researcher is independent of data and is objective			Value-laden: researcher inseparable from phenomena (disputed by earlier authors).

*Based on Blaikie, N. (2007) Approaches to Social Enquiry, 2nd Edition. Polity Press. Cambridge. Adopted from Renshaw, P. & Robinson, J. (2019). What difference does your paradigm make? Newcastle University.

	Structuration Theory	Social Realism/Critical Realism	Ethnomethodology	Critical Theory	Feminism
Leading exponents	Giddens	Harré and Bhaskar	Garfinkel	Habermas	Harding, Keller and Hekman
General comments	Structure and the agents within the structure are intrinsically connected and incapable of separation. Hence agents actions are a consequence of social structure and yet those actions re-create said social structure. Considers the approach to natural sciences also needs rethinking.	Reality is stratified. Bhaskar argues that the open system of the natural and social worlds challenges the positivist approach which implicitly assumes a closed system. The world may be socially constructed (Harré) or a function of hidden structures and mechanisms (Bhaskar).	The study of everyday practical reasoning that lay people use to make sense of reality. Has its own vocab. Builds on phenomenology. Concerned with activities that restore meaning and order, rather than the generation of knowledge.	Rejects the 'objectivist illusion' of positivism. Social science is dialogic not monologic as in natural sciences: the researcher is a reflective partner not a disengaged observer hence different logic of enquiry needed. Knowledge is a combination of the empirical-analytic, historical-hermeneutic and critical theory. Hence socially constructed.	Rejects traditional objectivity and rationality as having been androcentric.
Ontology	Idealist. Some elements are subtle realist.	Depth realist – reality exists of three domains (empirical, actual and real). Structures and mechanisms exist in the real which cause events to happen in the actual and, if we can observe them, in the empirical.	Idealist, possible agnostic idealist. Social reality is achieved through social actors' everyday activity.	Cognitive interests determine reality.	Idealist. Multiple realities are possible (male vs female at the most basic).
Epistemology	Adopts constructionism although does not specifically declare this.	Neo-realism. The objects of interest occur independently of social scientists.	Closest to constructionism.	Knowledge achieved through communication not just observation. Objective observation is impossible.	Constructionism.
Research Strategy	Abductive.	Retroductive and abductive.	Inductive.	Inductive, deductive, abductive.	Inductive and Abductive (feminist standpoint – grounded in experience)
Methods used		No restrictions. Mixed methods have advantages to expose the hidden causal structures and mechanisms.	'Breaching experiments' challenging the language of social actors to have them notice 'mistakes'. Participant observation. Conversational analysis.	No restrictions subject to the emancipatory intent which lends itself to qualitative research through interview	Historical tendency to reject quants as facilitating the status quo. Hence more quals.
Analysis	Language is both a description and medium of social life.		Sense-making (Weick)	Truth can only be determined through rational consensus via critical discussion.	
Desired outcomes	Generalisations are restricted by time and space. Immutable laws not possible. Explanation and understanding both relevant. Can be 'critical', undermining dominant groups.	Explain observable phenomena through structures and mechanisms. Causal-explanatory.	Restoring meaning, identifying inconsistency in lay people's language.	Emancipatory. Challenge the status quo. Research enables the subject(s) to notice the dominant forces to enable emancipation.	Emancipatory, primarily for women, but extending to other inequalities.
Axiology – the role of a researcher's values	Researcher's values are intrinsically embedded given duality. However, scientists can critique the views of social actors.	Value conscious as researcher identifies potential causal structures and mechanisms.		The researcher is a reflective partner not a disengaged observer.	Researcher's values are intrinsically embedded due to context and need to be challenged and understood.

Appendix C Received Replies to Invitations

RI	Thank you for your interest Joshua – however unfortunately I am unable to take part at present. I do hope you are successful in your research.
R2	Hi Joshua Thank you for your email however I would not like to take part in this project. Best Regards
R3	Sorry Joshua I'm not in a position to support in this instance Good luck with the research
R4	Joshua Thank you for your note, however, I am writing to advise that we are not interested in talking part in this research. I wish you every success with your project and your PhD Regards,
R5	Hi Joshua Thanks for the note. I'm afraid that I'll need to decline the offer to participate - having only very recently taken up the role, I think it would be premature of me to take part in the research and I'm also snowed under at this point in time! I wish you well in your research and for the future.
R6	Hi Joshua Thank you for your email. I don't have the capacity at present to be involved in your research but wish you well. Yes GRIT is the essential element! Kind regards
R7	Hello Joshua, Thanks for your message. This isn't something that I am ready to participate in, but I hope your research goes well and I will be very interested to hear about what you find out. Regards
R8	Please note I'm now out the office until the […] and will answer your enquiry on my return if required
R9	Hi Joshua, Apologies I think you've contacted the wrong person.

	Regards
R10	Hi Joshua
	Thank you for your email. I do apologise but I am in the middle of newspaper production so won't be able to take part at this time. Perhaps you'd like to contact one of my colleagues.
R11	Hi Joshua – I do not want to participate in your research, however, best of luck with your project
R12	Hi Joshua
	Unfortunately [NAME] has left our business. Let me know if we could help with another candidate for your research.
R13	Joshua,
	This is an unsolicited email, which is why I would not want to participate in your research
	Kind regards

Appendix D Task Performance Scale

Task Performance Scale Adopted from Williams and Anderson (1991)

	Strongly Agree			Strongly Disagree	
	1	2	3	4	5
I adequately complete assigned duties	O	O	O	O	O
I fulfil responsibilities specified in my job description	O	O	O	O	O
I perform tasks that are expected of me	O	O	O	O	O
I meet the formal performance requirements of my job	O	O	O	O	O

Appendix E Organisational Citizenship Behaviour Scale

Organizational Citizenship Behaviour Scale Adopted from Lee and Allen (2002)

Please indicate, using a 7-point scale (1 = never, 7 = always), how often you engaged in these behaviours

	OCBI Items	Never 1	2	3	4	5	6	Always 7
1	Help others who have been absent.	O	O	O	O	O	O	O
2	Willingly give your time to help others who have work-related problems.	O	O	O	O	O	O	O
3	Adjust your work schedule to accommodate other employees' requests for time off.	O	O	O	O	O	O	O
4	Go out of the way to make newer employees feel welcome in the work group.	O	O	O	O	O	O	O
5	Show genuine concern and courtesy toward coworkers, even under the most trying	O	O	O	O	O	O	O
6	Give up time to help others who have work or nonwork problems.	O	O	O	O	O	O	O
7	Assist others with their duties.	O	O	O	O	O	O	O
8	Share personal property with others to help their work.	O	O	O	O	O	O	O
	OCBO Items							
9	Attend functions that are not required but that help the organizational image.	O	O	O	O	O	O	O
10	Keep up with developments in the organization.	O	O	O	O	O	O	O
11	Defend the organization when other employees criticize it.	O	O	O	O	O	O	O
12	Show pride when representing the organization in public.	O	O	O	O	O	O	O
13	Offer ideas to improve the functioning of the organization.	O	O	O	O	O	O	O
14	Express loyalty toward the organization.	O	O	O	O	O	O	O
15	Take action to protect the organization from potential problems.	O	O	O	O	O	O	O
16	Demonstrate concern about the image of the organization.	O	O	O	O	O	O	O

Appendix F Innovative Job Performance Scale

Innovative Job Performance Scale Adopted from Janssen (2000)

How often do you perform the following work activities on a scale ranging from 1 = Never to 5 = Always

		Never				Always
		1	2	3	4	5
1	Creating new ideas for improvements	O	O	O	O	O
2	Mobilizing support for innovative ideas	O	O	O	O	O
3	Searching out new working methods, techniques, or instruments	O	O	O	O	O
4	Acquiring approval for innovative ideas	O	O	O	O	O
5	Transforming innovative ideas into useful applications	O	O	O	O	O
6	Generating original solutions to problems	O	O	O	O	O
7	Introducing innovative ideas in a systematic way	O	O	O	O	O
8	Making important organizational members enthusiastic for innovative ideas	O	O	O	O	O
9	Thoroughly evaluating the application of innovate ideas	O	O	O	O	O

Appendix G Employee Resilience Scale

Rate on a scale ranging from 1 (Never) to 7 (Almost always) how often you engaged in the described behaviours:

		Never						Almost Always
		1	2	3	4	5	6	7
1	I effectively collaborate with others to handle unexpected challenges at work	O	O	O	O	O	O	O
2	I successfully manage a high workload for long periods of time	O	O	O	O	O	O	O
3	I resolve crises competently at work	O	O	O	O	O	O	O
4	I learn from mistakes at work and improve the way I do my job"	O	O	O	O	O	O	O
5	I re-evaluate my performance and continually improve the way I do my work	O	O	O	O	O	O	O
6	I effectively respond to feedback at work, even criticism"	O	O	O	O	O	O	O
7	I seek assistance to work when I need specific resources	O	O	O	O	O	O	O
8	I approach managers when I need their support	O	O	O	O	O	O	O
9	I use change at work as an opportunity for growth	O	O	O	O	O	O	O

Source: Näswall *et al.,* (2015)

Appendix H Psychological Capital Questionnaire (PCQ Scale)

Joshua Haist

Psychological Capital Questionnaire (PCQ-12)
Self-Rater Short Form

Name: _____ Date: _____

Instructions: Below are statements that describe how you may think about yourself **right now**. Use the following scale to indicate your level of agreement or disagreement with each statement.

Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
1	2	3	4	5	6

1. I feel confident in representing my work area in meetings with management.   1 2 3 4 5 6
2. I feel confident contributing to discussions about the organization's strategy.   1 2 3 4 5 6
3. I feel confident presenting information to a group of colleagues.   1 2 3 4 5 6
4. If I should find myself in a jam at work, I could think of many ways to get out of it.   1 2 3 4 5 6
5. Right now I see myself as being pretty successful at work.   1 2 3 4 5 6
6. I can think of many ways to reach my current work goals.   1 2 3 4 5 6
7. At this time, I am meeting the work goals that I have set for myself.   1 2 3 4 5 6
8. I can be "on my own," so to speak, at work if I have to.   1 2 3 4 5 6
9. I usually take stressful things at work in stride.   1 2 3 4 5 6
10. I can get through difficult times at work because I've experienced difficulty before.   1 2 3 4 5 6
11. I always look on the bright side of things regarding my job.   1 2 3 4 5 6
12. I'm optimistic about what will happen to me in the future as it pertains to work.   1 2 3 4 5 6

Psychological Capital Questionnaire (PCQ-12)
Self-Rater Short Form Scoring Key

Psychological Capital (PsyCap) Questionnaire (PCQ) Scales:

Each of the four PCQ subscale scores is calculated by taking the mean (average) of all items in the scale. The overall PsyCap score is calculated by taking the mean of all items in the PCQ. It should be carefully noted that some items are **Reversed** scored (i.e., for these items a "1" is scored as a "6" and a "6" is scored as a "1"; a 2 is a 5 and a 5 is a 2; and a 3 is a 4 and a 4 is a 3). These items are marked with "R".

Efficacy: items 1-3

Hope: items 4-7

Resilience: items 8-10

Optimism: items 11-12

Source: Research Permission obtained from Mindgarden

Appendix I Challenge and Hindrance Stress Scale

Please indicate the extent to which the following statements produces stress for you at work on a scale ranging from 1 = "no stress at all" to 5 = "a great deal of stress".

		No stress at all			A great deal of stress	
		1	2	3	4	5
1	The number of projects and or assignments I have.	O	O	O	O	O
2	The amount of time I spend at work.	O	O	O	O	O
3	The volume of work that must be accomplished in the allotted time.	O	O	O	O	O
4	Time pressures I experience.	O	O	O	O	O
5	The amount of responsibility I have.	O	O	O	O	O
6	The scope of responsibility my position entails.	O	O	O	O	O
7	The degree to which politics rather than performance affects organizational decisions	O	O	O	O	O
8	The inability to clearly understand what is expected of me on the job.	O	O	O	O	O
9	The amount of red tape I need to go through to get my job done.	O	O	O	O	O
10	The lack of job security I have.	O	O	O	O	O
11	The degree to which my career seems "stalled."	O	O	O	O	O

Source: Cavanaugh *et al.* (1998)

Appendix J Summary of Pilot Study Sample Characteristics

	Gender	Age	Sector	Department	Employment	Position	Education	Work Experience
P1	Male	26	Consulting	IT	Self-employed	Consultant	Bachelor`s Degree	2
P2	Male	52	Health Care	Health Services	Self-employed	Professional	Doctoral Level	18
P3	Male	44	Education	Education Service	Employed	Professional	Doctoral Level	10
P4	Female	36	NFPO	PR / Marketing	Employed	Junior Management	Bachelor`s Degree	9
P5	Male	31	Consulting	Consulting	Self-employed	Consultant	Master`s Degrees	3
P6	Female	58	Manufacturing	Support Service	Employed	Skilled Worker	Secondary Education	41
P7	Male	21	Communication	HR	Employed	Apprentice	A-Level	3
P8	Female	28	Research	R&D	Employed	Researcher	Doctoral Level	2
P9	Male	61	Public Administration	Management	Employed	Senior Management	PG Diploma	38
P10	Female	59	Retail	Managing Director	Employed	Partner/Senior Management	Professional Qualification	35
P11	Female	49	Real Estate	Legal	Employed	Junior Management	Bachelor`s Degree	25
P12	Female	35	Arts	Design	Self-employed	Professional	A-Level	11
P13	Male	40	Insurance	HR	Employed	Professional	A-Level	20
P14	Female	64	Food Service	Operations	Employed	Support Staff	Secondary	48
P15	Male	20	Manufacturing	Production	Employed	Apprentice	Secondary	1
P16	Male	36	Utility (Electricity)	Finance	Employed	Junior Management	Bachelor`s Degree	14

Appendix K Received Feedback from Pilot Study

Participant	Comment
P1	The disclaimer about data confidentiality was very clear and easy to understand.
P1	I like that you had your contact details as well as the details of your supervisors so that if I had specific questions to I could directly contact those involved.
P1	I found the question about "what department do you work in" a bit tricky to answer because in my particular situation I am a working student in an institution (Immunology and infection research) within the School of Biological Science so I wasn't really sure which department to pick.
P1	The question about "which of the following best describes your role" was tricky as well because in my opinion I am both a student and a researcher.
P2	Section 1, question: "using the scale"
P2	There is a spelling mistake: "Please respond to the following 8 items using the scale from 1
P3	Instead of "Very much like me." or "Not very much like me." I would use "Most like me" and "Least like me"
P3	I forgot to answer a question and the webpage highlighted this question in red but the background of the text was dark blue. Somehow when I was reading the red text it was hard for me to distinguish the text on the dark blue background. It was strange but the best way I can describe it is that my eyes found it hard to focus.
P3	I would prefer to have the information about data confidentiality as a separate paragraph in order to know immediately what to expect and don't necessarily have to read it (always the same bla bla). Then the whole text would look a bit clearer as well
P4	You are informing the participant about the data collection and protection. In my opinion there is no lack of information.
P4	Adequate information about the aim of the project, the data and the procedure are given.
P4	Some questions didn't fit to my profession and my daily work. So maybe there should be a line where i can note that.

P4	the meaning of the following question was not clear for me: Go out of the way to make newer employees feel welcome in the work group
P5	section 1/3 I am a hard worker: maybe too colloquial?
P5	The last paragraph needs to be reviewed "withdraw from any part of the study.. any… any.."
P5	Typo section 1/3, 1st question: "using the scale"
P7	I do not feel informed enough. If I would have not spoken to you in the first place, I would have had no idea what your work is about and what I just agreed to participate in. There is a need for providing more information in terms of content and context. Eventually also a bit of an introduction into what type of questions will be asked, such as how do you work and how you overcome challenges.
P7	Confidentiality and security of data (protection) was okay, but I don't mind too much anyway.
P7	I generally felt informed enough to participate in the questionnaire.
P7	The instructions for answering the questions are clear enough.
P8	I had to look up some expressions (e.g. didn't come across the word "red tape" so far), but mostly everything understandable
P8	I did not find any spelling or grammatical issues in the survey, which is good.
P11	Presentation of the survey overall was suitable.
P12	A question I asked myself after finishing the survey was, what does this now actually mean for my current job situation?
P12	I wouldn't want to give away my line-managers email address, therefore I'd prefer option one, forwarding the link myself
P14	I would not want to send the link to the survey to my supervisor. I rather like the idea of me providing the email address and the researcher does this instead.
P11	I did not like the percentage number at the bottom of the point as I found it really confusing. I felt like I was done by about 99%, however, I still said something about 80% and then the survey was finished suddenly. It might be better to use page numbers such as 4/6 or something like this. This makes it easier to understand and psychologically clearer and easier.
P14	Do you really want to provide a middle option? This might lead lots of your participants to select the option of the golden middle?

P16	Kind of overwhelmed by the large text block on your first page. I felt more like "OMG this is too much to read". I would suggest splitting it up and make clear where the participant finds which kind of information (potentially use headings?). This will make it less deterrent right at the beginning.
P16	On your last page – 'We would like to thank you' - is somehow a repetition after the heading. If you want to thank me, just do it! Also, you might want to use a signature here and potentially your contact details again or an empty space to leave comments if there is anything after answering the survey to leave you with.

Appendix L Email Invitation for Prospective Participants

Dear "Name",

My name is Joshua Haist and I am a PhD candidate at Newcastle University Business School, currently conducting my research on Grit with which I could need your help. I appreciate that you must be very busy, however, I would be thankful for your support!

My research project is about Grit, a psychological factor that has been shown to predict future retention, success and performance in a range of domains, such as academia, sports and the military.

I am looking for individuals to take part in my research applying this concept of grit to a broader, more general business environment. I am trying to get a broad range of individuals from different work areas and backgrounds. Authors/artists are one of the groups of individuals of particular interest. Therefore, I would highly appreciate your participation.

Participation includes solely answering this relatively short survey that will need approx. 10-15 minutes to complete. This is the link that leads to the survey:

https://www.soscisurvey.de/Research_Project_Haist/

If you have any further questions or would like more information please contact me directly, I would be happy to hear from you (J.Haist2@newcastle.ac.uk; https://www.linkedin.com/in/joshua-haist-5977a294).

Thank you for your time and I am looking forward to hearing from you.

Kind regards

Joshua Haist
PhD Candidate

Newcastle University Business School
5 Barrack Road, Newcastle upon Tyne, NE1 4SE
Tel: +44 (0) 191 208 1500

www.ncl.ac.uk/business-school

Appendix M Copy of the Online Consent Form for Participation in this Research

PhD in Business and Management

Declaration of Informed Consent

Research title: The Role of Grit in Predicting Individual Performance. Developing the Concept and applying it to the Business Environment.

The aim of this project is to evaluate a new psychological factor and its applicability to and importance for the business environment

The type of data collected will involve you to answer a questionnaire

This information will be used for the PhD project and possibly other scientific communication (e.g. publication in a scientific journal). A short summary of this study will be provided to companies expressing their interest

Please read the following statements carefully:

1. I have been informed that the purpose of this study is to investigate a psychological factor in the business environment.

2. I have been informed that my participation in this study will involve me answering a questionnaire.

3. I have been informed that all data and information I will provide will be treated confidentially and anonymously in any presentation of this material.

4. I have been informed that the information I provide will be used for a PhD project and might be published in the future.

5. I have been informed that the study contains no known expected discomfort or risks involved with my participation.

6. I have been informed that any questions I have regarding the procedures in this study will be answered at any stage.

7. I have been informed that I do not have to answer any questions I do not feel comfortable answering.

8. I have been informed that I am free to withdraw from any part of the study at any time without any consequences.

9. I have been informed that if I have any concerns about this project I can contact **Joshua Haist, J.Haist2@newcastle.ac.uk,** the project supervisor **stephen.procter@newcastle.ac.uk** or the School Director of Research, **Professor Fred Lemke**, Newcastle University Business School, 5 Barrack Road, Newcastle upon Tyne, NE1 4SE, (+44 191 208 1661; fred.lemke@ncl.ac.uk).

10. I acknowledge that I have read and understood the participant information sheet.

With clicking on "next page" I acknowledge that I have read and understood the statements regarding my participation in this study.

Thank you for your participation

Please insert your full name: _____

Name of researcher**:**   Joshua Haist

Signature of researcher:

Contact details:

Email: J.Haist2@newcastle.ac.uk

Address: Newcastle University Business School, Office 6.09

               5 Barrack Road, Newcastle upon Tyne, NE1 4SE,

Appendix N Structure of the Online Survey

Newcastle University Business School Research Project - Survey

Joshua Haist, PhD candidate and researcher at Newcastle University Business School is undertaking this research project.

Please read the following information about this study and decide whether you would like to participate or not. Please note that you can withdraw from the study at any time.

The aim of this project is to evaluate the application and importance of a new psychological factor in business environments. This psychological personality trait was researched in many other domains such as education, military, sports and academica but has not been applied in depth to the business environment yet. An additional aim of this research is to expand the definition of this construct and reveal meaningful relationships to other well researched psychological constructs.

Data collection for this research will involve you answering a short, non-invasive, online questionnaire which will take approximately 10-15 minutes. Participants do not have to answer any questions they do not feel comfortable answering.

Data confidentiality and anonymity: Information provided by participants will remain confidential and anonymous at all times. The data and information will be stored in a secured location, with only the researcher having access. All data and information will be permanently disposed of upon successful completion of the research project. In the case that the study will be published, the data will be kept for longer, maintaining the same security conditions. There are no known risks for participants involved in participation.

Participants can withdraw from any part of the study at any time without any consequences, no disadvantages are connected with this step. Questions will be answered at any time of the study. If you have any concerns, comments or questions about the research please feel free to contact the researcher or the supervisory team:

Prof Stephen Procter (stephen.procter@newcastle.ac.uk)

Dr Michael Brookes (michael.brookes@ncl.ac.uk).

By signing this, I acknowledge that I have read and understood the information regarding my participation in this study. Please be aware that confidentiality will be maintained at all times and your details will not be made available to anybody else.

Thank you for your participation.

Joshua Haist

M.Sc. Performance Psychology B.A. Business Psychology

About you

What Sex are you?

◯ Female ◯ Male ◯ Prefer not to say

How old are you?

◯ 16-25　　　◯ 46-55　　　◯ Prefer not to say

◯ 26-35　　　◯ 56-65

◯ 36-45　　　◯ 66 or older

Which of the following best describes your job role?

◯ Senior Management　　◯ Trained Professional　　◯ Administrative Staff

◯ Junior Management　　◯ Consultant　　　　　　◯ Researcher

◯ Skilled Worker　　　　◯ Support Staff

◯ Apprentice　　　　　　◯ Self-employed/Partner

Other (Please specify):

[   ]

What department do you work in?

[   ]

Which of the following categories best describes the industry you primarily work in (regardless of your actual position)?

◯ Construction　　　　　　◯ Real Estate & Accommodation　　◯ Hotel and Food Services

◯ Manufacturing　　　　　◯ Education　　　　　　　　　　　◯ Scientific or Technical Services

◯ Retail, trade　　　　　　◯ Health Care and Social Assistance ◯ Consulting

◯ Transportation & Storage　◯ Arts, Entertainment, and Recreation　◯ Administrative & support service activities

◯ Finance, Insurance & Legal Services　◯ Government & Public Administration

Other Industry (Please specify):

[   ]

282

Would you describe your work as more project based or as everyday / line work?

Project based   Everyday / line work

◯———◯———————◯———————◯———————◯———————◯

What is your highest level of education? (UK or its non-UK equivalent) [Please choose]

◯ Secondary Education   ◯ Bachelor's degree   ◯ Doctoral level

◯ A-level qualification   ◯ Master's degree

Other (Please specify):

[   ]

How many years of work experience do you have?

[   ]

Please respond to the following 8 items using the scale from 1 = "Very much like me" to 5 = "Not like me at all". Be honest – there are no right or wrong answers!

	Not like me at all	Not much like me	Somewhat like me	Mostly like me	Very much like me
New ideas and projects sometimes distract me from previous ones.	○	○	○	○	○
Setbacks don't discourage me.	○	○	○	○	○
I have been obsessed with a certain idea or project for a short time but later lost interest.	○	○	○	○	○
I am a hard worker.	○	○	○	○	○
I often set a goal but later choose to pursue a different one.	○	○	○	○	○
I have difficulty maintaining my focus on projects that take more than a few months to complete.	○	○	○	○	○
I finish whatever I begin.	○	○	○	○	○
I am diligent.	○	○	○	○	○

Please indicate the extent to which the following statements produces stress for you at work on a scale ranging from 1 = "no stress at all" to 5 = "a great deal of stress".

	No stress at all				A great deal of stress
The number of projects and or assignments I have.	○	○	○	○	○
The amount of time I spend at work.	○	○	○	○	○
The volume of work that must be accomplished in the allotted time.	○	○	○	○	○
Time pressures I experience.	○	○	○	○	○
The amount of responsibility I have.	○	○	○	○	○
The scope of responsibility my position entails.	○	○	○	○	○
The degree to which politics rather than performance affects organizational decisions	○	○	○	○	○
The inability to clearly understand what is expected of me on the job.	○	○	○	○	○
The amount of red tape I need to go through to get my job done.	○	○	○	○	○
The lack of job security I have.	○	○	○	○	○
The degree to which my career seems "stalled."	○	○	○	○	○

Below are statements that describe how you may think about yourself right now. Use the following scale to indicate your level of agreement or disagreement with each statement.

	Strongly Disagree	Disagree	Somewhat agree/disagree	Agree	Strongly Agree
I feel confident in representing my work area in meetings with management.	○	○	○	○	○
I feel confident contributing to discussions about the organization's strategy.	○	○	○	○	○
I don't feel confident presenting information to a group of colleagues.	○	○	○	○	○
If I should find myself in a jam of work, I could think of many ways to get out of it.	○	○	○	○	○
Right now I don't see myself as being pretty successful at work.	○	○	○	○	○
I can think of many ways to reach my current work goals.	○	○	○	○	○
At this time, I am meeting the work goals that I have set for myself.	○	○	○	○	○
I can be "on my own," so to speak, at work if I have to.	○	○	○	○	○
I usually take stressful things at work in stride.	○	○	○	○	○
I can get through difficult times at work because I've experienced difficulty before.	○	○	○	○	○
I do not always look at the bright side of things regarding my job.	○	○	○	○	○
I'm optimistic about what will happen to me in the future as it pertains to work.	○	○	○	○	○

How much do you agree or disagree with each of the following statements about how you do your job (1 = strongly disagree, 3 = neutral, 5 = strongly agree) :

	Strongly Disagree				Strongly Agree
I adequately complete assigned duties	○	○	○	○	○
I fulfil responsibilities specified in my job description	○	○	○	○	○
I perform tasks that are expected of me	○	○	○	○	○
I meet the formal performance requirements of my job	○	○	○	○	○
I do things that will directly affect my performance appraisal	○	○	○	○	○
I neglect aspects of the job I am obliged to perform	○	○	○	○	○

Please indicate how often do you perform the following work activities?

	Never				Always
Creating new ideas for improvements	○	○	○	○	○
Mobilising support for innovative ideas	○	○	○	○	○
Searching out new working methods, techniques, or instruments	○	○	○	○	○
Acquiring approval for innovative ideas	○	○	○	○	○
Transforming innovative ideas into useful applications	○	○	○	○	○
Generating original solutions to problems	○	○	○	○	○
Introducing innovative ideas in a systematic way	○	○	○	○	○
Making important organisational members enthusiastic for innovative ideas	○	○	○	○	○
Thoroughly evaluating the application of innovative ideas	○	○	○	○	○

Rate on a scale ranging from 1 (Never) to 7 (Almost always) how often you engaged in the described behaviours:

	Never						Almost always
I effectively collaborate with others to handle unexpected challenges at work	○	○	○	○	○	○	○
I successfully manage a high workload for long periods of time	○	○	○	○	○	○	○
I resolve crises competently at work	○	○	○	○	○	○	○
I learn from mistakes at work and improve the way I do my job"	○	○	○	○	○	○	○
I re-evaluate my performance and continually improve the way I do my work	○	○	○	○	○	○	○
I do not effectively respond to feedback at work, even criticism	○	○	○	○	○	○	○
I seek assistance to work when I need specific resources	○	○	○	○	○	○	○
I approach managers when I need their support	○	○	○	○	○	○	○
I use change at work as an opportunity for growth	○	○	○	○	○	○	○

286

Please indicate, using a 7-point scale (1 = never, 7 = always), how often you engaged in these behaviours

	Never						Always
Help others who have been absent.	○	○	○	○	○	○	○
Willingly give your time to help others who have work-related problems.	○	○	○	○	○	○	○
Adjust your work schedule to accommodate other employees' requests for time off.	○	○	○	○	○	○	○
Go out of the way to make newer employees feel welcome in the work group.	○	○	○	○	○	○	○
Show genuine concern and courtesy toward fellow workers, even under the most trying business or personal situations.	○	○	○	○	○	○	○
Give up time to help others who have work or nonwork problems.	○	○	○	○	○	○	○
Assist others with their duties.	○	○	○	○	○	○	○
Share personal property with others to help their work.	○	○	○	○	○	○	○
Attend functions that are not required but that help the organizational image.	○	○	○	○	○	○	○
Keep up with developments in the organization.	○	○	○	○	○	○	○
Defend the organization when other employees criticize it.	○	○	○	○	○	○	○
Show pride when representing the organization in public.	○	○	○	○	○	○	○
Offer ideas to improve the functioning of the organization.	○	○	○	○	○	○	○
Express loyalty toward the organization.	○	○	○	○	○	○	○
Take action to protect the organization from potential problems.	○	○	○	○	○	○	○
Demonstrate concern about the image of the organization.	○	○	○	○	○	○	○

Newcastle University Business School

Thank you for your participation.

As part of the project we want to see how things are subject to change over time, which would mean answering a second (much shorter) survey,

Please indicate whether you would be willing to be contacted via email. If you would be willing to, please keep your participation number and insert your email adress in the box below.

If you would be willing to participate in a second follow-up survey, please insert your email address here.

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Appendix O Ethical Application Form and Ethical Approval

Full Ethics Application Checklist

Checklist to accompany all applications submitted for full ethical approval.

Information about Ethics Procedures is available at
http://www.ncl.ac.uk/res/research/ethics_governance/ethics_procedures/index.htm

Applicant Name: Joshua Haist

Date Application Submitted: 23/05/16

Postgraduate Student

Documentation Attached	YES	NO
Full Application	☑	☐
Ethics Application Checklist	☐	☐
Consent Forms	☑	☐
Questionnaire	☐	☐
Risk assessment	☐	☐
Other documentation attached?	☑	☐

If yes, please specify: Information sheet

Faculty Office Use
Date Received: 23/05/16
Date Sent to reviewer: 26/05/16
Sent to: SACS   (School Name)
                         Deborah Chambers   (Ethics Convenor Name)

Ethics Convenor Comments (please return within 3 weeks of date received)

This is an interesting research topic: an exploration of the predictive validity of 'grit' for business related measures. I gather the participants comprise new employees (employees for less than 12 months), managers with at least five years of leadership experience and potential employees during the hiring process in UK based companies Adherence to the following procedures is noted:
- A gatekeeper is to be used;
- Participation is voluntary;
- Participants are over the age of 18, from English speaking backgrounds;
- Participants will be informed they can withdraw at any time;
- Anonymity will be ensured and confidentiality maintained;
- An information sheet is to be provided;
- Written consent for participation is to be obtained (on second page of questionnaire)
- Debriefing to take place via written debriefing document;
- No risks are involved for participants or researcher.

Minor query:

It may be advisable to submit a draft debriefing document. Has such a document been drafted already?

Ethical Approval Received

Dear Joshua

Thank you for your application for ethical approval of your project "The Role of Grit in Predicting Individual Performance. Developing the Concept and applying it to the Business Environment". I confirm that Prof Daniel Zizzo has approved it on behalf of the Faculty of Humanities and Social Sciences Ethics Committee.

Please note that this approval applies to the project protocol as stated in your application - if any amendments are made to this during the course of the project, please submit the revisions to the Ethics Committee in order for them to be reviewed and approved.

Kind regards,

Wendy

Wendy Davison

PA to Lorna Taylor (Faculty Research Manager)
and Sue Mitchell (Research Funding Development Manager)
Faculty of Humanities and Social Sciences
5th floor, Daysh Building
Newcastle University
Newcastle upon Tyne, NE1 7RU

Telephone: 0191 208 6349
Fax: 0191 208 7001

Appendix P Invitation Document for Participants

The Role of Grit in Predicting Individual Performance. Developing the Concept and Applying it to the Business Environment

My PhD project is about a psychological construct which has been shown to have a high impact on the performance, retention and success of individuals in different studies. The construct, defined as "passion and perseverance for long term goals" was recently developed in the USA and is called "Grit".

Recent research into Grit and its impact mainly approached this construct within academic, military and sport environments and omitted to adapt this non-cognitive trait to the business context. In one former study, it has been shown that grit might have an impact on employees' performance, effectiveness and success (Haist, 2015).

Therefore, this study aims to:

- Establish a deeper understanding of the importance of grit towards long term goals on individual outcomes
- Distinguish this construct from similar constructs used in business environments such as employee resilience or psychological capital
- Elaborate upon the impact of grit on performance, success, attitude towards change, and perceived stress on a long term basis
- Use the long term data in order to identify characteristics of grit which can be developed over time

Participation is completely voluntary and confidentiality and anonymity will be maintained at all times of the study as prescribed in the code of ethics of Newcastle University. All individual data will be anonymised and kept confidential, stored at the University's file store service with secure audited access procedures accessible only for the researcher.

I am happy to answer any questions you might have per email or in person if preferred.

Joshua Haist

BA BusPsych, MSc. PerfPsych

Email: J.Haist2@newcastle.ac.uk

Supervisors:

Prof Stephen Procter   stephen.procter@ncl.ac.uk

Dr Michael Brookes   michael.brookes@ncl.ac.uk

Appendix Q Participant Debriefing Sheet

Participant debriefing, Newcastle University Business School

The Role of Grit in Predicting Individual Performance. Developing the Concept and Applying it to the Business Environment

Thank you again for taking part in the Newcastle University Business School study of Joshua Haist. Your participation was gratefully received and highly appreciated. It has enabled us to analyse the data and information you gave our researcher.

The overall purpose of the research project was to Establish a deeper understanding of the importance of grit towards long term goals on individual outcomes in the business environment. Moreover, the aim was to elaborate upon the impact of grit on performance, success, attitude towards change, and perceived stress on a long-term basis. The information received and studied will help the researcher to understand the applicability and importance of Grit in the broader business environment within the UK. These information can be used to develop HR policies and HR development schemes in order to enable individuals to achieve success on a long-term basis and to develop their skillsets in order to pursue their goals.

The following are the major draft findings of the component of the study you were involved with:

Grit is a predictor of higher job performance and lower levels of stress. However, the current model of grit is lacking preciseness and requires further conceptual development.

As part of our study, we highly value any comments, suggestions, queries and observations you might have on these findings. If you wish to address any such comments in writing please do so by emailing me to the email address on the top of this document.

We may wish to follow up these comments with you. If you are happy for us to do so, please include your contact details. Equally, you may wish for your comments to be anonymous. We are also very happy to receive any anonymous comments.

Any comments and feedback from your side will be considered in the revised version of the findings. As all information that have been obtained for this study, also any comments which we might include will be made anonymous. The revised findings will be distributed in due course and send to you to the email address provided.

Again, thank you so much for your help in making this research possible.

Kind regards

Joshua Haist

5 Barrack Road
NE1 4SE, Newcastle upon Tyne
Tyne and Wear
Email: J.Haist2@ncl.ac.uk

Appendix R Sample Covariance and Correlation Matrix of Grit

Summary of the Sample Covariances in the Second-Order Model of Grit

		1	2	3	4	5	6	7	8
1	GR01_02_Pers	0.956	-						
2	GR01_04_Pers	0.249	0.608	-					
3	GR01_07_Pers	0.279	0.25	0.865	-				
4	GR01_08_Pers	0.29	0.314	0.447	0.66	-			
5	GR01_01_Cons	0.105	0.032	0.232	0.109	0.984	-		
6	GR01_03_Cons	0.193	0.136	0.365	0.203	0.442	1.125	-	
7	GR01_05_Cons	0.111	0.095	0.325	0.162	0.334	0.458	0.949	-
8	GR01_06_Cons	0.199	0.131	0.343	0.191	0.359	0.493	0.464	1.134

Summary of the Sample Correlations in the Second-Order Model of Grit

		1	2	3	4	5	6	7	8
1	GR01_02_Pers	-							
2	GR01_04_Pers	0.327	-						
3	GR01_07_Pers	0.307	0.345	-					
4	GR01_08_Pers	0.365	0.496	0.591	-				
5	GR01_01_Cons	0.108	0.041	0.252	0.135	-			
6	GR01_03_Cons	0.186	0.165	0.37	0.235	0.42	-		
7	GR01_05_Cons	0.116	0.125	0.359	0.205	0.346	0.444		
8	GR01_06_Cons	0.191	0.158	0.346	0.221	0.34	0.436	0.447	

Appendix S Regression of the Person-Centred Model of Grit for Job Performance

Summary of Linear Regressions of the Person-Centred Model of Grit for Job Performance

	Task Performance			OCB			Innovative Performance		
	M1	M2	M3	M1	M2	M3	M1	M2	M3
Age	-.01	.01	.01	-.06	-.01	-.01	.04	.09	.09
Gender	-.03	-.05	-.05	-.03	-.03	-.03	.09**	.06*	.06*
Educational Level	.03	.02	.02	-.04	-.05	-.05	.03	.03	.03
Work Sector	.03	.02	.02	-.01	-.01	-.10	.00	-.00	-.00
Department	-.01	-.02	-.02	-.03	-.04	-.04	-.00	.00	.00
Position	-.02	.07*	.07*	-.19	-.10	-.10	-.29***	-.17***	-.17***
Experience	.13	.00	.01	.21	.09	.09	.03	-.08	-.08
In-role Experience	-.01	.03	.02	-.04	-.00	-.00	.01	.03	.03
PsyCap		.29**	.27***		.20	.20		.36***	.36***
Resilience		.28**	.26***		.40	.40		.17***	.17***
Person-Centred Grit			.14***			-.00			-.01
R^2	0.014	0.223	0.240	0.086	0.326	0.326	0.136	0.315	0.316
ΔR^2	-	0.210	0.017	-	0.241	0.000	-	0.179	0.000
F	2.02*	33.21***	33.20***	12.66***	52.26***	47.47***	21.36***	49.73***	45.18***
ΔF	-	155.82***	25.86***	-	192.71***	0.02	-	141.08***	0.06

Note: ***$p < .001$, **$p < .01$, *$p < .05$