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The Relationship between Working Memory and Psychological Resilience

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A research project submitted in partial fulfilment of the requirements for the degree of Master of Arts in Social and Psychological Research by Coursework and Research Report in the Department of Psychology, Faculty of Humanities, at the University of the Witwatersrand, Johannesburg, March 2017

The financial assistance of the National Research Foundation (NRF) towards this research is hereby acknowledged. Opinions expressed and conclusions arrived at, are those of the author and are not necessarily to be attributed to the NRF.

Declaration

I declare that this research report is my own, unaided work. It has not been submitted before for any other degree or examination at this or any other university.

Sign: _____

Date: _____

Abstract

Working memory (WM) is an executive function that may promote resilience by enabling individuals to generate novel solutions in adverse situations. Research regarding the relationship between these constructs is limited. It is particularly unclear whether, and how, WM may promote resilience in the South African context. This study thus used a mixed method concurrent triangulation design to quantitatively investigate whether WM is related to resilience; and to qualitatively investigate how WM processes feature in participants' experiences of resilience, and how this is influenced by socio-cultural factors. Thirty-eight young Black South African adults from disadvantaged backgrounds (whose WM had been assessed in a pre-existing study) completed a demographic questionnaire and the Resilience Research Centre-Adult Resilience Measure in person or online. For the qualitative phase, 14 of these participants were interviewed using a semi-structured interview schedule. Quantitative findings were equivocal, but primarily non-significant. Qualitative findings indicated that WM processes featured in participants' accounts of resilience-promoting resources, but that this was shaped by socio-cultural resources accessible to participants. Working memory also featured as one amongst many of the resilience-promoting resources accessible to participants. The disparity between the quantitative and qualitative findings may be due to the individualistic nature of the quantitative WM measure used. Findings are interpreted in relation to existing literature regarding cognitive functioning and resilience. Implications for understanding and promoting the resilience of Black South African young adults are discussed.

Keywords: working memory, resilience, young adults, South Africa, mixed methods

Acknowledgements

Alhamdulillah - all praise is due to Allah, without whom this research would not have been possible.

I would also like to express my gratitude to the following people who have been instrumental to the completion of this research:

My supervisor, Professor Kate Cockcroft, for your continuous support and guidance throughout this research process, and for always being willing to listen and help during my spontaneous ‘pop-ins’ to your office. I sincerely thank you for making my journey through postgraduate study an academically, and personally, enriching experience.

My parents- for your love, support, encouragement, sacrifices and prayers that have helped me get to where I am today. The words ‘thank you’ are insufficient.

My brothers- for being my tech support and comic relief.

Fatimah- for the phone calls, messages, book browsing and lunches that kept me sane during this process.

Professor Linda Theron- thank you for your insight, expertise, and support throughout this process.

Professor Sumaya Laher- your support and mentorship in all things psychology, research and beyond has helped me grow as a researcher and a person, and has been instrumental in getting me to this point. I am truly grateful.

To other family, friends and lecturers who have offered me support and encouragement throughout this journey. My apologies for not personally thanking you, as the list would just be too long; my gratitude to you is no less.

The National Research Foundation for the Innovation Masters scholarship, and the University of the Witwatersrand for the postgraduate merit award.

Last, but certainly not least, to the people who took the time and effort to participate in this study- your participation is most appreciated.

Table of Contents

Declaration i
Abstract ii
Acknowledgements iii
List of Tables vi
List of Figures vii
Chapter One: Introduction 1
Chapter Two: Literature Review and Theoretical Framework 3
Conceptualising Executive Functioning and Working Memory 3
A Socio-Ecological Conceptualisation of Resilience 6
The Relationship between Executive Functioning and Resilience: Theoretical and Empirical Evidence 12
The Relationship between Working Memory and Resilience: Theoretical and Empirical Evidence 17
Executive functioning, Working Memory and Resilience: The South African Context 21
Conclusion 24
Chapter Three: Methodology 25
Research Questions 25
Research Design 25
Sample and Sampling Strategy 27
Instruments 30
Biographical questionnaire. 30
The Automated Working Memory Assessment (AWMA; Alloway, 2007). 30
The Resilience Research Centre Adult Resilience Measure (RRC-ARM; Ungar & Liebenberg, 2013). 32
Interview schedule. 35
Note. 35
Procedure 35
Ethical Considerations 38
Data Analysis 39
Self-reflexivity 40
Conclusion 40
Chapter Four: Results 41
Quantitative Results 41
Normality and descriptive statistics. 41

Inferential statistics: Correlation coefficients. 43
Summary of quantitative results. 43
Qualitative Results 45
Theme 1. Self-talk as a possible resilience-promoting resource. 45
Theme 2. Setting and focusing on goals as promoting resilience. 47
Theme 3. Finding multiple solutions to a problem. 49
Theme 4. Persistence and diligence: Socially-motivated, personal resilience-promoting resources. 51
Theme 5. Positivity: An internally-sourced, and an externally-driven/-sourced, resilience resource. 54
Theme 6. Personal and social spirituality as support structures that promote resilience. 58
Theme 7. Social networks as a key support structure promoting resilience. 61
Summary of qualitative results. 68
Conclusion 68
Chapter Five: Discussion 69
Discussion of Quantitative Results 69
Discussion of Qualitative Results 72
Mixed Method Findings 78
Limitations and Suggestions for Future Research 80
Strengths 82
Conclusion 83
References 85
Appendices 101
Appendix A: Demographic Questionnaire 101
Appendix B: RRC-ARM Complete Scale, Subscales, Question Cluster Divisions 105
Appendix C: Interview Schedule 107
Appendix D: Ethics Clearance Certificate 110
Appendix E: Information/Invitation Letter 111
Appendix F: Consent Form (Quantitative Phase) 115
Appendix G: Consent Form for Qualitative Phase (Interview) 116
Appendix H: Consent Form for Qualitative Phase (Recording) 117
Appendix I: Histograms with Normal Curves 118
Appendix J: Six Steps of Thematic Content Analysis (Braun & Clarke, 2006; 2012) 132

List of Tables

Table 1. Home Language by Study Phase 28
Table 2. University Educational Indices by Study Phase 29
Table 3. Internal Consistency Reliability of RRC-ARM Subscales and Question Clusters....34
Table 4. Descriptive Statistics and Kolmogorov-Smirnov Tests for Normality for WM and Resilience Variables.....41
Table 5. Pearson's Correlation Coefficients between all AWMA and RRC-ARM scores. 44
Table 6. Themes Identified As Per Number of Participants and Frequency. 45

List of Figures

Figure 1. The multicomponent model of WM 4
Figure 2. Bronfenbrenner's (1979) environmental systems. 8
Figure 3. Concurrent triangulation design 27

Chapter One: Introduction

Psychological resilience (hereafter referred to as resilience) is broadly defined as the ability to overcome significant adversity, and to excel despite such conditions (Masten, 2001). Here, significant adversity refers to any psychosocial and/or biological hardships that disrupt normative development or place individuals at risk for negative outcomes (Theron, 2011). There are a set of key resources that have universally been found to promote resilience (Masten & Wright, 2010). One such resource is executive functioning (EF); cognitive processes which enable the efficient coordination and control of thought and behaviour (Jurado & Rosselli, 2007; Masten & Wright, 2010).

Working memory (WM) is one of the components of EF (Jurado & Rosselli, 2007; Miyake et al., 2000), and as such may promote resilience. Working memory specifically refers to the cognitive processes which enable the storage and manipulation of a limited amount of information (Baddeley, 2000), and consequently may promote resilience by enabling individuals to generate and evaluate multiple novel solutions in adverse situations (Hofmann, Schmeichel, & Baddeley, 2012; Williams, Suchy, & Ru, 2009). However, few studies have investigated how measurable components of EF, like WM, relate to resilience (Curtis & Cicchetti, 2003; Wingo, Fani, Bradley, & Ressler, 2010). Given that different EF components have different functions (see Barkley, 2012; Jurado & Rosselli, 2007), it follows that different EF components may be differentially related to resilience. As WM is an EF component, and given that there is some argument that WM may underpin all executive functions (EFs; see Jurado & Rosselli, 2007; Miyake et al., 2000), there is justification for a focused investigation into how WM is related to resilience. Since WM is often measured through psychometric tests which yield numerical data (see Baddeley, 2007), it appears that the relationship between WM and resilience requires quantitative investigation, or explanation through numeric measurement and statistical analyses (Babbie & Mouton, 2001). In addition, there is evidence that individuals' experiences with their sociocultural context influence how such resources impact on resilience, and so the relationship between WM and resilience also requires qualitative investigation (Theron, 2015). That is, this relationship also requires detailed description and understanding through non-numerical observations and interpretation of participants' accounts of their experiences (Babbie & Mouton, 2001). The present study thus investigated the relationship between WM (as conceptualised using the multicomponent model of WM; Baddeley, 2000), and resilience (as conceptualised using the

socio-ecological model of resilience; Ungar, 2011; Ungar, Ghazinour, & Richter, 2013), using a mixed method approach.

Investigating the relationship between WM and resilience may be valuable in the South African context as South Africans are exposed to high levels of adversity (Du Preez, 2013). This investigation may have particular importance for young Black South African adults who are more likely to grow up in disadvantaged contexts; a consequence of the country's political past (Dass-Brailsford, 2005; Du Preez, 2013). The adverse effects associated with growing up in disadvantaged contexts (see Dass-Brailsford, 2005) may be exacerbated by other risk factors these individuals may be exposed to, by virtue of being young adults in the South African context (see Statistics South Africa, 2016). For example, South African young adults are highly likely to be at risk for poverty, unemployment, HIV/AIDS and crime/violence (see Statistics South Africa, 2016). As some of these adults may enter the university setting, they may also be exposed to further psychosocial challenges such as increased financial stress and pressure to perform academically (Dass-Brailsford 2005; Mokgele & Rothmann, 2014). Investigating the relationship between WM and resilience among Black South African young adults from disadvantaged circumstances, who gained entry into a tertiary institution, is likely to have significant value. Such research may contribute to developing resilience-promoting interventions for this group (Masten & Wright, 2010), and may also help to develop a contextually-relevant theoretical understanding of resilience in this group (Ungar, 2005). This study thus quantitatively and qualitatively investigated the relationship between WM and resilience among Black South African young adults, from disadvantaged backgrounds, who attended university.

An in-depth review of the theoretical and empirical literature regarding WM and resilience, and the gaps within this literature, is provided in Chapter Two. Chapter Three describes the methodological approaches used to investigate the relationship between WM and resilience. Details are provided regarding both the quantitative and qualitative phases of the study. The quantitative and qualitative results are presented separately in Chapter Four, and are then discussed and interpreted in Chapter Five in relation to the reviewed literature. The study's limitations, consequent future directions, and strengths are also discussed in Chapter Five. The study concludes in Chapter Five, with a summary of the key findings, and their theoretical and practical implications.

Chapter Two: Literature Review and Theoretical Framework

Given the rationale provided in the introduction, this chapter will explore theoretical and empirical evidence for the relationship between working memory (WM) and resilience. The chapter first conceptualises the core theoretical constructs, commencing with that of executive functioning (EF). This is followed by a more in-depth exploration of the multicomponent model of WM (Baddeley, 2000), and the socio-ecological model of resilience (Ungar, 2011; Ungar et al., 2013). Following the exploration of these core theoretical constructs, theoretical and empirical evidence regarding the relationships between EF and resilience, and WM and resilience, is discussed. The latter part of this discussion includes an overview of the relevant existing research in South Africa, and the gaps present in this research. The need for examining the relationship between WM and resilience in the South African context, and for a mixed method approach in doing so, is emphasised in this section of the review. A brief discussion of the study's research questions and purpose concludes the review.

Conceptualising Executive Functioning and Working Memory

Executive functioning is an umbrella term for a number of higher-order, regulatory, cognitive processes (Zelazo & Cunningham, 2007). Although EF comprises of many components (Jurado & Rosselli, 2007), the following are considered the primary elements: inhibition, shifting, and updating and monitoring (Miyake et al., 2000). Inhibition refers to the ability to deliberately restrain habitual responses (Miyake et al., 2000). This enables individuals engaged in tasks, to override or restrain habitual responses that may be irrelevant to these tasks (Miyake et al., 2000). Shifting refers to the ability to flexibly move between objectives or perspectives when problem-solving (Miyake et al., 2000). This enables individuals to disengage from an irrelevant objective/perspective so that they may engage in a relevant objective/perspective. It may also enable individuals to move to a different objective/perspective with regard to some stimuli, when there is negative priming or proactive interference from a previous objective/perspective regarding the same stimuli (Miyake et al., 2000). Updating and monitoring refer to the ability to assimilate and maintain new and relevant information (Miyake et al., 2000), allowing for old information, that is no longer relevant, to be replaced (Morris & Jones, 1990).

Of these EF components, updating and monitoring is most closely linked to WM, implicating WM as a core EF component (Baddeley, 2007; Miyake et al., 2000). These terms

are often used interchangeably in the literature (Bull, Espy & Wiebe, 2008), and will be used this way in the current study. There are different theoretical conceptualisations of WM; however the multicomponent model of WM (depicted in Figure 1) appears to offer the most empirically-validated conceptualisation (Baddeley, 2000; 2012).

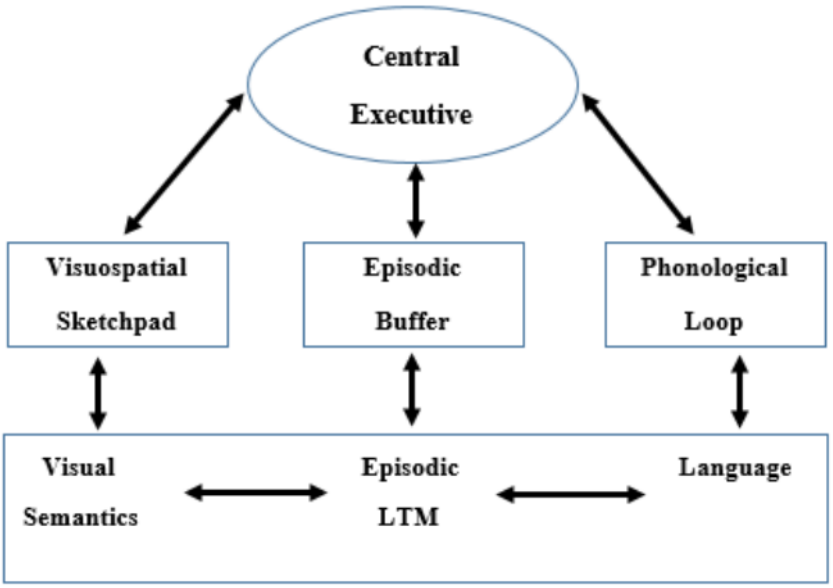


Figure1: The multicomponent model of WM. Adapted from "The episodic buffer: A new component of working memory?" by A. Baddeley, 2000, *Trends in Cognitive Sciences, 4,* p.421.

According to this model, WM comprises of an attentional centre (the central executive) and three limited-storage systems: the episodic buffer, visuospatial sketchpad and phonological loop (Baddeley, 2000). The central executive is the primary system which regulates the spread of attention and information between the other WM systems, and between WM and long-term memory (LTM; Baddeley, 2000). There is also some argument that the central executive is not merely involved in attention regulation, but comprises of other executive functioning abilities as well (Baddeley, 2007). The episodic buffer is the multidimensional system that reciprocally connects the phonological loop and visuospatial sketchpad, with LTM (Baddeley, 2000). This enables the buffer to integrate information from these various systems into a small number of chunks, which are then temporarily stored by the buffer. Using conscious awareness, the buffer can be accessed by the central executive, with the latter influencing the content of the buffer by attending to information from LTM or the other WM systems. This enables the buffer to construct new cognitive representations,

and to subsequently promote problem-solving (Baddeley, 2000). The visuospatial sketchpad and phonological loop are the WM subsystems that briefly hold and manage visuospatial, and auditory-verbal, information respectively (Baddeley, 2000). The phonological loop consists of two subcomponents; the phonological store and articulatory rehearsal system (Baddeley, 2007). The phonological store is a brief storage subcomponent that holds auditory-verbal information, with the memory traces of this information decaying in approximately two seconds (Baddeley, 1993; Baddeley, 2010). The articulatory rehearsal system allows these traces to be maintained through vocal or subvocal rehearsal (Baddeley, 2012); that is, reactivating information in the phonological store using a process that simulates speaking but does not necessarily require actual articulation (Gathercole, 2008). The articulatory rehearsal system also enables information of other modalities to enter, and be represented in, the store by phonologically coding this information (Repovš & Baddeley, 2006). The visuospatial sketchpad is also argued to be fractionated as there is evidence for separate visual and spatial components in the sketchpad (Baddeley, 1996; 2012). There is also some argument that the sketchpad is fractionated into two separate, yet related, subcomponents namely the visual cache and inner scribe (Baddeley, 2012; Logie, 1995; 2011). The visual cache briefly stores visual information (Logie, 2011). The inner scribe can store and manipulate spatial information, and maintain the storage of visual information in the visual cache through mental rehearsal (Logie, 2011). All four of these WM systems thus enable information to be mentally held and manipulated, allowing individuals to engage in complex cognitive processes such as goal-directed behaviour and problem-solving (Baddeley, 2000; D'Esposito, 2007; Diamond, 2013). Developmental (Alloway & Ledwon, 2014), learning disability (Lanfranchi, Baddeley, Gathercole, & Vianello, 2012), neuropsychological (Foley, Kaschel, Logie, & Della Sala, 2011; Huntley & Howard, 2015), and neuroimaging research (Fried, Rushmore III, Moss, Valero-Cabré, & Pascual-Leone, 2014; Rottschy et al., 2012), have provided evidence and support for this model of WM (see Baddeley, 2007 for a review of earlier literature). While the above research is predominantly cross-sectional and correlational and consequently prevents causal conclusions from being drawn, these findings do appear to be credible as such research has frequently been replicated and has yielded highly consistent results (Baddeley, 2007).

Cognitive constructs like EF and WM should not be understood separately from socio-emotional functioning. For example, executive functions (EFs) can help individuals to regulate their behavioural and emotional responses to social situations (see Diamond, 2013;

Hofmann et al., 2012). One manner in which this can occur is that EFs may assist an individual in regulating and controlling their emotional response to a situation in an appropriate manner (Diamond, 2013). This includes assisting individuals to regulate their behavioural and emotional responses when interacting with other individuals, so that these responses are appropriate to the social and contextual demands of the interaction (Barkley, 2012). Further evidence regarding the link between EF and socio-emotional functioning derives from research that has indicated that impairments in EF are linked to psychological disorders (see Diamond, 2013). For example, meta-analyses and a systemic review of EF ability in individuals diagnosed with posttraumatic stress disorder (PTSD) showed that those diagnosed with the disorder showed significantly poorer EF ability compared to non-PTSD affected, and trauma-exposed, controls (Polak, Witteveen, Reitsma, & Olff, 2012; Scott et al., 2015). Further examples come from research on EF ability in individuals diagnosed with mood disorders. One meta-analysis found EFs to be endophenotypes (heritable psychobiological markers) of euthymic bipolar mood disorder (Arts, Jabben, Krabbendam, & van Os, 2008). Meta-analyses and systemic reviews regarding cognitive functioning and major depressive disorder also found that individuals diagnosed with this disorder display impaired performances on measures of EF (Snyder, 2013); and have poorer EF ability and hence display significant EF deficits compared to normal controls (Bora, Harrison, Yücel, & Pantelis, 2013; Rock, Roiser, Riedel, & Blackwell1, 2014). Although causation cannot be inferred from these relationships (for example, subtle EF impairments that predate trauma exposure may increase the likelihood and severity of PTSD after exposure [Aupperle, Melrose, Stein, & Paulus, 2012]), they nevertheless indicate that EF is related to healthy socio-emotional functioning. As EF is linked to socio-emotional functioning (Diamond, 2013; Hofmann et al., 2012), it follows that the components of EF, like WM, may be linked to resilience (Masten & Wright, 2010).

A Socio-Ecological Conceptualisation of Resilience

Since the definition of resilience is often debated (Boyden & Cooper, 2007), it is necessary to define this construct before reviewing evidence regarding the relationships between EF and resilience, and WM and resilience. Despite disagreements regarding the definition of resilience, there is general agreement that resilience should be conceptualised as involving systemic processes (Cicchetti, 2010; Theron & Donald, 2013; Ungar et al., 2013). These refer to occurrences in one context as influencing, and being influenced by, occurrences in other contexts (Bronfenbrenner, 1979). The socio-ecological model of

resilience conceptualises resilience in this manner (Ungar, 2011; Ungar et al., 2013), and specifically defines resilience as follows:

> I. The capacity of individuals to navigate their ways to resources that sustain well-being;
>
> II. The capacity of individuals' physical and social ecologies to provide those resources; and
>
> III. The capacity of individuals and their families and communities to negotiate culturally meaningful ways to share resources. (Ungar & Liebenberg, 2013, p.3)

According to this definition of resilience, resilience involves a set of complex processes which are moulded by an individual's reciprocal interactions with their socio-ecological environment (Ungar, 2011). The manner in which these interactions influence an individual's resilience can be understood in relation to the (bio-) ecological systems theory (EST) of human development (Bronfenbrenner, 1979; Bronfenbrenner & Ceci, 1994; Ungar et al., 2013). This is because this theory has influenced the study and conceptualisation of resilience through its emphasis on person-environment interactions (Ungar et al., 2013). Specifically, the concepts from the EST termed 'proximal processes' and 'context (or 'the ecological environment') seem to have provided a guiding framework for the development of a socio-ecological understanding of resilience (see Ungar et al., 2013). This is discussed below.

The first concept from the EST that appears to have influenced the development of the socio-ecological model of resilience is proximal processes (see Ungar et al., 2013). This refers to the regular, yet increasingly complex, reciprocal relationships between a developing individual and other individuals, objects or symbols which are directly accessible to them over a prolonged period of time (Bronfenbrenner, 1999). The expression, strength, composition and direction of these processes alters according to the interactive and cumulative effects of the developing individual's personal characteristics, their ecological environment, the nature of potential developmental outcomes, and the degree of contextual/historical consistency present throughout their lifespan (Bronfenbrenner, 1999). Proximal processes are thus the drivers for development, and operate by actualizing genetic potentials for efficient developmental functioning (Bronfenbrenner & Ceci, 1994). These processes both facilitate developmental competence, and reduce and safeguard against developmental dysfunction (Bronfenbrenner, 1999; Bronfenbrenner & Ceci, 1994). Proximal

processes have greater strength in promoting developmental competence in privileged and stable environments, and have greater strength in reducing developmental dysfunction in disadvantaged and unstable environments (Bronfenbrenner, 1999; Bronfenbrenner & Ceci, 1994). The strength of these processes is also positively affected by the supportive and emotionally strong relationships an individual has with others (Bronfenbrenner & Morris, 2006). It is in these ways that environmental factors can influence the expression of hereditary traits which may hinder, or promote, resilience (Ungar et al., 2013).

The second concept of the EST that appears to have shaped the socio-ecological model of resilience is the context/ecological environment (see Ungar et al., 2013); the nested, interdependent environmental systems of development (Bronfenbrenner, 1979; see Figure 2). From the most proximal to the least, these systems are: the micro-, meso-, exo-, macro- and chronosystem (Bronfenbrenner, 1979).

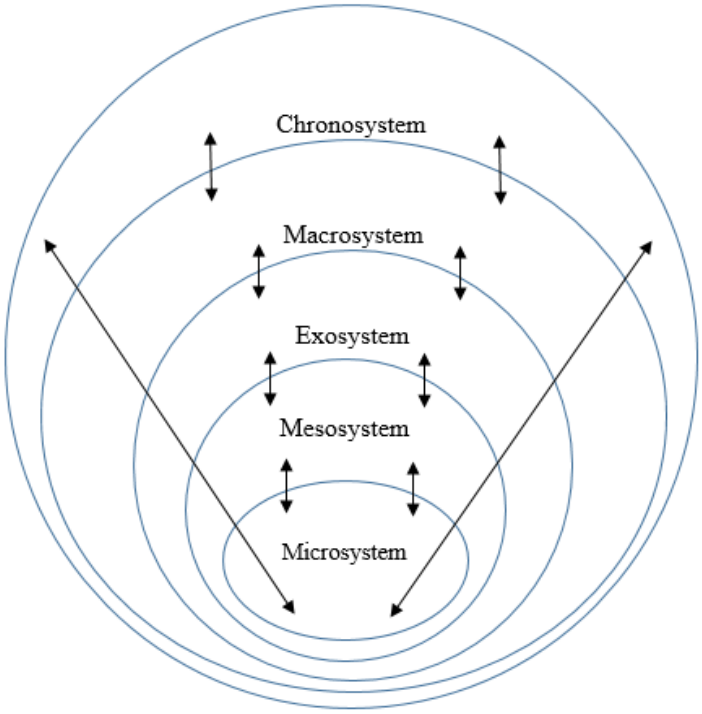


Figure 2: Bronfenbrenner's (1979) environmental systems. Adapted from "Bronfenbrenner's ecological theory of development," by D. Hook, In J. Watts, K. Cockcroft, & N. Duncan (Eds.), *Developmental psychology* (2nd ed., p.505), 2009, Cape Town: UCT Press.

The microsystem refers to the immediate settings, such as the home and educational environment, that an individual is located in (Bronfenbrenner, 1977). It affects the individual directly because it involves the influence of the reciprocal relationships between the individual and important others with whom they are in direct contact with (Bronfenbrenner,

1977). The microsystem includes an individual's interpersonal relationships, and the specific activities and roles they participate in (Bronfenbrenner, 1977). Activities refer to continuing behaviours that have their own momentum, which is produced by an individuals' conscious or unconscious perception of the activities as having purpose (Bronfenbrenner, 1979). Activities vary in terms of complexity and serve as indicators of an individual's development: activities engaged in with others, considered as more complex activities, facilitate development (Bronfenbrenner, 1979). Environmental factors enabling more complex activities thus facilitate development (Bronfenbrenner, 1979). Roles refer to the societal expectations regarding the behaviours associated with the social positions held by an individual (Bronfenbrenner, 1979). Interacting with others in varying roles, and broadening their own role repertoire, enhances an individual's development (Bronfenbrenner, 1979). Interpersonal relations involve the attention given to, or participation in, another's activities (Bronfenbrenner, 1979). The greater reciprocity and positive affect within these relations facilitates development (Bronfenbrenner, 1979). Personal and biological characteristics that influence development are also located within this system (Bronfenbrenner & Morris, 2006). Factors within this system that influence resilience include personality, and microsystemic family processes such as family cohesion and adaptability to stress; however, microsystemic processes in resilience tend to differ widely across cultures (Ungar et al., 2013).

The interconnections between the various immediate settings that the individual, and those they have relationships with, actively engage in comprises the mesosystem (Bronfenbrenner, 1977; 1979). This system thus not only takes into account the possibility that occurrences in one setting influence the development of an individual in another, but also the cumulative effects that occurrences in different settings may have on the individual's development (Bronfenbrenner, 1977). An individual's development within this setting is enhanced if they are advised and supported in their movement to a new setting, if this advice and support is transferrable (and encourages mutual growth) between settings, and if they engage with differing and multiple settings (Bronfenbrenner, 1979). The interactions that occur in this system determine the character of resources that are available to the individual, and that may support them developmentally, influencing their capacity to overcome, or do well, in the face of adversity (Ungar, 2011). These interactions also allow for the exchange of resources across different microsystems (such as between the home and educational microsystems); this promotes positive growth and mitigates the risks associated with

exposure to adversity (Ungar, 2012b). In other words, resilience is predicted by how well the elements of this system fit together (Ungar, 2012b).

The next environmental system is the exosystem, which comprises of the social settings beyond those immediate to an individual, but that still impact on their development (Bronfenbrenner, 1977). The developing individual, and those acting on their behalf, may positively alter these settings (thus facilitating development) by engaging in decision-making and influencing resource-allocation that meet the developing individual's needs. These formal or informal social settings include social networks, media networks and governmental services (Bronfenbrenner, 1977). This system thus refers to the design and delivery of services and policies, in addition to interactions that the individual's close others have with various community and institutional contexts, that influence social development and hence resilience (Ungar, 2011).

The macrosystem refers to the cultural ideologies and wider institutional frameworks (such as the socio-political, legal and educational systems) which manifest concretely in the other environmental systems (Bronfenbrenner, 1979). Information and ideologies present in the macrosystem directly or indirectly provide specific structures, activities, social networks and roles (and the interconnections between them) with a sense of significance and purpose (Bronfenbrenner, 1977). These ideologies and frameworks may contribute to resilience in that they can provide individuals with the opportunities to succeed and develop in a positive manner despite exposure to adverse circumstances (Ungar, 2011). Cultural values and beliefs may be particularly important here as they not only influence the resilience-promoting resources/opportunities provided by the socio-ecological context (Ungar, 2012b), but also an individual's discrimination of these as either enabling or hindering personal growth (Ungar, 2011; Ungar, 2012b). The elements in the macrosystem that promote resilience may thus be especially visible in their manifestations at a microsystemic, individual level (Ungar et al., 2013).

All the systems discussed above are influenced by the chronosystem (Hook, 2009); that is, the effects of time on the other ecological systems, and consequently in the individual (Rosa & Tudge, 2013). Within the EST, time denotes the pattern of events and normative or non-normative changes that occur across an individual's lifespan, their socio-historical position, and the sense of stability in their life (Bronfenbrenner, 1979; Bronfenbrenner & Morris, 2006). Resilience has a socio-historical dimension, where the aspects present in the

lower systems are influenced by sociohistorical changes that occur; this impacts individuals themselves, who are located at the microsystem (Ungar et al., 2013). Individual and environmental factors thus interact over time to influence resilience; this can increase the understanding of local patterns of resilience (Ungar, 2011).

The adoption of the ecological environment in relation to resilience thus suggests that the resources present in these systems which strengthen resilience fall under three broad categories, namely: individual, relational and cultural/contextual resources. In an individual's interactions within and between the abovementioned systems, these resources work together to mediate the effects associated with adversity (Ungar, 2011; Ungar et al., 2013).

The adoption of the EST concepts discussed in relation to resilience has also suggested that a socio-ecological understanding of resilience is informed by three principles, namely: equifinality, differential impact and cultural moderation (Ungar et al., 2013). The principle of equifinality indicates that there are there are various proximal processes that can lead to different (yet equivalent) resilient outcomes. These outcomes may present themselves as expressions of development that are linked to resilience (Ungar et al., 2013). While all processes may be important to development, under different temporal and environmental conditions, certain process may have a greater influence on resilience than others (Ungar, 2011; Ungar et al., 2013). The principle of differential impact refers to the impact exerted by resilience-promoting or protective resources, as differing across contexts (Ungar et al., 2013). The impact depends on the nature of the risk factors that individuals are exposed to, their level of exposure to these risk factors, their perceptions of resilience-promoting/protective resources that are accessible or available, and the opportunities to fully use these resources (Ungar et al., 2013). These aspects shape how proximal processes influence individuals' development and resilience (Ungar et al., 2013). This principle takes into account instances where resources may not exert much of an impact at a population level, but have a great impact on socially-excluded groups of individuals (Ungar et al., 2013). This principle also encompasses the use of non-normative resources in order to overcome, or excel, despite adverse circumstances (Ungar, 2011; Ungar et al., 2013). This principle also indicates why certain resources may have an impact on individuals exposed to high, but not low, adversity and vice versa (Ungar et al., 2013). The principle of cultural moderation refers to the fact that culture and context influence how individuals navigate to, and negotiate for, resilience-promoting and protective factors (Ungar et al., 2013). This principle indicates that while there are common factors that promote or protect resilience across contexts, cultural and contextual

demands shape what is considered as adaptive to adversity (Ungar et al., 2013). These demands determine what resources are considered valuable, and subsequently are made available to individuals (Ungar, 2012b). Hence although certain factors may promote resilience universally, what promotes resilience is relative to, or is negotiable across, different cultures (Ungar, 2011).

Although the socio-ecological model resilience is still in its developmental stages, it appears to be supported by empirical evidence (see Ungar, 2011; Ungar et al., 2013 for reviews). This is not to say the model may be without criticism. This is because ecological models have been critiqued as lacking sufficient systematic empirical support (Darling, 2007; Williams, 2010). These models have also been criticised as being too complex and difficult to implement in practice; such as in research, policy, and intervention development (Hook, 2009; Ungar, 2002; Williams, 2010). However, using such a model in relation to resilience ensures that the role of the environment in resilience is not de-emphasised, and that individuals are not blamed for their lack of resilience; these are concerns regarding earlier conceptualizations of resilience (Ungar, 2012b). Furthermore, using this theory in research, such as the current study, may serve to further provide evidence for this model.

Despite the above concerns, the socio-ecological model of resilience provides an empirically-supported understanding of how, through an individual's reciprocal interactions with the ecological environment, individual, relational and contextual factors work together to promote their resilience (Ungar, 2011). It is therefore a valuable model to include in this investigation of the relationship between WM and resilience.

The Relationship between Executive Functioning and Resilience: Theoretical and Empirical Evidence

Executive functioning is a microsystemic, individual resource that may contribute to promoting resilience (Masten & Wright, 2010). For example, EF may help individuals solve problems arising from adversity. This is because EF enables individuals to assess incoming information, and to flexibly consider varying courses of action that can be taken to solve these problems. Executive functioning may also enable individuals to engage in better decision-making when facing adversity. As EF is also implicated in emotion regulation, it can also help individuals better control their emotional responses to adversity (Masten & Wright, 2010). While not explicitly stated by Masten and Wright (2010), it appears that these abilities involve the primary EF components of inhibition, shifting and WM discussed previously.

Thus, in theory, EF is likely to promote resilience. However, detailed empirical evidence is needed to confirm this.

Drawing from research showing that intelligence promotes resilience, reviews of resilience research conducted in Eurocentric contexts have inferred that EF promotes resilience (Masten, 2001; Masten & Wright, 2010). These reviews have in turn been cited in international and local contexts as evidence for the positive relationship between EF and resilience (see Masten, 2014a; Masten & Obradović, 2006; Theron & Donald, 2013). This is concerning as intelligence and EF, while related, are different constructs (Duggan & Garcia-Barrera; 2014). Along the same lines, research demonstrating that self-regulation promotes resilience has also been used to infer that EF promotes resilience (Masten, Herbers, Cutuli, & Lafavor, 2008; Masten & Obradović, 2006; Masten & Wright, 2010). This inference is also problematic for a couple of reasons. Firstly, the review by Masten et al. (2008) does not provide any references for their claim that self-regulation promotes resilience; this seems to have been inferred from other research. Secondly, what is concerning regarding the above inference is that while self-regulation forms part of EF, EF is more than self-regulation (Hofmann et al., 2012; Zelazo & Cunningham, 2007). As demonstrated, the suggestion that EF promotes resilience is based on problematic inferences. Consequently, research that has directly investigated the relationship between EF and resilience requires evaluation before any conclusion regarding this relationship can be reached.

Some evidence for the relationship between EF and resilience is derived from neuroscientific research conducted with both humans and animals (Karatsoreos & McEwen, 2013; Maier & Watkins, 2010; Ozbay, Fitterling, Charney, & Southwick, 2008). A review of research regarding the role of the medial prefrontal cortex (a brain region associated with EF) in resilience appears to provide such evidence (Maier & Watkins, 2010). This review suggested that the functioning and plasticity of the ventral medial prefrontal cortex appears to enable organisms to have a sense of behavioural control over an adverse, stressful event (Maier & Watkins, 2010). This then influences how an organism responds to that stressor, and future adverse events, such that they display reduced behavioural and neural responses to subsequent stressors (Maier & Watkins, 2010). They may also respond to stressors that are often responded to as uncontrollable, as controllable (Maier & Watkins, 2010). This review may not be applicable to humans though, as most of the studies reviewed used animal samples. However, research has been conducted with human samples and yielded similar findings (Maier & Watkins, 2010), and there are studies conducted with humans that

implicate the entire prefrontal cortex (PFC; the brain region primarily associated with EF) in promoting resilience (Karatoreos & McEwen, 2013). For example, a review of neurobiological and physiological factors implicated in resilience of humans and animals has indicated that biological and early environmental experiences interact to impact on the way that individuals respond to adversity in adulthood (Karatoreos & McEwen, 2013). This alters the structure and function of brain regions associated with cognition and emotion, such as the PFC, resulting in altered responses to perceived adversity that in turn may alter these brain regions (Karatoreos & McEwen, 2013). While this suggests that the inefficient functioning of the PFC and other relevant brain regions may increase organisms' vulnerability to adversity, efficient functioning of these pathways may increase resilience (Karatoreos & McEwen, 2013). This review thus also suggests that the PFC, and by implication EF, are positively related to resilience. Supporting this, another review of research regarding genetic and neurobiological factors implicated in the resilience of animals, and human adults and children, found that the PFC circuits may play a key role in promoting resilience (Ozbay et al., 2008). The review also indicated that increased PFC functioning can increase hormonal responses to stress, that enhance resilience-related behaviour (Ozaby et al., 2008). This review thus also suggests that efficient EF is positively related to resilience. The above reviews thus seem to indicate that the structure and functioning of the PFC, and its main cognitive by-product EF, are positively related to resilience (Karatsoreos & McEwen, 2013; Maier & Watkins, 2010; Ozbay et al., 2008).

Psychological research also provides some evidence for the relationship between EF and resilience. For instance, there is direct evidence for the relationship between self-regulation (a component of EF) and resilience (Buckner, Mezzacappa, & Beardslee, 2003; 2009; Rutter, 2013). Buckner et al. (2003) found that high self-regulation (measured using an adapted, rating measure) differentiated between resilient and non-resilient children from low socioeconomic status (SES) backgrounds, and was positively related to resilience (measured using mental health measurements). A more recent study conducted by Buckner et al. (2009), indicated that among youths from low SES backgrounds, higher self-regulatory ability (operationalised using the measure used by Buckner et al., 2003) was linked to better outcomes in areas of adaptive functioning such as social competence, academic performance and mental health (Buckner et al., 2009). Self-regulation has also been identified in reviews of resilience literature as assisting at-risk individuals to adapt to stress and adversity (Masten, 2014a; Rutter, 2013). Reviews of resilience literature provide further empirical support for

the relationship between EF and resilience (see Bonanno, Romero & Klein, 2015; Feder, Nestler, & Charney, 2009; Rutter, 2013; Wu et al., 2013). These reviews have indicated that cognitive flexibility, planning and emotion-regulation strategies (all elements of EF) have each been found to be positively associated with resilience (see Bonanno et al., 2015; Feder et al., 2009; Rutter, 2013; Wu et al., 2013). However, most of these reviews cited only a few studies that supported the relationship between resilience and these EF elements (see Feder et al., 2009; Rutter, 2013; Wu et al., 2013). There is nevertheless some evidence that EF broadly, is positively linked to resilience in children (see Masten et al., 2012; Obradović, 2010; 2016). Masten et al. (2012) examined how homeless children's EF skills (namely inhibition, shifting and delaying gratification, which were measured using a battery of six tests) were related to their resilience (measured using various school adjustment criteria). Children with better EF skills were found to score higher on these criteria (Masten et al., 2012). Similarly, Obradović (2010) studied the relationship between effortful control (measured using four EF tasks) and resilience in homeless children. Resilience was conceptualised as adaptive functioning and operationalised using cut-off scores on a number of academic functioning and psychopathology measures (Obradović, 2010). Effortful control was found to positively predict resilience (Obradović; 2010). Executive functioning is also positively implicated in the resilience of children (Obradović; 2016). The above research thus suggests that EF and resilience are positively related.

The research and reviews cited above focused primarily on children and adolescents (see Buckner et al., 2003; 2009; Bonanno et al., 2015; Feder et al., 2009; Karatoreos & McEwen, 2013; Masten et al., 2012; Obradović, 2010; 2016; Rutter, 2013; Wu et al., 2013). This is a general trend in resilience research that is of concern, as EF skills change over the lifespan, with the most marked changes occurring in childhood and adolescence (Masten & Wright, 2010). Another reason why the paucity of research in early adulthood and beyond is concerning is because there is strong empirical evidence to suggest that, although children exposed to adversity may not display resilience during their childhood, they may display resilience as adults (Rutter, 2013). Another concern is that in a number of the studies and reviews cited above, validated objective resilience measures were not used. For instance, resilience tended to be operationalised in terms of clinical levels of psychopathology and other achievement outcomes, such as school completion (for examples, see Buckner et al., 2003; 2009; Masten et al., 2012; Masten & Wright, 2010; Obradović, 2010; Rutter, 2013). This is also a common problem throughout resilience research (van Rensburg, Theron, &

Rothmann, 2015). An additional limitation that is evident from the literature reviewed above, is that very few studies have investigated how specific components of EF related to resilience (see Feder et al., 2009; Rutter, 2013; Wu et al., 2013 for examples). These limitations suggest that more supportive research regarding the positive relationship between EF and resilience is needed.

Complicating the matter is the presence of research that suggests that EF is negatively related to resilience (Hackman, Farah, & Meaney, 2010; Sameroff & Rosenblum, 2006). For instance, while longitudinal research has shown that emotional self-regulation (operationalised using mental health measures) and cognitive self-regulation (operationalised using intelligence quotient measures) contribute to later competence among children exposed to adverse socio-environmental circumstances, this was not seen in instances where high socio-environmental risks were present (Sameroff & Rosenblum, 2006). While this suggests that EF would be negatively related to resilience, as EF is more than self-regulation (Hofmann et al., 2012; Zelazo & Cunningham, 2007), perhaps the nature of the relationship between resilience and EF differs according to different EF components. However, there is further evidence that high EF may be negatively related to resilience (see Hackman et al., 2010). A review of the impact of SES on brain functioning indicated that children exposed to adversity (in the form of low SES) tend to have lower EF ability (Hackman et al., 2010). As adversity may thus negatively impact EF, such research suggests EF may be negatively related to resilience. However, the direction of the relationship between EF and resilience is unclear.

There is research that suggests that EF and resilience are unrelated (DuMont, Widom, & Czaja, 2007; Noltemeyer & Bush, 2013). Noltemeyer and Bush (2013) pointed out that the evidence regarding the relationship between cognitive ability and resilience is inconsistent, with most evidence indicating there is no relationship between these constructs. In line with this, DuMont et al.'s (2007) research on adults who were abused as children found that resilience (measured on several academic, behavioural and psychopathological domains) and cognitive functioning (measured using the Wide Range Achievement Test) were not significantly related. The above review and study did however fail to directly measure EF (see DuMont et al., 2007; Noltemeyer & Bush, 2013), and as such do not provide conclusive evidence for EF and resilience being unrelated.

This section of the review thus indicated that efficient EF is recognised in theory as a resilience-promoting resource, but the empirical evidence to support this is lacking and the nature of the relationship between the two constructs is equivocal. In particular, there seems to be a dearth of research into the relationship between resilience and specific components of EF, especially among adults, which warrants further investigation.

The Relationship between Working Memory and Resilience: Theoretical and Empirical Evidence

A specific EF component that may relate to resilience is WM; specifically the WM processes outlined by Baddeley (2000). For instance, individuals with efficient WM systems may be better able to generate and evaluate multiple novel solutions to adverse circumstances, thereby ameliorating adversity-related stress (Evans, Kouros, Samanez-Larkin, & Garber, 2016; Williams et al., 2009). Another way in which WM may facilitate resilience may be through verbal mediation, or self-talk (Wekerle, Waechter, & Chung, 2012); that is, the overt or covert speech addressed to oneself for the purposes of self-regulation (Hardy, 2006; Vygotsky, 1986). Self-talk can be used to reduce the impact of a visual memory of an adverse situation, thereby promoting resilience (Wekerle et al., 2012). Such self-talk requires individuals to simultaneously work with and organise numerous pieces of both verbal and nonverbal/visual information, drawing on several WM systems (Wekerle et al., 2012). Working memory and resilience may also be related through the process of updating (assimilation and maintenance of new and relevant information to replace old/irrelevant information [Morris & Jones, 1990]), which can be used by individuals to adapt to adversity (Levens, Armstrong, Orejuela-Dávila, & Alverio, 2016). Specifically, updating may allow individuals to fluidly update the emotional information associated with an adverse situation in WM, and thus enable them to better meet the psychological demands of that situation (Levens et al., 2016).

This theoretical link between WM and resilience is supported by some empirical evidence. A review of the relationship between WM and cognitive appraisal in children with acute lymphocytic leukaemia indicated that cognitive reappraisal of stressful events requires efficient WM functioning (Compas, Campbell, Robinson, & Rodriguez; 2009). As cognitive reappraisal has been positively linked to resilience (Feder et al., 2009), the conclusions reached by Compas et al. (2009) suggest that WM would also be positively linked to resilience. As emotion regulation has been found to be positively associated with resilience (Wu et al., 2013), research that has examined whether individual's updating ability played a

role in their efficacy of emotion regulation (Pe, Raes, & Kuppens; 2013) may also serve as evidence for the relationship between WM and resilience. Pe et al. (2013) examined whether the efficacy of specific aspects of emotion regulation (namely use of reappraisal and rumination) differed according to individuals' WM in the form of their updating ability (measured using an emotional n-back task). Reappraisal-use was found to be linked to decreased levels of negative emotional arousal for individuals with high updating ability (individuals who scored one standard above the mean), but was not significantly related to negative emotional arousal for those individuals with low updating ability (individuals who scored one standard deviation below the mean). For individuals with both high and low updating ability, rumination-use was found to be positively related to negative emotional arousal. However, rumination-use was associated with less negative emotional arousal for individuals with high WM in the form of updating ability, compared to those with low updating ability (Pe et al., 2013). Given that emotion regulation has been linked to resilience (Wu et al., 2013), the study by Pe et al. (2013) suggests that WM would also be positively related to resilience. This is supported by Levens et al. (2016) who found that university students (*n*=69) who experienced distant adversity (measured using the Trauma History Questionnaire) performed significantly better on a WM task (measured using an emotional n-back task) compared to those who experienced no adversity (*n*= 74). However, task performance was impaired amongst individuals who had recently experienced adversity (*n*=25; Levens et al., 2016). This suggests that the passing of time may allow individuals to learn from the adverse situations that they experienced and become more adapt in updating and evaluating emotional information related to an adverse situation (Levens et al., 2016). Consequently they may be better able to adaptively respond to the situation (Levens et al., 2016). While the study by Levens et al. (2016) did not directly investigate whether WM was related to resilience, it does suggest that these constructs may be positively related, particularly since updating is a function of WM. However, direct investigation of this proposal is needed.

Studies which have shown that WM is related to, and predicts, coping ability also seem to suggest that WM may facilitate resilience (see Andreotti et al., 2013; Evans et al., 2016). This is because coping involves an individual's efforts to alter or adapt to stressful circumstances by engaging in problem-solving, and regulating attention, cognition and emotion (Andreotti et al., 2013; Evans et al., 2016). Evans et al. (2016) investigated whether WM was related to primary control coping (an individual's efforts to alter stressful

circumstances, or their emotional reactions to it, such as through emotion regulation or problem solving) and secondary control coping (attempts to adapt to stressful circumstances by controlling attention and cognition through strategies such as positive thinking and cognitive restructuring) in 192 children. Working memory was measured using the forward and backward digit span tasks of the Wechsler Intelligence Scale for Children–Fourth Edition (Wechsler, 2003.). Coping was measured using two subscales from the Responses to Stress Questionnaire (Connor-Smith, Compas, Wadsworth, Thomsen, & Saltzman, 2000), one measuring primary control coping and the other measuring secondary control coping. The authors found that WM significantly and positively correlated with both primary and secondary control coping. They also found that, four months later, higher WM significantly predicted both types of coping (Evans et al., 2016).

Similarly, Andreotti et al. (2013) investigated whether WM was associated with the use of secondary control coping (measured using the Responses to Stress Questionnaire;) amongst undergraduate university students (*N*=124). Working memory was measured using The Digit Span and Arithmetic subtests of the Wechsler Adult Intelligence Scale-Fourth Edition (Wechsler, 2008), and The Behavior Rating Inventory of Executive Function-Adult Version (Gioia, Isquith, Guy, & Kenworthy, 2000). The scores from these measures were standardised and used to obtain a composite measure of WM. Working memory was found to be significantly and positively, but moderately, correlated with secondary control coping. Working memory was also found to be significantly and negatively associated with negative affect, depressive and anxiety symptoms (Andreotti et al., 2013). Whilst the results from the studies by Andreotti et al. (2013) and Evans et al. (2016) suggest that WM is positively related to, and may promote, resilience; using these results to infer this relationship is problematic because coping and resilience are different constructs (Rutter, 2012; Theron, 2011). Unlike resilience, coping does not necessarily occur in the context of significant adversity (Theron, 2011), and is an individualistic, as opposed to systemic, construct (Rutter, 2012). This indicates that in order to determine whether WM and resilience are related, research that directly investigates the relationship between these constructs requires evaluation.

Only one study appears to have directly investigated the relationship between WM and resilience (Wingo et al., 2010). It investigated the neurocognitive functioning of highly traumatized African-American adults (*N*=226) from disadvantaged backgrounds. Nonverbal WM was found to be significantly higher among resilient adults, while verbal WM was

similar across resilient and non-resilient adults. However, this study has several limitations. Firstly, it did not use a validated resilience-measure; instead resilience was narrowly measured in terms of the level of current depressive or PTSD symptoms after exposure to at least one previous traumatic event. Secondly, WM was measured using the Reynolds Intellectual Assessment Scales which contains only one measure of verbal WM, and one measure of nonverbal WM. This provided a very limited measure of WM and does not allow for construct validity to be examined. Furthermore, no theoretical framework of WM was provided (Wingo et al., 2010). The limitations of this study and paucity of research in this area indicate that further research regarding the relationship between WM and resilience is required.

In contrast to the theoretical and empirical literature reviewed above which suggests that WM is positively related to resilience, there is a body of literature that suggests WM may not be a resilience-promoting resource. In terms of theoretical evidence, WM has been argued to be negatively associated with resilience as it is a stable cognitive function; that is, a cognitive function that facilitates "the maintenance of current actions through focused and sustained attention" (Melor, & Anderson, 2016, p.219). This stability may hinder an individual's spread of attention, consequently hindering the pool of information and strategies the individual can access and use to adaptively respond to adversity (Melor & Anderson, 2016). However, it should be noted this proposition fails to take into account the manipulative function of WM that may assist in promoting resilience, as was previously discussed. Nevertheless, this theoretical proposition seems to be supported by international research which indicates that adversity-related stress may negatively affect WM capacity (Quidé et al., 2016; Reuben et al., 2016; Schweizer & Dalgleish, 2016). For instance, Quidé et al. (2016) found that WM performance (measured using an n-back task) was negatively associated with trauma severity (measured using the Childhood Trauma Questionnaire) amongst childhood trauma exposed adults. Childhood trauma exposure was also found to be linked to abnormal functioning of the parietal regions of the brain that are associated with visuospatial WM performance (Quidé et al., 2016). Greater childhood adversity exposure (measured using retrospective and prospective self-report measures of adverse childhood experiences) has also been found to be associated with poorer WM performance which was measured using the Working Memory Index of the Wechsler Adult Intelligence Scale–IV (Reuben et al., 2016). Another study also found that WM capacity (measured using a novel complex span task) was reduced upon exposure to emotionally-negative distractor images

amongst university students, community members and life-threatening/fatal motor vehicle accident survivors (Schweizer & Dalgleish, 2016). These findings suggested that WM capacity is impaired upon exposure to a highly emotional negative environment (Schweizer & Dalgleish, 2016). Reviews of the effect of adversity on WM capacity provide further support that WM is not a resilience-promoting resource (see Hackman et al., 2010; Shonkoff et al., 2012). For example, the review by Hackman et al. (2010) indicated that there is a strong evidence base that supports there being SES disparities in WM, such that those from lower SES backgrounds tend to have lower WM ability (Hackman et al., 2010). The review by Shonkoff et al. (2012) indicates that exposure to adversity can result in changes in neuronal and brain structures, including those linked to WM; this can lead to extreme reactivity to even mildly stressful events and may thus be negatively related to resilience. This is particularly relevant to the current study as participants were from disadvantaged backgrounds. These studies thus suggest that WM may not promote resilience. However, this is merely suggestive as none of the studies directly examined the relationship between WM and resilience.

Thus, this discussion indicates that there is some limited evidence that supports WM components as promoting resilience. Although there seems to be more support for a positive relationship between WM and resilience, this finding is equivocal with some literature suggesting there may be a negative or non-existent relationship between these constructs. In addition, most studies only provide indirect evidence for these relationships. There is thus a need to examine whether the various components of WM are related to resilience.

Executive functioning, Working Memory and Resilience: The South African Context

Research regarding the relationship between WM and resilience is necessary in South Africa, given the high levels of adversity, poverty and stress that face the population, particularly Black South Africans (Du Preez, 2013). Existing research in this area has focused on children and adolescents. For example, research that qualitatively investigated South African street youths' resilience found that participants' self-regulatory skills helped promote their resilience (Malindi & Theron, 2010b). Other qualitative research has studied South African adult advisory panel members' conceptualizations of resilience of Basotho youths living in an impoverished, rural community (Theron, Theron, & Malindi, 2013). Advisory panel members are people who hold vast knowledge regarding youth of a community, and assist in researching the resilience of these youth (Theron et al., 2013). It was found that

youths who demonstrated agency and flexibility in finding solutions to their adverse circumstances, were observed to be resilient (Theron et al., 2013). Furthermore, a review of South African resilience research has indicated that a number of studies have shown problem-solving to be a key resilience-promoting resource in South Africa (see Theron & Theron, 2010). A review of research, published between 2000 and 2015, on young Black South African's resilience processes also highlighted flexibility and problem-solving ability as promoting resilience amongst this group (see Theron, 2016a). Whilst this literature suggests that EF skills can promote resilience in Black South African young adults, none appear to have directly examined how the components of WM relate to resilience. In addition, none of the abovementioned studies appear to have used standardised, objective tests to measure these EFs (see Malindi & Theron, 2010b; Theron et al., 2013; Theron & Theron, 2010). Some studies also failed to theoretically conceptualise resilience (see Theron & Theron, 2010). This is of concern as research conducted in Western contexts has been used to identify 'universal' resilience-promoting resources like EF (Masten & Wright, 2010; Theron, 2015). However, these seemingly universal resilience-promoting resources may present differently in different contexts and cultures (Theron, 2015; Ungar, 2012a).

This discussion indicates why research investigating the relationship between EF components, like WM, and resilience is needed in South Africa's multicultural context. As previously discussed, such research is especially needed among Black South African young adults from disadvantaged backgrounds. Hence, this study set out to investigate whether the quantitatively measurable components of WM are related to resilience among this group.

While the relationship between WM and resilience requires quantitative investigation, this method of investigation on its own may only provide a limited understanding of this relationship. These measures will not take into account how WM, as a possible resilience-promoting resource, operates through interactions with the socio-ecological environment (Ungar, 2011). This is a limitation as all resilience-promoting resources require socio-ecological collaboration (Theron, 2015). For instance, in order for youth to be able to engage in problem-solving, it is necessary for the socio-ecological environment to provide them with access to information and quality education (Theron, 2015), and to help develop these skills through encouragement and role modelling (Malindi & Theron, 2010a). Consequently, qualitative investigation may indicate how universal resilience-promoting resources like EF are shaped by cultural and contextual factors (Theron & Donald, 2013). For example, family support has been shown to influence Black South African university students' cognitive

appraisal of adverse situations, thereby affecting their meaning making and in turn, their resilience (Theron & Theron, 2014). Cultural values and life lessons learnt from important others have also been shown to guide self-regulatory behaviour and thereby promoted resilience in a Black South African university student (Theron, 2013). Furthermore, while qualitative research has shown that Black South African youths' resilience involves skills related to WM or EF, these skills manifest in ways specific to the sociocultural contexts of these youth (Malindi & Theron, 2010b; Theron et al., 2013). For example, in Theron et al.'s (2013) study, youths' ability to solve problems was observed to be dependent on the support they received from their social systems. Furthermore, these youths' flexibility was described as being influenced by their willingness to change their own expectations to be in line with that of the community. In Malindi and Theron's (2010b) study, youths' self-regulatory behaviour was carried out with reference to respecting their community's values, even when their individual values differed.

The socio-cultural context may also influence the extent to which youth rely on certain resources to become resilient, as can be seen in the qualitative study conducted by Ungar et al. (2015) on coping patterns, social support engagement, and formal services usage across a sample of resilient youth from five countries. The study found that, due to unreliable interpersonal and environmental resources (such as lack of support from close others, or abuse from social services), South African youth indicate that they rely less on these resources, and more on individual cognitive and behavioural strategies (such as self-efficacy and religious faith) to adapt to adversity (Ungar et al., 2015). These studies thus suggest that only using a quantitative method to investigate the relationship between WM and resilience among Black South African young adults is limiting, as this would fail to consider the role of socio-cultural factors.

Only using a quantitative method to investigate the relationship between WM and resilience may also be limiting from an ethical point of view (Theron, 2012). Such an investigation would fail to take into account how contextual factors promote resilience, which may result in the blaming of young people for not adapting to adversity (Theron, 2012). The role of these factors in promoting resilience, particularly through interactions with the socio-ecological environment, are typically explained more thoroughly through qualitative methodologies (see Ungar, 2003). It is thus necessary to also adopt a qualitative approach to investigate the relationship between WM and resilience.

This section of the review indicated that resilience in South Africa is transactional in nature, where culture and context may shape whether, and how, cognitive processes promote resilience (Theron & Donald, 2013). It is ethical to also take such contextual factors into account when investigating how these cognitive processes are related to resilience (Theron, 2012). As such, this study also set out to qualitatively investigate how WM processes feature in Black South African young adults' accounts of their resilience, and how this is influenced by sociocultural factors.

Conclusion

Based on the theoretical and empirical literature reviewed in this chapter, this research hypothesised that WM would play a positive role in resilience, and set out to quantitatively and qualitatively investigate the relationship between these constructs. In doing so, information on both generalizable and local processes which underlie the resilience of Black South African young adults from disadvantaged backgrounds, may be obtained. Such information may help to develop a socio-ecological understanding of these adults' resilience, and may also contribute to developing contextually-relevant resilience-promoting interventions for these adults (Ungar, 2012b). The specific research questions developed from the literature reviewed, and the methodology used to answer these questions, are presented in the next chapter.

Chapter Three: Methodology

The methods used in this study are described in this chapter. The chapter begins with an outline of the study's research questions. The philosophical assumptions and related research design used are then described. This is followed by a description of the sample and sampling strategy, instruments used to collect the data, procedure in which research was carried out, ethical considerations taken into account, and the data analytic strategies used. A brief discussion of how self-reflexivity was used in the research process concludes this chapter.

Research Questions

- Overarching Research Question

What is the role of WM in the resilience of Black South African young adults?

- Quantitative Phase

a. Are the components of WM, as conceptualised by Baddeley (2000), related to resilience for Black South African young adults?

- Qualitative Phase

b. How do WM processes, as conceptualised by Baddeley (2000), feature in Black South African young adults' accounts of their resilience?

c. How do socio-cultural factors feature in these accounts?

Research Design

A pragmatic paradigm grounded this research study. Such a paradigm indicates that the researcher's primary focus is on answering the research questions in the most practical manner possible, using multiple research methods if necessary. Thus, whatever methods work best, in practice, are used to answer the research questions (Creswell & Plano Clark, 2011). Ontologically, participants' reality is seen as not only being objectively measurable, but also that participants hold subjective views of this reality (Creswell & Plano Clark, 2011). Epistemologically, the researcher was thus intersubjective; which means she adopted both an objective and subjective approach to the research process (Morgan, 2007). The relationship between WM and resilience was thus seen as being objectively measurable through psychometric instruments, while it was also understood that this relationship may present in

different ways in terms of participants' subjective accounts of their experiences of resilience. Consequently, this study adopted a mixed methods design, using both quantitative and qualitative methods (Creswell, 2003).

The mixed method design used was a concurrent triangulation design, otherwise known as a convergent design (Creswell, 2003; Creswell & Plano Clark, 2011). This design was chosen based on the philosophical grounding of this study and the following three decisions that need to be considered when conducting a mixed methods study: 1) the sequence in which quantitative and qualitative data collection will occur; 2) the priority accorded to both the quantitative and qualitative phases; 3) and the stage at which integration of data and findings from the quantitative and qualitative phases will occur. As with all mixed method designs, this study comprised of two phases; a quantitative phase and a qualitative phase (Creswell & Plano Clark, 2011). The concurrent triangulation design is characterised by conducting both phases at the same time in one study while giving both phases equal priority, and is underpinned by the pragmatic paradigm. Following a pragmatic paradigm, this enables efficient use of limited time constraints (Creswell & Plano Clark, 2011).

This design involved a number of primary steps. The first involved collecting quantitative and qualitative data. It should be noted that although data collection of the two phases occurred simultaneously, they were distinct in that one phase did not depend on the results from the other. The second step of the design involved data analysis, where data from both phases were analysed separately. The third step occurred once the results were obtained for each phase and involved the results from each phase being directly compared and integrated in the discussion. The fourth step involved interpreting whether, and to what extent, the two sets of results related to each other, and integrated to provide an in-depth understanding of the phenomena under investigation (Creswell & Plano Clark, 2011).

In addition, the parallel-databases variant of the convergent design was used. This means that the quantitative and qualitative phases were conducted separately and were only compared and synthesised in the discussion. Conclusions and inferences were made on the basis of this synthesis and comparison. This variant of the design was used as the researcher initially attempted to examine different aspects of the relationship between WM and resilience, focusing separately on the quantitative and qualitative research questions. (Creswell & Plano Clark, 2011). A diagram of the design can be seen below in Figure 3, where QUAN= quantitative phase prioritised, and QUAL= qualitative phase prioritised.

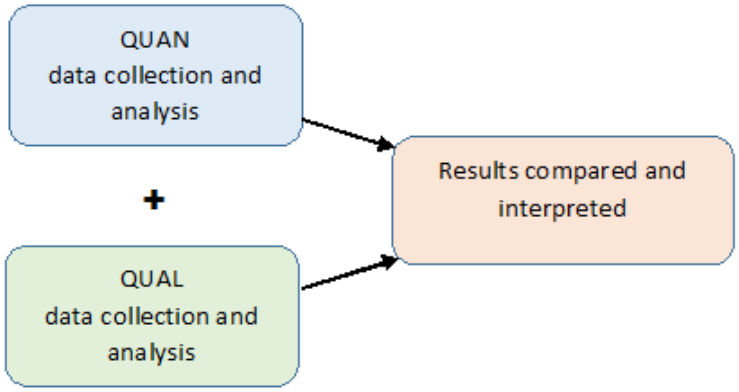


Figure 3: Concurrent triangulation design. Adapted from "Mixed Methods Research Designs in Counseling Psychology" by W.E., Hanson, J.C., Creswell, V.L., Plano Clark; K., S., Petska, and J.D., Creswell, 2005, *Journal of Counseling Psychology*, *52*, p. 228.

In addition to the reasons discussed above, a convergent design was used for the purposes it serves: to validate findings in a single study, to explain quantitative findings together with qualitative findings, and to develop a more holistic understanding of the phenomena under investigation (Creswell, 2003; Creswell & Plano Clark, 2011).

In quantitative research, the focus is to generally explain and predict human behaviour by quantifying variables and using statistical analyses (Babbie & Mouton, 2001; Creswell, 2003). In the quantitative strand of the current study, the researcher thus used a correlational design as the research question aimed to investigate whether WM is related to resilience (Stangor, 2014).

On the other hand, in qualitative research, the focus is to describe and understand human behaviour in rich detail by using open-ended questions to attempt to collect accounts of the meanings of individuals' experiences (Babbie & Mouton, 2001; Creswell, 2003). In the qualitative strand of this study, an interpretive design was used in that the researcher interacted with participants who were Black South African young adults from low SES backgrounds, in order to focus on their subjective viewpoints regarding the role of WM in resilience.

Sample and Sampling Strategy

The sample was obtained by following up a sample (N=107) from a pre-existing study, which comprised of young adults from disadvantaged backgrounds (low SES as indicated by a Living Standards Measure) who were then enrolled at university (Cockcroft,

Alloway, Copello, & Milligan, 2015). This was an appropriate sample for researching resilience as these individuals had already demonstrated adaptation/positive outcomes (i.e. admission into university) in the presence of adversity (i.e. low SES; Theron, 2011). Furthermore, it was appropriate to sample individuals who have some level of tertiary education as they were likely to be test-wise, computer literate and proficient in English, thus reducing bias with respect to these aspects (Laher & Botha, 2012; Tredoux, 2013).

As the sample was recruited from a pre-existing study, nonprobability, convenience, volunteer samples (Laher & Botha, 2012) were obtained for both the quantitative and the qualitative phases. The total sample size for the quantitative phase was 38 and comprised of 21 females and 17 males (*M* age=24.52 years, *SD*=1.65 years). The response rate was thus 36%. While this is lower than the standard survey response rate of 50% (see Gordon, 2016), this is in line with the expected response rate for online surveys (see Ornstein, 2013 for a brief literature overview). Although paper-based questionnaires were also used, most potential participants indicated that they were unable to meet with the researcher in person to complete the questionnaires. This may have contributed to the low response rate. The total sample size for the qualitative phase was 14, and comprised of an even number of males and females (*M* age= 23.93 years, *SD*= 1.29 years). It should be noted that the researcher attempted to sample participants for this phase until sample saturation (sampling occurred until no new data was obtained) was reached (Laher & Botha, 2012). This attempt was however limited by time constraints and volunteer-rates. The young adults who participated in the current study can also be referred to as youth, as this refers to individuals between the ages of 15 to 34 years (Statistics South Africa, 2016).

Although the quantitative and qualitative samples are described separately, they are nested as the sample used in the qualitative phase was a subset of the sample used in the quantitative phase (Onwuegbuzie & Collins, 2007). For both samples, participants spoke an average of three to four languages. No participants spoke English as a home language. Table 1 provides a detailed breakdown of the home languages spoken by participants in each sample. The most common language spoken by the quantitative sample was Sepedi. The most common languages spoken by the qualitative sample were IsiZulu and Tshivenda.

Table 1. *Home Language by Study Phase*

	Quantitative phase (*N*=38)	Qualitative phase (*N*=14)
	n (%)	*n (%)*
Home language		

IsiXhosa	1 (2.6)	
IsiZulu	9 (23.7)	4 (28.6)
Sepedi	11 (28.9)	3 (21.4)
Sesotho	1 (2.6)	1 (7.1)
Setswana	2 (5.3)	
SiSwati	2 (5.3)	2 (14.3)
Tshivenda	8 (21.1)	4 (28.6)
Xitsonga	4 (10.5)	

The university educational indices of each sample can be seen in Table 2; this comprises of faculty of registration and number of degrees completed. In both samples, most participants were currently/previously registered with the Faculty of Engineering, and most had not yet completed a degree. For the quantitative phase, 12 participants had completed their studies and were working (5 had completed postgraduate degrees, 7 had completed undergraduate degrees), 23 participants were still studying (12 were completing their undergraduate studies, 11 were completing their postgraduate studies), 2 participants indicated that they were not studying and had not completed any degree despite having entered university, and 1 participant did not answer this question. For the qualitative phase, 2 participants had completed their studies and were working (1 participant had completed an undergraduate degree and the other had completed a postgraduate degree), 11 participants were still studying (7 were completing their undergraduate studies, 4 were completing their postgraduate studies), and 1 participant indicated that (after having spent two years at university) they were no longer studying.

Table 2. *University Educational Indices by Study Phase*

	Quantitative Phase (*N*=38)	Qualitative Phase (*N*=14)
	n (%)	*n (%)*
Faculty		
Commerce	9 (23.7)	1 (7.1)
Engineering	19 (50)	9 (64.3)
Business	1 (2.6)	1 (7.1)
Humanities	6 (15.8)	2 (14.3)
Science	2 (5.3)	1 (7.1)
Health Sciences	1 (2.6)	
Previous Degree		
None	23 (60.5)	10 (71.4)
1	13 (34.2)	3 (21.4)
2	2 (5.3)	1 (7.1)

There are some concerns regarding the sample and sampling method used. Firstly, the unequal sample sizes between the quantitative (*N*=38) and qualitative (*N*=14) phases may be seen as problematic (Creswell & Plano Clark, 2011). This is because the conclusions drawn from synthesising and comparing findings across the quantitative and qualitative phases when using a convergent design may be more valid when the sample sizes used in both phases are equal (Creswell & Plano Clark, 2011). However, as the aim of qualitative research is to obtain in-depth information regarding the phenomenon under investigation in a rigorous manner, it is often the case that a smaller subset of the larger group is sampled for in-depth interviews (Creswell & Plano Clark, 2011). Secondly, both the sample and sampling method limit the generalizability of the results as a random sample was not obtained, and a very specific group of individuals were sampled. Despite this concern, this sample was used because, as discussed in the introduction, it is an important one to research with respect to resilience.

Instruments

This section of the chapter outlines the instruments used in both the quantitative and qualitative phases of the study. The first three instruments that are outlined were used in the quantitative phase. The last instrument that is outlined was used in the qualitative phase.

Biographical questionnaire. A biographical questionnaire (see Appendix A) was administered to obtain information regarding participants' demographic and other relevant background information (such as gender, date of birth, home language, faculty of registration and number of degrees completed). These variables were measured for descriptive purposes, and to aid in evaluating the ecological validity of the study. Please note that because this study is part of a larger research project, several of the questions on the questionnaire were not relevant to this study.

The Automated Working Memory Assessment (AWMA; Alloway, 2007). Participants' WM was previously assessed by Cockcroft et al. (2015) with the Automated Working Memory Assessment (AWMA), a computerised assessment of short-term memory (STM) and WM. The AWMA is based on Baddeley's (2000) multicomponent model of WM, and assesses both verbal and nonverbal/visuospatial components of STM and WM, making this instrument an appropriate measure of WM for the current study. Participants were assessed with the long form of the AWMA, which comprises of 12 subtests. Each memory

component (i.e. verbal STM, verbal WM, visuospatial STM and visuospatial WM) is assessed using three subtests (Alloway, 2007).

Verbal STM was assessed using the following tasks: Digit Recall, Word Recall and Non-Word Recall. These tasks involve participants hearing a series of digits, words and non-words respectively, and recalling them in the order presented (Alloway, 2007).

Verbal WM was assessed using the following tasks: Listening Recall, Counting Recall and Backward Digit Recall. Listening Recall requires participants to evaluate the veracity of sentences presented to them, and to then sequentially recall the last word in each sentence. Counting Recall involves participants being presented with a series of visual presentations, each containing red circles and blue triangles. Participants have to count the number of red circles and, once the trial has ended, to sequentially recall the number of red circles counted. Backward Digit Recall requires participants to sequentially recall a series of digits in the reverse order in which it was presented to them (Alloway, 2007).

Visuospatial STM was assessed using the following tasks: the Dot Matrix, Mazes Memory and Block Recall tasks. In the Dot Matrix task, participants have to recall the location of a red circle that appears in a sequence of four-by-four grids; they depict this by tapping on an empty grid that appears on the computer. The Mazes Memory task involves participants being shown a pathway in a maze for three seconds, before having to recall and trace the pattern on a blank maze. The Block Recall task requires participants to recall the pattern in which a series of blocks are tapped; they indicate their recall by tapping on an image of the blocks (Alloway, 2007).

Visuospatial WM was assessed using the following tasks: the Odd-One Out, Mr. X and Spatial Span tasks. The Odd-One Out task requires participants to identify from the 3 shapes presented in a row of boxes, which shape is the odd-one out. At the end of a trial, the participant has to sequentially recall the order in which the odd-one out shapes appeared by taping on an image of the row of boxes. The Mr. X task requires participants to identify from the two Mister X figures presented, if the Mr X. wearing the blue hat (and who may be rotated) holds a ball in the same hand as Mr X. with the yellow hat. Once a trial ends, participants have to sequentially recall each ball's position; they depict this by tapping on an image that has six marked positions. In the Spatial Recall task, participants are shown a picture containing two shapes; they have to identify if the shape on the right (which has red point above it, and is sometimes rotated) is identical or not to the one that is on the left. Once

a trial ends, participants have to recall the red point's location in the order in which it appeared, by pointing to an image with three marked positions (Alloway, 2007).

Prior to each subtest, the participant engages with a series of practice trials so that they are familiar with the response procedures. As the participant completes a response, it is scored. Raw scores for each subtest are automatically produced by the program. For each memory component, composite scores can be obtained by summing and averaging the scores of the subtests that comprise each component. The program converts these raw scores to standardised scores, with a mean of 100 and standard deviation of 15, in order to depict each participant's scores in relation to the scores obtained by individuals in the same age group. Higher scores on the AWMA represent better performance (Alloway, 2007).

Norms, reliability and validity of the AWMA has been ascertained using individuals, aged 4 to 22 years, who live in the United Kingdom (Alloway, 2007). At the time of administration of the AWMA, all participants were within this age range. Good test-retest reliability has been found for each of the subtests where estimates for the subtests ranged from .69 (Non-Word Recall), to .90 (Block Recall; Alloway, 2007). The AWMA has been shown to demonstrate convergent validity (Alloway, Gathercole, Kirkwood, & Elliot, 2008) and (as test inter-correlations suggest) good internal validity (Alloway, 2007). The validity of the AWMA in South Africa has been demonstrated by studies conducted in this context which have investigated WM using the AWMA, although this has only been with school children (for example Alloway & Cockcroft, 2012; Cockcroft, 2016; Cockcroft & Alloway, 2012). The reliability of the AWMA in the current study could not be calculated as item scores were unavailable. The AWMA is also said to be culture fair, and has weak correlations with SES (Alloway, 2007; Cockcroft, Bloch, & Moolla, 2016).

The Resilience Research Centre Adult Resilience Measure (RRC-ARM; Ungar & Liebenberg, 2013). The RRC-ARM is a paper-based, self-report measure of the resources that promote an individual's resilience. It was adapted from the Child and Youth Resilience Measure (CYRM), and is generally used with adults aged 23 years and older (Ungar & Liebenberg, 2013), and therefore was suitable for the quantitative phase's sample.

There are three options of the RRC-ARM that can be used; this study used option one, section C which takes approximately 15 minutes to complete (see Appendix B). This comprises of 28 items that are responded to on a 5-point Likert scale where 1=not at all and 5=a lot. The scale comprises of three subscales, which represent the three broad categories of

resilience-promoting resources (individual, relational and contextual) as was discussed in the literature review. These subscales are labelled as follows; individual capabilities, relationships with important individuals, and contextual factors that promote a sense of belonging. Scores for each subscale can be obtained by summing up the scores on the relevant items. A composite resilience score can be obtained by summing up the score on each item, with higher scores indicating a greater number of characteristics linked to resilience. The questions of the RRC-ARM can also be divided into eight question clusters. The 'individual' subscale is divided into 3 clusters: personal skills, peer support and social skills. The 'relationships with key individuals' subscale is divided into two clusters: physical caregiving and psychological caregiving. The 'context' subscale is divided into three clusters: spiritual, educational and cultural. Although these clusters have not been tested in the RRC-ARM, it has been recommended that these clusters be included when analysing the results from this measure since the items of the RRC-ARM mirror that of the CYRM; the test in which these question clusters have been found (Ungar & Liebenberg, 2013).

The RRC-ARM was an appropriate measure of resilience in this study, as it is based on a socio-ecological framework of resilience and measures resilience as comprising of systemic processes (Ungar & Liebenberg, 2011; 2013). Thus the working definition and theoretical framework of resilience adopted in this study, was matched with the operationalization of the construct. The suitability of this measure is further demonstrated by scholars indicating that a measure of resilience which conceptualises the construct in this way, is the most conceptually adequate (Windle, Bennett, & Noyes, 2011).

Data regarding the norms, reliability and validity of the RRC-ARM in various countries is still in the process of being collected (Ungar & Liebenberg, 2013). However studies conducted in Turkey (Cronbach's α=.94), Romania (Cronbach's α=.82), and on Somalian refugees living in the United States have found that the RRC-ARM has good internal consistency reliability (Arslan, 2015; Robinson, 2013; Vlădescu, 2015). Test-retest reliability has been found to be .85 on the sample from Turkey (Arslan, 2015). The internal consistency reliability of the RRC-ARM in the current study was α=.88. The internal consistency reliability for each subscale and question cluster can be seen in Table 3. With the exception of the 'individual: personal skills', 'context: education' and 'context: cultural' clusters, the alpha coefficients for the question clusters closely matched, or were higher than, those found for the CYRM in a South African sample of school-going youth (see Liebenberg,

Theron et al., 2015). The alpha coefficients for some of the question clusters are low, indicating that these clusters have poor reliability; this will be addressed in the discussion.

Table 3. *Internal Consistency Reliability of RRC-ARM Subscales and Question Clusters.*

	Cronbach's α
RRC-ARM Subscales	
Individual Resources	.79
Relational Resources	.83
Contextual Resources	.62
RRC-ARM Question Clusters	
Individual: Personal Skills	.48
Individual: Peer Support	.79
Individual: Social Skills	.63
Relationships: Physical Caregiving	.59
Relationships: Psychological Caregiving	.74
Context: Spiritual	.75
Context: Education	.37
Context: Cultural	.41

Exploratory factor analyses has shown the RRC-ARM to have varying factor structures across contexts. The study on Somalian refugees showed the RRC-ARM as comprising of three factors; that is, individual, relational, and cultural factors (Robinson, 2013; Robinson, David, & Hill, 2016). The study conducted in Turkey, which used a sample of adults from low SES contexts, found the RRC-ARM to have a four factor structure; this was confirmed using confirmatory factor analysis (Arslan, 2015; Liebenberg, Arslan, & Moore, 2015). Research conducted on adults living in Ireland, who had experienced abuse as institutional-based children, identified the RRC-ARM as having five factors (Liebenberg Arslan, & Moore, 2015). With regards to the studies conducted in Turkey and Ireland, these factors primarily related to family/civic/cultural connectedness, personal capabilities and interpersonal relationships (Liebenberg, Arslan, & Moore, 2015). Despite differing results regarding the factor structure of the RRC-ARM, these results do support the use of this measure (Liebenberg, Arslan, & Moore, 2015). The studies conducted in Turkey, Ireland, and on Somalian refuges have also shown the RRC-ARM to have good convergent validity (Liebenberg, Arslan, & Moore, 2015; Robinson, 2013).

While none of these studies has been conducted in South Africa, as the development of the RRC-ARM is based on the CYRM, it seems that the RRC-ARM may be applicable in the South African context (Ungar & Liebenberg, 2011; 2013). This is because the data obtained from a South African sample contributed to the development of the CYRM (Ungar & Liebenberg, 2011; 2013).

Interview schedule. A semi-structured interview schedule was used to gather data for the qualitative phase. Given the purpose of this phase, this instrument appeared appropriate for this phase due to its ability to gain in-depth information (Bryman, 2012). The interview schedule (Appendix C) was developed by adapting the schedule reported in an article by Ungar and Liebenberg (2011) in light of the research questions and literature reviewed. Prior to being used, the schedule was reviewed by numerous lecturers; based on concerns raised, necessary alterations were made and approved prior to the schedule being used. The schedule was not piloted due to the very specific sample that was used; because of this, the researcher opted not to pilot the instrument in order to avoid exhausting the sample by doing so.

Note. All 38 participants in this study had completed the AWMA previously as part of a larger project; this data was used in the current study. These 38 participants were administered the RRC-ARM in this study. Of these 38 participants, a subset of 14 participants were administered the interview schedule as they agreed to be interviewed.

Procedure

After having obtained ethical clearance from the University of the Witwatersrand Human Research Ethics Committee (HREC; Refer to Appendix D), potential participants were contacted using the contact details obtained from the database compiled during the conduction of the study by Cockcroft et al. (2015). All potential participants were initially contacted through email, where they were emailed a letter containing information regarding the study, along with an invitation to participate (Refer to Appendix E). Participants who did not respond to the initial invitation, or whose email addresses bounced back, were then contacted telephonically. These participants were verbally informed of the study's details, and were invited to participate. Voicemails and short message services (SMS's) were used to contact potential participants in the event that they were unavailable to speak over telephone. Of these potential participants, those who indicated an interest in participating in the study, were emailed the information/invitation letter. Interested potential participants were instructed to contact the researcher using the contact details provided in the letter. Potential

participants were also informed in the information/invitation letter that they could request the instruments for the quantitative phase be made available electronically through an online survey platform if they were unable to complete them in person.

Participants who initially volunteered to participate fell into two camps: those who expressed interest in doing both phases of the study (quantitative and qualitative), and those who expressed their interest in participating in the online quantitative phase of the study.

Each of the participants who were able to meet the researcher was sent a reminder email or SMS about the meeting date and time. Testing occurred individually in a quiet room on the University premises, with quantitative data collection taking place first. Prior to testing, participants were verbally informed of the study's procedure and ethical issues. Participants were required to provide written and verbal consent (see Appendix F for consent form). Participants were then requested to complete the demographic questionnaire, followed by the RRC-ARM. This took approximately 30 minutes. A payment of R75 was made upon participation, in order to compensate for time taken to participate in the research.

Participants were then asked whether they still wished to complete the interview that formed the second part of the study. After verbally consenting, they were asked if they would like a break prior to conducting this phase; each participant declined this offer. It should be noted that this aspect of the procedure was not followed with one participant; due to unforeseen traffic issues and having another appointment, the participant requested to complete the qualitative phase a week after completing the quantitative phase. The procedure used for this phase remained the same as per the procedure used with the other participants. For this phase, participants were once again verbally informed of the study's procedure and relevant ethical issues. They were required to provide verbal consent and written consent for both being interviewed and recorded (see Appendices G and H for consent forms). The interview schedule (see Appendix C) was then used as a guideline to conduct the interview. Each interview lasted approximately an hour, and was tape-recorded. A payment of R75 was made upon participation, in order to compensate for participants' time and travel costs.

As a number of individuals expressed interest in an online version of the quantitative instruments, and there were no more individuals who volunteered to participate in the research in person approximately a month after two recruitment attempts, the paper-based instruments for the quantitative phase were made electronically available through LimeSurvey (a free, online survey platform). The information for the quantitative phase (as

outlined in the information/invitation letter), in addition to the consent form, were placed on LimeSurvey. These were made available before participants could access the questionnaires. There were some minor differences regarding the paper- and electronic formatting of the RRC-ARM. The electronic-formatting of the RRC-ARM meant participants were unable to see all of the items on a single screen without having to scroll down. The researcher thus repeated the headings of the Likert-scale after every 8 items on the scale, since this was the number of items that could be seen at one time on the screen. This was necessary for participants to be able to select the correct response number without having to scroll to the top of the page to see what each number represents. The other difference between the online and face-to-face administration was regarding item 28 of the RRC-ARM (see Appendix B). The paper-based version requires participants to write the country they refer to in the space provided in the item itself [28. I am proud to be a citizen of _____ (insert country)]. This could not be replicated in LimeSurvey. Consequently, the researcher had to provide a separate answer box below this item, so the country could be specified. The researcher indicated next to 'insert country', for participants to 'do so in the box below'. These differences were minor and were unlikely to have altered the psychometric properties of the test. However, it is acknowledged that there is a possibility that these differences may have altered the way participants responded. With the exception of the abovementioned differences, there were no differences between the paper-based and online instruments beyond the difference of paper- and electronic-formatting. Once the survey was set up, participants were sent an adapted version of the invitation/information letter containing the link to the survey. Numerous attempts after this were made to recruit as many participants as possible. The survey was kept open for a month and one week. Participants were required to provide their banking details prior to answering the questionnaires; for those who provided these details, an electronic fund transfer of R75 was paid into their bank account to compensate for their time.

Once data collection from both phases were completed, quantitative and qualitative data were prepared for analysis prior to being analysed. For the quantitative phase, quantitative data from both the face-to-face testing and the survey were collated into a single Excel spreadsheet. Each participant's RRC-ARM scores were matched to their AWMA scores, and biographical information was updated where needed. Data were then anonymised, coded, cleaned and analysed. For the qualitative phase, the interviews were transcribed, anonymised and analysed. It should be noted that transcripts were not included with this

report due to page constraints, but can be made available upon request. The results from both phases were then synthesised and compared in the discussion.

Ethical Considerations

Ethical clearance was obtained from HREC (Protocol No: MPSYC/16/001 IH; Refer to Appendix D). In order to ensure that the research was conducted in an ethical manner such that participants' well-being was not placed at risk, various ethical issues were taken into consideration during the research process. For both phases of the study, the invitation letter fully informed participants of the study's requirements and was verbally reiterated prior to testing. Participants were informed of the voluntary nature of participation, and their freedom to withdraw at any point without repercussions. This ensured that participants could truly provide informed verbal and written consent. As this study forms part of a larger project, participants' consent for the additional data obtained in this study to be archived alongside their previous data, was also required. All participants were fully informed of this, and provided consent for their data to be archived. The researcher attempted to remain aware of any participants who experienced distress during the face-to-face sessions; one participant who subtly expressed some concerns regarding his cognitive and emotional well-being at the end of a session was verbally referred to free counselling service-centres located at the University of the Witwatersrand. All participants were provided with the contact details of these centres in the information/invitation letter, and were advised to contact these centres in the event that they experienced any distress during the testing/interviews. Participants were informed that they may contact the researcher for any queries they may have, and that they may request a summary of the study's results 12 months subsequent to data collection.

The stipends provided upon participation might be considered an ethical concern. However, the stipends were not excessive, and were offered to compensate participants for their time and transport costs. As such, the stipends could not be considered unduly coercive. The provision of the stipend may have been problematic in terms the characteristics of the sample and thus findings of the research; this will be addressed in the discussion.

As the researcher needed to use participants' personal information for recruitment and matching of data, and directly met with some participants, participants did not remain anonymous. However, all personal information was kept confidential. Once captured, the data was transferred to an anonymous database for further analyses. The data has thus been anonymised in this final research report, and will remain so for any additional academic

papers or presentations in which this data is used. The completed questionnaires, interviews, recordings and transcripts were allocated a participant code and locked in a safe place. All data was stored on a password-protected laptop.

Data Analysis

The purpose of the study was to investigate the relationship between WM and resilience. In light of the mixed method research questions and design, quantitative and qualitative data analytic methods were used for the applicable phases of the study.

For the quantitative phase, the study's research question and design indicated that descriptive statistics and correlations would be the most suitable statistical techniques to use (Stangor, 2014). For the purpose of analysis, mean scores were calculated for the AWMA subscales, and for the RRC-ARM subscales and question clusters. Furthermore, as the scales of the observed scores for the AWMA and RRC-ARM differed, all scores were transformed into z-scores to allow for AWMA and RRC-ARM scores obtained by each participant to be directly correlated. Descriptive statistics were then calculated in order to describe the sample. In order to determine if the data fulfilled the assumptions of parametric analyses prior to running the inferential analyses, the normality of the data was then calculated using skewness and kurtosis coefficients, Kolmogorov-Smirnov tests for normality, and histograms with normal curves (see Appendix I; Singh, 2007). As these tests indicated that most of the data were normally distributed, and since the Pearson's Product-Moment correlation is a statistically robust test, this correlation test was used to answer the quantitative research question (Stangor, 2014). All statistical techniques for this phase were carried out using IBM SPSS 23.

For the qualitative phase, data was analysed using thematic content analysis as outlined by Braun and Clarke (2006; 2012). This analytic technique assists the researcher to search for, identify, and interpret recurrent patterns or themes in the data that provide meaning in relation to the research questions being asked. According to Braun and Clarke (2006; 2012), this method of analysis can be conducted in a series of six steps (see Appendix J). Using these steps enables in-depth descriptions of the data which may be beneficial when researching topics on which minimal research has been conducted (Braun & Clarke, 2006), making this method of analysis well suited to this study. As the qualitative research questions of this study were exploratory, an experiential analytic approach was primarily adopted; however coding was both inductive and deductive as, while coding was driven by the data,

specific WM-related themes that were searched for in the data was guided by the research questions and literature reviewed (Braun & Clarke, 2012).

Self-reflexivity

Being from a Western and Islamic-Indian cultural background, the researcher holds knowledge of cognition from a Western perspective, and of resilience from both a Western and cultural perspective. The researcher thus attempted to be aware of this during data collection, so as to not impose her own perspectives onto participants or make participants feel uncomfortable. Attempts were also made to remain aware of these aspects during analysis so that relevant data incongruent with the researcher's perspective were not ignored. In order to account for these issues, a reflexivity journal was kept throughout the research process which helped the identification of any issues present. The influence of such issues on the themes that the researcher identified were discussed with her supervisor, and attempts were made to take such issues into account in the analysis. In this process, the researcher perceived that some participants viewed her as being in a position of privilege and success in comparison to them and felt the researcher could not truly understand their experiences. It is possible that this may have affected the quality of the interview and thus the data; however, this did not seem to feature directly in relation to the themes identified, and thus has not been discussed in the analysis. This process of self-reflexivity was carried out to provide a more appropriate record of participants' accounts of resilience, but it is acknowledged that all interpretations of data are likely to be biased as people cannot completely extract themselves from their background.

Conclusion

This chapter described the methodological approaches used in this study. This included an explanation of the research design and sample/sampling method used, descriptions of sample demographics and instruments used, an outline of the procedure, ethical issues pertaining to the study, the methods used to analyse the data, and the process of self-reflexivity taken to enhance the analysis of the qualitative data. The next section presents the study's results.

Chapter Four: Results

This study investigated the relationship between WM and resilience. A mixed method approach was used, where the quantitative phase aimed to investigate the relationship between components of WM, as conceptualised by Baddeley (2000), and resilience; and where the qualitative phase aimed to investigate how WM processes, as conceptualised by Baddeley (2000), feature in Black South African young adults' accounts of resilience, as well as how socio-cultural factors feature in these experiences. For the quantitative phase, WM and resilience were measured using the AWMA and RRC-ARM respectively, where higher scores on each instrument indicated greater presence of the characteristic. The data obtained from both instruments were on an interval scale of measure and were transformed to z-scores for the analysis. For the qualitative phase, a semi-structured interview schedule was used to collect data. The nature of this data was open-ended and allowed for themes to be identified in the data. The results of each of these phases of the study are presented below, with the quantitative results being presented first, followed by the qualitative results.

Quantitative Results

Normality and descriptive statistics. Prior to running any inferential analyses, the data was assessed for normality. An examination of the skewness and kurtosis coefficients (Table 4), and the histograms and superimposed normal curves (see Appendix I), indicated that the data was mostly normally distributed. The only variable that appeared slightly positively skewed was Spatial Recall. In addition, the histograms and superimposed normal curves suggested that the RRC-ARM scores were all slightly negatively skewed. A more stringent measure of normality was provided by the Kolmogorov-Smirnov tests of normality, where $p<.05$ indicated that data was not normally distributed (Singh, 2007). According to these tests, Verbal STM composite score, Counting Recall, Verbal WM composite score, Dot Matrix, Block Recall, VS STM composite score, Mr X, VS WM composite score, Individual and Contextual Resources subscales were all normally distributed. As z-scores were used in the analysis, the means and standard deviations of each score were 0 and 1 respectively, but the means and standard deviations of the raw scores can be seen in Table 4.

Table 4. *Descriptive Statistics and Kolmogorov-Smirnov Tests for Normality for WM and Resilience Variables*

	M	*SD*	Range		Skewness	Kurtosis	*KS Test* [a] *(df=38)*	
			Min.	Max.			Statistic	*p*

AWMA Scores								
Digit Recall	33.34	5.82	24	49	.776	.120	.235	.000
Word-Recall	25.53	4.03	19	36	.935	1.144	.262	.000
Non-Word Recall	16.08	3.48	9	23	.145	-.901	.154	.024
Verbal STM	24.98	3.75	19	35	.749	.484	.116	.200*
Listening Recall	15.79	3.47	12	24	.500	-1.015	.290	.000
Counting Recall	26.47	5.17	12	38	-.035	.804	.139	.063
Backward Digit Recall	17.39	4.97	8	33	.667	1.564	.163	.012
Verbal WM	19.89	3.79	13	29	.404	-.316	.092	.200*
Dot Matrix	30.66	6.03	18	47	.113	.557	.114	.200*
Mazes Memory	28.89	4.26	19	40	.117	1.702	.213	.000
Block Recall	30.03	5.05	18	44	.123	.887	.130	.105
Visuospatial STM	29.86	3.95	20	40	.314	1.224	.110	.200*
Odd-One Out	27.08	5.58	18	42	.030	.142	.173	.006
Mr X	19.32	5.66	11	31	.365	-.716	.128	.122
Spatial Recall	23.89	6.60	17	42	1.151	.633	.170	.007
Visuospatial WM	23.43	4.91	15	35	.577	-.189	.112	.200*
RRC-ARM Subscales								
Individual Resources	46.87	5.32	35	55	-.347	-.474	.088	.200*
Relational Resources	29.18	5.09	18	35	-.825	-.231	.143	.049
Contextual Resources	41.82	4.70	32	50	-.152	-.443	.083	.200*
RRC-ARM Question Clusters								
Individual: Personal Skills	22.84	1.78	19	25	-.296	-.999	.151	.029
Individual: Peer Support	8.03	1.82	3	10	-.747	.284	.176	.004
Individual: Social Skills	16.24	2.75	8	20	-.898	1.012	.134	.081
Relationships: Physical Caregiving	8.79	1.40	5	10	-1.169	1.104	.254	.000
Relationships: Psychological Caregiving	20.39	3.98	12	25	-.804	-.369	.165	.011

Context: Spiritual	11.89	2.82	6	15	-.545	-.982	.173	.006
Context: Education	8.08	1.60	4	10	-.553	-.369	.165	.011
Context: Cultural	21.74	2.33	15	25	-.729	.586	.180	.003

Note. *M*=mean, *SD*= standard deviation, Min. = minimum, Max. = maximum, *KS*=Kolmogorov-Smirnov.
[a.] Lilliefors Significance Correction. *This is a lower bound of the true significance.

Inferential statistics: Correlation coefficients. In order to answer the quantitative research question, Pearson's Product-Moment correlations were run for each of the WM subtests, RRC-ARM subscales and question clusters; these results can be seen in Table 5. It should be noted that instead of only correlating the RRC-ARM subscales with the AWMA subtests and subscales, the RRC-ARM question clusters were also correlated with the AWMA subtests and subscales. This is because the Child and Youth Resilience Measure, from which the RRC-ARM was adapted from, is said to measure resilience using eight constructs as per the eight question clusters (see Liebenberg et al., 2015). It is thus possible that the RRC-ARM may not in fact just measure three constructs, but may in fact also measure eight separate constructs as is represented by the instrument's eight question clusters.

As can be seen in Table 5, there were significant, weak negative correlations between physical caregiving and Block Recall (r = -.332, p<.05), Visuospatial Short-Term Memory (r = -.320, p<.05), Spatial Recall (r = -.457, p<.01) and Visuospatial Working Memory (r = -.323, p<.05). Significant, weak, positive correlations were also found between spiritual resources, and Digit Recall (r = .391, p<.05) and Verbal Short-Term Memory (r = .321, p<.05).

Most significant, positive correlations were found between the AWMA subtests. Verbal subtests tended to be inter-correlated, and visuospatial subtests tended to be inter-correlated. There was some cross-correlation between verbal and visuospatial subtests, suggesting that the participants may have used general EF or intelligence skills in order to complete the subtests. A number of significant, positive correlations were also found between the RRC-ARM subscales/question clusters. The strength of these correlations ranged from moderate to strong. These suggest these measures had good construct validity in this study.

Summary of quantitative results. This section of the results chapter indicates that the correlations between WM and resilience scores were primarily non-significant. The next section will explore the qualitative results regarding WM and resilience.

Table 5. *Pearson's Correlation Coefficients between all AWMA and RRC-ARM scores*

	1. Digit Recall	2. Word Recall	3. Non-Word Recall	4. Verbal STM	5. Listening Recall	6. Counting Recall	7. Backward Digit Recall	8. Verbal WM	9. Dot Matrix	10. Mazes Memory	11. Block Recall	12. VS STM	13. Odd One Out	14. Mister X	15. Spatial Recall	16. VS WM	17. Individual	18. Relationships	19. Context	20. Personal Skills	21. Peer Support	22. Social Skills	23. Physical Caregiving	24. Psychological Caregiving	25. Spiritual	26. Education	27. Cultural
1	1																										
2	.565**	1																									
3	.549**	.544**	1																								
4	.891**	.820**	.789**	1																							
5	.340*	.606**	.322*	.493**	1																						
6	.292	.374*	.205	.349*	.551**	1																					
7	.475**	.498**	.289	.514**	.598**	.494**	1																				
8	.444**	.573**	.318	.534**	.817**	.839**	.844**	1																			
9	.466**	.352*	.166	.419**	.487**	.379*	.317	.460**	1																		
10	.384*	.283	.420**	.431**	.326*	.188	.146	.249	.274	1																	
11	.448**	.237	.174	.371*	.251	.193	.425**	.350*	.609**	.215	1																
12	.566**	.382*	.309	.526**	.472**	.343*	.395*	.473**	.867**	.591**	.813**	1															
13	.404*	.470**	.251	.456**	.565**	.373*	.459**	.543**	.607**	.139	.596**	.613**	1														
14	.307	.388*	.010	.301	.472**	.356*	.142	.368*	.507**	.241	.408*	.519**	.443**	1													
15	.430**	.309	.196	.394*	.481**	.512**	.357*	.536**	.654**	.506**	.438**	.702**	.427**	.679**	1												
16	.464**	.466**	.187	.465**	.612**	.507**	.388*	.587**	.718**	.372*	.579**	.746**	.740**	.856**	.871**	1											
17	.143	.153	.182	.185	-.008	.063	-.104	-.019	-.116	.192	-.151	-.055	-.179	.174	.050	.022	1										
18	-.099	.060	-.042	-.043	-.064	.059	-.091	-.032	-.283	-.014	-.278	-.267	-.144	-.004	-.304	-.192	.441**	1									
19	.138	.047	.081	.113	-.069	.076	-.103	-.031	-.090	.140	-.154	-.061	-.120	.017	-.086	-.078	.654**	.661**	1								
20	-.002	.080	.150	.074	.091	-.036	-.143	-.051	-.071	.076	-.141	-.069	-.138	.225	.031	.048	.829**	.245	.541**	1							
21	.193	.219	.161	.228	.095	.156	.005	.102	.040	.265	-.050	.094	-.120	.240	.250	.159	.816**	.145	.496**	.693**	1						
22	.149	.096	.145	.156	-.137	.040	-.110	-.072	-.204	.143	-.166	-.123	-.174	.028	-.090	-.095	.841**	.591**	.576**	.484**	.452**	1					
23	-.190	.049	-.102	-.113	-.127	-.109	-.163	-.160	-.262	-.126	-.332*	-.320*	-.147	-.162	-.457**	-.323*	.249	.845**	.437**	.084	.034	.401*	1				
24	-.060	.059	-.018	-.015	-.037	.114	-.059	.015	-.269	.026	-.239	-.229	-.133	.052	-.228	-.133	.476**	.982**	.691**	.284	.174	.615**	.730**	1			
25	.391*	.188	.163	.321*	-.119	.141	.129	.084	.181	.175	-.006	.153	.018	-.111	.060	-.009	.359*	.320	.710**	.202	.253	.391*	.173	.349*	1		
26	-.145	-.116	.018	-.111	-.163	.133	-.245	-.097	-.300	-.090	-.208	-.273	-.222	-.048	-.209	-.196	.608**	.506**	.650**	.517**	.472**	.519**	.358*	.522**	.170	1	
27	-.097	-.054	-.047	-.084	.117	-.108	-.194	-.098	-.193	.130	-.160	-.120	-.110	.201	-.102	-.010	.460**	.589**	.699**	.485**	.364*	.326*	.422**	.606**	.098	.411*	1

Note. AWMA scores= 1 to 16. RRC-ARM subscale scores= 17 to 19, RRC-ARM question clusters= 20-27. * = $p < .05$, ** = $p < .01$.

Qualitative Results

Within and across the qualitative data, common resilience resources accessible to participants were identified. This included searching the data for how WM processes featured in participants' accounts of their resilience and how socio-cultural factors featured in these accounts. The researcher used this process to identify and analyse the themes and/or subthemes presented below. Themes 1 to 3 appear to be directly related to WM, while themes 4 to 7 are broader resilience-related factors that may have a less direct relationship to WM. Frequency counts of the themes are presented in Table 6. The quotes from participants used to present these themes, are provided verbatim.

Table 6. *Themes Identified As Per Number of Participants and Frequency.*

Theme[a]	Number of participants	Frequency
1. Self-talk	9	30
2. Setting and focusing on goals	14	25
3. Finding multiple solutions	14	24[b]
4. Persistence and diligence	9	34
5. Positivity		
5.1. Internally-sourced positivity	8	11
5.2. Externally-sourced positivity	7	9
6. Spirituality as support structure		
6.1. Personal spirituality	12	44
6.2. Social spirituality	9	35
7. Social networks as key support structure		
7.1. Psychosocial support	14	117
7.2. Informational/instructional support	13	49
7.3. Social support as key resource	9	36

a.Shortened theme names provided. b. This number refers to the number of challenges that participants found multiple solutions to.

Theme 1. Self-talk as a possible resilience-promoting resource. Using the qualitative research question, and literature reviewed as a guide, some WM processes were identified as having promoted participants' resilience. Amongst the processes that were identified is self-talk, or verbal mediation, which requires individuals to simultaneously work with and organise numerous pieces of information thereby drawing on several WM systems (Wekerle et al., 2012). The use of self-talk can be seen in Participant 12's account of the solutions she used to overcome the challenges she experienced: "… with the academic challenge I would say I just- it's self-motivation. I just- I was there and I just motivated myself with 'This is not the end. This is me.'" This suggests that Participant 12 engaged in

self-talk as a means to motivate herself to overcome her challenges and accordingly positively altered her behaviour in the face of these challenges. Thus Participant 12's engagement in self-talk can be considered a resource that promoted her resilience. This use of self-talk in promoting resilience can also be seen in Participant 2's account of how she overcame her challenges which were academic in nature:

> P2: …I think that was the major challenge- I was very shy, so when I didn't understand stuff, I'd just keep it to myself. I was scared to go to the lecturer or even the tutor, I was scared to say, 'I don't get this', but one day I just told myself, 'If you don't understand, ask. That's how you'll overcome it'….I just told myself, 'You know what, things are not easy, but they are doable'. So I started doing it, putting in the effort, studying, especially asking where you do not understand. …And by the end of the year, my marks turned.

This suggests that when Participant 2 was faced with academic challenges, she engaged in self-talk as a means to motivate herself to persevere in the face of her challenges, which then translated into practical application of this self-motivation. Her engagement in such self-talk seemed to then enable her to overcome her challenges, as is evident from her indicating that her "marks turned" as a result of this.

The above quotes suggest that these participants engaged in self-talk as a means to motivate themselves to overcome their challenges. However, the quote from Participant 2 also indicates that she used self-talk as a means to develop a solution to overcome her challenges, as can be seen when she stated, "...one day I just told myself, 'If you don't understand, ask. That's how you'll overcome it.'" It thus seems that Participant 2's use of self-talk allowed her to reflect on her challenges in order to problem-solve; where she worked with and manipulated verbal information to generate a solution to her challenges, while simultaneously holding the challenges she was experiencing in mind. This then contributed to promoting her resilience. The following quote from Participant 9, regarding the challenges associated with failing at University, also supports this role of self-talk in promoting resilience:

> P9: …after failing, I was, 'Okay, now you need to really, really, like, learn the work.'…then it's like, 'Okay, why did I fail?' And then, ja, so I'm not – I'm very aware of the reasons why. Like, always- always I try and if I do it myself, then 'Okay, how well am I doing in this, and what are the reasons for that?' So most of the time I – the failure is just - I don't take it badly, like it's because I know the reason why.

This suggests that Participant 9 too used self-talk as a means to motivate himself to overcome his challenges, as is evident from the first sentence of the quote. Furthermore, it seems that Participant 9 used self-talk to examine his failures and successes, where this was used to overcome his challenges. Participant 9's engagement in self-talk thus enabled him to self-reflect on, and find solutions to, his challenges such that this limited the extent to which he considered failing as a challenge. In this way, self-talk seemed to promote his resilience.

Most instances of self-talk that were identified seemed to promote resilience by motivating participants to overcome challenging circumstances. Self-talk was not explicitly identified as a resilience-promoting resource by participants and it is possible that the researcher's prior knowledge of WM and self-talk in relation to resilience may have shaped the identification of this strategy as a WM-related process that promoted resilience. However, the evidence provided above regarding participants' accounts of how they overcome their challenges does suggest that these included instances of self-talk to motivate themselves, reflect on, and work through their challenges.

Theme 2. Setting and focusing on goals as promoting resilience. Another WM-related process that seemed to promote participants' resilience was setting and focusing on goals; a complex cognitive process that WM enables individuals to engage in (Diamond, 2013). This can be seen in Participant 11's response to the question about what personal characteristics helped her deal with her challenges:

> P11: …I just- if I have a goal then I just really work hard towards that goal. So whatever challenge I face, as long as I know that there is an end goal towards it, then I'm always working towards a purpose.

This suggests that, for Participant 11, any challenge she had experienced could be managed by setting a goal and following the steps she set out to achieve it, regardless of challenges experienced along the way. In keeping this goal in mind, it appears that Participant 11 was then motivated to work through these challenges with the purpose of achieving her goal, and thereby engaged in goal-directed behaviour to overcome these challenges. In seems that in this way, Participant 11's focus on her goal provided her with the motivation to work towards overcoming her challenges, and thus promoted her resilience.

Goal-directed behaviour as promoting resilience can also be seen in part of Participant 1's response regarding what helped her most to overcome her academic challenges:

"…staying positive- like focused on the goal. That my goal is to complete this degree….just to think of the ultimate reward." This suggests that for Participant 1, a key factor that helped her overcome her challenges was setting a goal related to overcoming her challenge; and holding this goal and the positive outcomes associated with achieving this goal, in mind. This seemed to have provided her with a sense of purpose which then helped her work towards overcoming her challenges. In this way, it seems that Participant 1 thus engaged in goal-directed behaviour to overcome her challenges, with her focus on the goal and subsequent engagement in goal-directed behaviour thus seeming to have promoted her resilience.

It seems that for some participants, the role of individual goals in helping promote their resilience may have been motivated by social factors. This can be seen in Participant 8's account of what factors helped him overcome his challenges:

> P8: The desire to be successful. …I think that was it, so like, you look around, when there is lack you are like, 'There is lack I don't want to experience this when I am at a certain age. I don't want to live like this.' And then you look back and you see your nieces and your nephews and you are like, 'I don't want them to experience the same things I experienced,' and then you are like, that just being successful enough to really take care of everyone else and myself and I think that's- that's it.

This suggests that Participant 8 set out to achieve the goal to be successful; this goal served to help him work through his challenges, suggesting he engaged in goal-directed behaviour to do so. In his case, it seems that this goal was motivated by his need to assist his family, as achieving this goal would enable him to do this. This suggests that Participant 8's individual goal to be successful was motivated by his social goal of helping others in his social network; together, these goals thus seemed to help promote his resilience.

Participant 14's response regarding whether her goals and aspirations helped her overcome her challenges also seems to indicate how individual goals that help promote resilience, can be motivated by the social goal of helping others.

> P14: …I want to be successful. I want to have a great career where there is a lot of growth and personal development and benefit for companies or whatever organisations I will be working for, but at the end of the day I don't want to find myself or the people around me still in poverty. I want to get myself or the people around me whatever they need. So ja that's- I think for me waking up every day and, not necessarily thinking about that in the morning when I wake up, but at several times during the day, it pushes me further because

> that's what I need at the end of the day and if it means that I have to endure or experience what I'm going through at the moment then so be it, but at the end of the day I have to get whatever I have to do, done…

This suggests that Participant 14's setting and focusing on an individual goal to be successful and have a great career motivated her to overcome her challenges. However, this goal was motivated by her social goal of helping to remove those within her social network from poverty. These goals together then seemed to encourage Participant 14 to work through her challenges, suggesting that her individual and social goals led to goal-directed behaviours which then helped promote her resilience. These quotes from Participants 8 and 14 thus suggest that, for some participants, their individual goals which helped promote their resilience were motivated by their broader social goal to help others within their social network. It should be noted that for some participants, this social goal related to helping others in their indirect, broader social network (for example, Participant 10 indicated his goal to obtain his degree, and to use this to help the country, helped promote his resilience).

This theme thus suggests setting and focusing on personal goals motivated participants to engage in goal-directed behaviour to overcome their challenges. For some participants, this was driven by broader social goals. In this way, goal-setting and behaviour seemed to promote participants' resilience.

Theme 3. Finding multiple solutions to a problem. In accordance with the literature that suggests that WM may promote resilience by enabling individuals to generate and evaluate multiple possible novel solutions to adverse circumstances (Evans et al., 2016; Williams et al., 2009), participants in this study seemed to have found and used multiple solutions to the challenges that they experienced. This is evident from the following quotes from Participant 2, which formed part of her response regarding what factors helped her overcome the academic challenges she experienced at university: "… I would go to my friend, 'I don't understand this, explain to me'. And they would explain it to me, and we write a test and we all pass, and it was good. …"

> P2: …. So I think, ja, being persistent works. Having a positive attitude when things don't look like they are doable but you still tell yourself you can do it- that also works. Prayer. That works. Hard work, that's important. That also works.

These quotes suggest that Participant 2 found numerous solutions to her challenges that ranged from recognising and utilising personal characteristics in helping her overcome

her challenges, to seeking social support. In this way Participant 2 demonstrated her effort in finding solutions to her challenges, where these solutions contributed to her developing resilience in the face of these challenges. The following quotes from Participant 4's account of the solutions that helped him overcome his challenges, provides further evidence in support of this:

> P4: …I took it upon myself to help other people- do assignments for other students in exchange for money. There was a time when it was illegal to smoke at school. But then, a lot of students were smoking during break time and so forth. Because I was one of those students that you wouldn't think they would do much wrong, I partnered with this other friend of mine and we were selling cigarettes to those students during break and so forth.

> P4: They [the family][1] couldn't afford [equipment for a school-level engineering subject] at home, but because I was entrepreneurial, I would go to other students who had finished and would try to buy their drawing boards second-handed, at a price I could afford. Maybe buy them one-by-one.

As can be seen from these quotes, Participant 4 took the initiative of thinking of different ways of working around the challenge of growing up in a financially-disadvantaged background, where he generated/found multiple solutions to his disadvantaged circumstances by finding multiple ways in which to earn an income, and the means to spend this income in a financially-sound manner. That he took the initiative himself can be seen in his use of phrases such as "I took it upon myself" and "I would go". In this way, Participant 4 generated and/or found multiple methods of circumventing the financial challenges he experienced when growing up, which promoted his resilience.

While these quotes suggest that participants searched for multiple solutions on their own, to promote their resilience in the face of challenges they experienced, they also seem to suggest that these participants found solutions with the help of others. This can be seen in Participant 2 having indicated that she would seek help with academic challenges from friends, and Participant 4 having indicated that he worked with a friend to sell cigarettes to generate an income. It thus seems that participants may have utilised individual and social pathways to find multiple solutions to their challenges, thus promoting their resilience. This seems to be particularly supported by Participant 12's account of how she overcame her academic challenge:

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1. In quotations, words appearing in square-brackets contains researcher's descriptions.

P12: …with the academic challenge…I just motivated myself…I studied harder. This time I read and ja…….I tried to seek for help because first year I didn't; like I thought I got this and then I realised that I cannot actually pass on my own. I need to work with other people…

This suggests that Participant 12 took the initiative to find/generate solutions to her challenges as is evident from her indicating "…I just motivated myself…I studied harder. This time I read…". However, it seems that one of Participant 12's solutions was to seek help from other people, where it seemed that she could find solutions to her challenges by working with these people. This suggests that while Participant 12 could find/generate multiple solutions to her challenges, the social network accessible to her, assisted her in finding/generating solutions to her challenges and thus promoted her resilience.

This theme thus suggests that participants' ability to find/generate multiple solutions helped them overcome the challenges they experienced, sometimes with the help of other people. However, in examining the multiple solutions generated by all participants, it seems that amongst these solutions, there were other key resources beyond WM-related processes that also promoted participants' resilience. The themes presented below explores these other resources in detail.

Theme 4. Persistence and diligence: Socially-motivated, personal resilience-promoting resources. Among the resources that participants indicated promoted their resilience in the face of challenging circumstances, persistence and diligence seemed to be common resources. The role of diligence as a resilience-promoting resource can be seen in Participants 4's and 6's responses to what personal factors helped them overcome their challenges, the latter having been mostly academic in nature:

P4: …whatever the cost, you-you try- you try your utmost best to make it work…it was just a matter of trying- trying my utmost best…I just had to keep on working and- ja.

P6: When I want to do something, I do it, I give my all to it….it's all down to the fact when I do something, I give my all.

These responses indicated that these participants held an awareness and knowledge of the utility of working conscientiously and persistently when faced with challenging circumstances. It seems that these participants were in possession of such diligence as indicated by their use of the possessive pronoun 'my', where they then utilized this diligence

when faced with challenging circumstances in order to manage them. In this way, their knowledge of the utility of diligence in challenging circumstances, and their possession of this ability, seemingly promoted their resilience.

Participant 11's response regarding what the personal characteristics she thought she possessed, that helped her deal with her challenges highlights the role of both persistence and diligence as resilience-promoting resources: "Ja well, I'm very hard working and I don't give up." The role of persistence and diligence as resilience-promoting resources seems to be particularly evident in Participant 2's response regarding what personal characteristics helped her overcome her challenges:

> P2: Oh then. Hmm uhm what helped? Hmm. I think let me say being persistent. Because I'm thinking I- I had friends in first year that were doing the same thing, going through the same challenges but when they failed this course that I'm talking about, they decided to leave and go but I decided to come back and say, 'Let me give it one more try again.' So persistence helped. Because when I came back, I came back- 'Yes, I failed the course but can I now do it again'. Let me say persistence. And number two, when I then came back, I had to realise you need to put in the effort, you need to do the work. …So hard work, that's another characteristic.

As can be seen in this quote, Participant 2's decision to try again to continue with her degree despite experiencing academic challenges, such as failing her first year at University, suggests that her recognition of the role that persistence might play in overcoming challenging circumstances, and her ability to be persistent, facilitated her resilience. That this ability promoted her resilience seems supported by Participant 2's account of friends who were unable to be resilient in the face of these challenges, as they seemingly lacked the ability to be persistent, or recognize the need for persistence, to overcome these challenges. Furthermore, Participant 2's account of how conscientious effort and work helped her overcome her academic challenges suggests her ability to be diligent, and recognition of its utility in facing the challenges, promoted her resilience.

These quotes suggest that the awareness of the utility of persistence and diligence when faced with challenges, and the possession of these personal characteristics, were among the key resilience-promoting resources that featured in participants' experiences of resilience.

However, it seems that for some participants the awareness and use of these characteristics was motivated by the social network that participants were part of. This can be

seen in how Participant 2's diligence in the face of her challenges seemed to be motivated by her interaction with a friend doing the same degree, as Participant 2 indicated that:

> …by just being around her, I just realised that it's not that things are easy for her, she's willing to put in the effort and do the work. So I also decided let me do the same thing…- let me put in the effort.

This suggests that Participant 2's awareness of the utility of diligence in overcoming her challenges was fostered through the social interaction with a close other, where this interaction also served to motivate Participant 2's use of diligence in promoting her resilience. How social interactions with others can motivate diligence and persistence is similarly reflected in Participant 4's response to whether family played a role in helping him overcome his academic challenges, which were a consequence of financial challenges: "…they [P4's parents] would always encourage me …they'll just keep on saying, 'You know what, uh keep on studying. Once you get- once you get educated, all will be well.'" It thus seems that Participant 4's parents encouraged him to work persistently towards getting his degree, despite him experiencing challenges regarding this, in order to overcome his broader challenges. It seems this may have motivated Participant 4 to work diligently and persistently so as to overcome his academic challenges, as seen in the quote from this participant provided at the beginning of this theme.

The influence of social networks on the awareness of, and motivation to use, diligence and persistence can be seen in the accounts of resilience that were provided by participants who, indirectly indicated that persistence and diligence enabled them to be resilient. This can be seen in the following quotes by Participants 3, 7 and 9:

> P3: …family I think has been important because sometimes you feel like ugh, you know this isn't worth it. You know and they make you realise no, just push, just carry on. You know it will be fine, kind of thing, it's just a matter of time. Um so I think family has been instrumental in that area, friends as well… [Participant 3, in response what role other people have played in helping him overcome his challenges].

> P7: …even when I felt like crying or giving up I would speak to my friends…[Participant 7, in response to what role other people have played in helping her overcome her challenges].

> P9: Ja, ja, I also attend prayers too, so, ja, also that, you know, it- it helps to - because, I mean in those kind of situations, you come across people who are also going through different - other things, you know? And you see how persistent they've been in those, uh, situations. And then you realise that, 'Okay, you know this, you can go through this and still be fine.' [Participant 9, in response to whether prayer or church groups played a role in helping her overcome her challenges].

These quotes indicate that the social networks surrounding these participants served to inform them of the role that persistence and/or diligence may play in overcoming challenging circumstances, and in this way promote resilience. Furthermore, these networks appear to have motivated these participants to then display these personal characteristics in facing their own challenges. In this way, the social environment surrounding participants seemed to provide them with the knowledge of personal characteristics that can be used to develop resilience. Furthermore, the social environment encouraged these participants to display persistence and diligence, where this served to then facilitate their resilience in the face of their challenges.

This theme thus suggests that diligence and persistence are key personal resilience-promoting resources among participants; however, the influence of these characteristics on resilience may be shaped and driven by the social networks accessible to these participants.

Theme 5. Positivity: An internally-sourced, and an externally-driven/-sourced, resilience resource. Like persistence and diligence, positivity seems to be another key-resilience promoting resource for some participants. This theme will be discussed under two subthemes as the manner in which positivity promoted resilience seemed to manifest in different ways where sometimes an innate positive attitude to challenging circumstances seemed to promote resilience, and in other instances the positivity provided by participants' social network seemed to promote their resilience. These subthemes are discussed below.

5.1: Positivity as an internally-sourced resilience promoting resource. Some participants' accounts of their resilience-related experiences suggested that an innate ability to be positive in the face of challenging circumstances helped them overcome their challenges. So it seemed that a positive attitude in the face of hardship was a key, internally-sourced, resilience-promoting resource for these participants. That this may be the case can be seen in part of Participant 1's response to what primarily helped her overcome the challenges she faced: "Um, just remaining positive, staying positive…". This suggests that

Participant 1 had an innate ability to remain positive when faced with challenging circumstance, where this helped promote her resilience. This also seems to be reflected in Participants 2 and 7's responses regarding what personal characteristics helped them overcome the challenges they faced:

> P2: …the change in attitude, to be positive…that changed things for me because ja, I started passing…So I chose to be positive even when things are very, very bad. …Having a positive attitude when things don't look like they are doable but you still tell yourself you can do it that also works.

> P7: …I stayed positive … just staying positive … it actually helped….I think that is- um I'm not a pessimistic person I always believe that everything happens for a reason and that um in order for you to move forward you have to be positive…

These responses thus suggest that these participants attributed their possession of positivity or being able to adopt a positive attitude as having motivated them to overcome their challenges, by enabling them to not be discouraged by difficult circumstances. This, coupled with the fact that these responses were provided with regards to participants' accounts of their personal characteristics that enabled them to overcome their challenges, indicates that their innate ability to be positive in the face of challenging circumstances helped them overcome these challenges. In this way, it seems positivity can be considered an internally-sourced resilience-promoting resource.

The role of positivity as an internally-sourced, resilience-promoting resource also seemed to be reflected in some participants' accounts of having viewed challenging circumstances from a positive viewpoint. Specifically, some participants observed these challenges as having positive effects on them and/or no longer viewed them as challenges per se. This thus suggests that having an innate ability to adopt such a positive attitude in the face of challenging circumstance may have served to foster participants' resilience. This can be seen in the accounts of the challenges experienced by Participants 8 and 9:

> P8: … growing up uhm there was a time when, well, …he [P8's father] would leave me by myself and then my mother wasn't really around at the time, at that time…there are also cases of a bit of abuse in the house and alcohol abuse… I don't really think they were challenges…..they were just things that happened that made me a better person. I think they are just- that's all they are; things that happened that made me see life from a different perspective, they made me appreciate things more...

> P9:…my dad was the only bread winner and then he passed on in 2008…So, ja, I think that changed a lot for me. Especially, uh, being the first born in the family and then, you know, the amount of expectations that were placed upon me. But I could say that it mostly it was for the good because after then – I mean, I started focusing more on my school work and then ja, which led me to be – to me being here, actually. So, ja. I would say, ja, that it was a negative event that had a positive effect.

These quotes seem to indicate that these participants experienced some severely challenging circumstances. Despite this, these participants displayed an innate ability to adopt a positive outlook towards these challenging circumstances. This seems evident by their having looked for the positive effects that these challenges had in terms of their personality or in their lives, thus seemingly altering the degree to which these challenges were then viewed as insurmountable. As can be seen in the case of Participant 8, adopting a positive outlook particularly enabled him to view these circumstances as not being challenges per se but reframing them as opportunities, and thus could be considered an internally-sourced factor that promoted his resilience to these challenges. The role of positivity as enabling participants to reframe challenging circumstances also seemed to have been articulated by Participant 6 when he was asked what challenges he had experienced, as he indicated that whatever challenges he had "…met, I don't think were challenges" and "…it would be very difficult [for P6 to indicate the challenges he may have experienced] because personally, I am-I'm an optimist". It thus seems that participants' innate ability to adopt a positive outlook towards their challenges enabled them to alter their perceptions of these challenges such that they were perceived to (albeit in varying degrees) yield positive, as opposed to negative, outcomes- it seems that it was in this manner that adopting such an outlook promoted these participants' resilience.

This subtheme thus suggests that internally-sourced positivity may have promoted resilience by motivating participants to overcome and/or positively reframe challenging circumstances.

5.2: Positivity as an externally-driven/-sourced resilience promoting resource.

While evidence thus suggests positivity may be an internally-sourced, resilience-promoting resource, there is also evidence that positivity may promote resilience through external factors. The influence of external factors on positivity in promoting resilience may be seen in participants' accounts which suggest an ability to remain positive when faced with

challenging circumstances was facilitated or motivated through the support they received from their social networks. For example, Participant 2 indicated "…the support that I got from family and friends made me change an attitude, and like, let me be positive and do this and ja." This indicates that the positive support Participant 2 received from her social network in relation to her challenges motivated her to adopt a positive attitude to help her overcome these challenges. Similarly, Participant 7 indicated that "… whilst consulting [with lecturers] I would basically tell them, 'Okay, this is what I'm facing, how can I get through this?' and then all of them would say, would tell me to be positive…" This indicates that the support Participant 7 received from her lecturers guided her to adopt a positive attitude towards her challenges, in order to help her overcome these challenges.

It seems that purely external sources of positivity may also have promoted some participants' resilience, as can be seen in the responses from Participants 3, 9 and 11 regarding the role that other people have played in helping them overcome their challenges:

> P3: ...it was just that encouragement [from family] you know um it was- you know it's like positive reinforcement, you uh I don't know, like you get encouragement no I think you're on the right track, you know.
>
> P9: So just, you know, having someone [P9 referring to his mentor at a student-support organization] who is that positive about, you know, a situation where everyone would regarded as, like, the end of your career or anything. You know, that also helped a lot.
>
> P11: … I think their [family and friends] confidence and their positivity helps me deal with a lot of things. Because if you're really down and people are just stressing you, I think having someone to calm you down, someone on your side, someone who is there to help if you need them, that really helps you deal with challenges.

According to these quotes, it seems that the social networks accessible to these participants provided them with a positive supportive environment when they were faced with challenging circumstances. In particular, it seems that through their interaction with close-others, participants received positive support from these close-others, where this positivity then served as sources of guidance and encouragement in relation to how participants could manage and overcome the challenges that they were facing. In this way, the positivity provided from external sources seemed to promote these participants' resilience.

This subtheme thus indicates that external support can encourage the use of internally-sourced positivity to overcome challenges, and that externally-sourced positivity may also serve as a means to guide and encourage participants. Overall, this theme suggests that internally-sourced positivity and/or positivity sourced externally through participants' social support networks, promoted participants' resilience.

Theme 6. Personal and social spirituality as support structures that promote resilience. Similar to the role of positivity in resilience, spiritual orientation seems to be another resource that promoted participants' resilience through individual and social means. This is discussed in the subthemes below.

6.1: Personal spirituality as a support structure. Some participants emphasised the role of personal spiritual beliefs and actions in helping them overcome the challenges they faced. For example, Participant 3 indicated that while he was not religious, being "spiritual" helped him overcome his challenges by providing him with "confidence" where his orientation to spirituality enabled him to independently "pray for ability" to overcome these challenges. This suggests that Participant 3's engagement in prayer formed a personal spiritual support structure that provided him with the confidence to overcome his challenges. Similarly, Participants 5, 11 and 13's accounts of resources that helped them overcome their challenges, indicates how their personal spiritual beliefs and actions enabled them to overcome their challenges:

> P5: …there is just something about you- okay when you believe that is just something about you praying that will make you feel better. You just know, okay that you have taken off a lot of weight from your shoulders because like I said I used to read a lot, the Bible a lot, so I can even still recall scriptures that will comfort me…
>
> P11: Well for me religion is a big part of it and just being spiritually intact, I think that serves…that- that builds up my resilience because if- I'd think if you work on your inner strength and the things that happen outside, you're able to go through them and just know that you will get through them, and ja, things will get better…I feel …it [religion] goes with mindfulness, I think praying it's a type of meditation, and just for me reading the Bible a lot, and just seeing how other people in the Bible went through challenges which are weirdly similar to the things that I am going through. So that really- that really helps.
>
> P13: Personal attributes that helped me?…having a lot of faith… So I think that helped a lot…Faith: like believing that whatever situation I'm in, it was because God knew that I

was going to face that situation. It's not because of 1, 2, 3; it's because He knew I was going to be able to overcome that situation.

As can be seen from these quotes, it seems that these participants had personal spiritual beliefs, and independently engaged in spiritual actions, such as praying and reading religious scriptures, which helped them overcome their challenges. These beliefs and actions seemed to be personal/individual and intrinsic as seems to be reflected by Participant 5 having indicated it was his own beliefs and actions that assisted him (evident from his use of the personal pronoun 'I'), Participant 13's response that "faith" was one of her "personal attributes" that helped her, and Participant 11 having stated that for her, religion and spirituality respectively involved a "mindfulness" and working on "inner strength". These spiritual beliefs and actions thus appeared to be a personal/individual and intrinsic source of support to these participants when they faced challenging circumstances, because these beliefs and actions seemed to be a source of comfort and motivation to these participants to overcome their challenges.

Furthermore, these beliefs and actions also seemed to provide participants with a pathway in which to obtain guidance as to how to go about overcoming these challenges, with religious scriptures in particular providing such guidance. It thus seems that for these participants, their personal spirituality seemed to provide a support structure that promoted their resilience. It should be noted that Participant 12, who indicated she was not 'religious', may have been the exception; however, as the researcher did not probe if spirituality broadly helped her overcome her challenges, it is possible that Participant 12 may have had some personal spiritual belief that helped her overcome her challenges.

This subtheme thus suggest that for most participants, personal spiritual beliefs and actions provided a personal support structure that facilitated their resilience.

6.2: Social spirituality as a support structure. It also seems that engaging in spiritual actions with a group of people who are spiritually like-minded may also promote resilience. The accounts provided by Participants 1 and 7 regarding the role of religion in helping them overcome their challenges, seem to provide evidence for this:

P1: …all the time, the words the preacher would be speaking, its motivation all the time. And then, also people do share their challenges, and you get to realise that actually what you're going through, it's nothing compared to what they're going through… just knowing

that they believed in God and then there was a way through whatever they were going through, ja, it's motivation.

P7: …a lot of the time I would go to church every Sunday to speak to one of the elders and then um they would just say that, 'Okay God will do His will, um just continue praying', and- and that's what I've done …

These quotes suggest that by participants engaging in social spiritual actions, there is a sharing of spiritual beliefs that occurs which motivates participants to overcome their challenges. Specifically, it seems that engaging in social spiritual interactions exposes participants with regards to how spiritual beliefs and actions help in overcoming challenging circumstances. This includes exposure to how others in their spiritual social network overcame their challenges with spirituality having assisted them in doing so. It seems that this sharing and support served as a source of encouragement for participants to persevere in the face of their challenges and to use this as a resource to overcome their own challenges.

The above quotes also seem to suggest that by engaging in social spirituality, the spiritual social network that is then accessible to participants may provide a general support network for participants in overcoming their challenges. It thus seems that social spirituality may promote resilience beyond only motivating participants to persevere in the face of their challenges through spirituality itself. This can be further seen in the following quotes from Participants 6, 8 and 14:

P6:…So, so going to church every Sunday…you're there engaging with people and some have graduated. Some of that, it- it-it motivates you, you learn a lot and you learn to open and to respect other people's view. [Participant 6, in response to whether he had any social resources he had access to that helped him overcome his challenges].

P8: Again I am going to go back to the religion

R: Okay

P8: Ja. It- it really, I mean, it- uhm being part of the group of people, people who-who really encourage you to uhh to stay uhm academically excellent, …who drive morality forward…who really are inspired, you- you want to- you-you also want to just stay as a part of that, you also want to instil that in your life, so I think that was one of the res- the resources I had… [Participant 8 in response to whether he had any social resources he had access to that helped him overcome his challenges].

> P14: At the church we have, they have organised some weekend tutorials for- for some of the students there. So ja you would attend them and you find that some of the tutors there have done what you did, like, for their undergrads. [Participant 14, in response to whether religious organizations helped her overcome the challenges she experienced].

These quotes seem to provide evidence that the social networks formed through social spirituality provided participants with resilience-promoting resources beyond spiritual beliefs and actions themselves, where these helped them address the challenges they were experiencing. In particular, it seemed that participants were able to connect with people with whom they not only shared a spiritual background with, but with whom they shared social backgrounds and who would understand their challenges. These social spirituality networks thus acted as a broader support structure by providing information and motivation that served to encourage participants to overcome their challenges, or in other words, facilitated participants' resilience.

This subtheme thus suggests that engaging in social spiritual beliefs and/or activities may have served as a means of motivation, encouragement and support in promoting participants' resilience. The theme overall thus indicates that personal and social spirituality respectively provided participants with a personal and social support structure that helped promote participants' resilience.

As this theme, in conjunction with the other themes discussed above, has indicated the various ways in which the social network accessible to participants promoted their resilience, it seems that these social networks may have played a key role in participants' resilience. This will be explored in further detail in the next theme.

Theme 7. Social networks as a key support structure promoting resilience. As can be seen from the themes discussed above, participants' social networks seem to have played a key role in promoting their resilience. After having analysed this theme further, it appeared that participants' social networks were sources of support that promoted participants' resilience. This is examined in more detail in the three subthemes presented below. The first subtheme discusses how social networks provided psychosocial support in terms of providing encouragement and material resources to overcome hardship. The second subtheme discusses how social networks provide information/instruction regarding what resources can be used to promote resilience, and where/how to access these resources. The third subtheme discusses how, overall, social support is a key resilience-promoting resource.

7.1: Social networks as sources of psychosocial support: Motivational and material provisions as promoting resilience. While some of the previous themes have discussed how social networks motivated participants' use of personal characteristics to overcome their challenges, further analysis suggested that social networks may also have promoted participants' resilience by providing material and motivational support to participants.

The influence of motivational support on participants' resilience can mostly be seen in the quotes supporting the social factors discussed in Themes 2, 4, 5 and 6. While these quotes were used to support the arguments made in the previous themes, these quotes also seem to provide evidence that social networks provided overall motivational support which encouraged participants to overcome their challenges. This can be particularly seen in the following quotes from Participants 6 and 13 which indicate how the general encouragement received from their social network promoted their resilience:

> P6: … I think emotionally and psychologically and just encouragement and it's just having friends who are there for you, who- who-who realize that they see the best in you. [Participant 6, in response to how friends helped him overcome the challenges he faced].

> P13: Emotionally, I spoke to my mum a lot. My mum helped me a lot through this difficult time. She used to talk to me about stuff, telling me I should not blame myself for what happened. I should be strong, I should not- I should just relax, everything will work itself out. [Participant 13, as part of her response regarding factors helped her overcome the emotional aspect of her academic challenges].

These extracts suggest that these participants received emotional support from people within their social networks with regards to their challenges, where this support served to then encourage participants to overcome their challenges. This is evident in Participant 6 indicating the support he received from his friends was a source of encouragement, and Participant 13 indicating the support she received from her mother helped her a lot. This provision of motivational support, which is particularly emotional in nature, thus seemed to promote these participants' resilience.

As motivational support provided to participants through their social interactions seems to have promoted their resilience, so too did material support. The following quotes from Participants 2 and 5, seem to provide evidence regarding how the material support provided to these participants helped them overcome their challenges:

> P2: …my friends- because uh there will be times where maybe the workload is too much, so they will be like, 'It's okay, let's study and then when you too tired you can come crash at my place because home is too far'…or because I'm working too late, that day I don't have money to buy food, they will cook in their room and give me food so I can have the strength to study…[Participant 2, as part of her response regarding how friends have helped her overcome the challenges she faced].

> P5: I stayed with my friend, because I once left Wits. I stayed with my friend for like uh 6 months and he didn't expect anything from me; that is when I was still looking for opportunities and he didn't expect anything financial and I didn't feel like I was going to owe him anything. [Participant 5, in response whether he had access to social, or any other, resources that helped him overcome his challenges].

This suggests that these participants' social networks provided them with material resources (such as a place to stay, a meal, or money for food) that they required when experiencing certain challenges. Given that these quotes were part of participants' responses regarding what factors had helped them overcome their challenges, it seems that this material support provided by their social networks helped these participants circumvent and ultimately overcome the challenges that they faced.

For 13 of the 14 participants, social networks provided participants with both psychological and material support, where such support structures seemed to promote their resilience. This can be seen in the quotes from Participants 4 and 7, which indicate their responses to the role that other people have played in helping them overcome their challenges:

> P4: …I think in friends…it's people that are like, 'You know what, even though we don't have much but guys, let's continue- let's continue doing what we do and someday, all will be well'. I mean these are guys where if someone was getting an allowance from a bursary and you-you weren't getting anything, he'd-he'd share with you whatever that he had. So I think my friends are what I would call my family because they- it's guys that are mainly supportive and they are guys that are mainly encouraging. [Participant 4, as part of his response regarding what role have family and friends played in helping him overcome his challenges].

> P7: I didn't have money to pay my registration fee but I'd also applied for financial aid the thing is they had not yet responded so the-the challenge that I faced was um finding that

> money to pay the registration fee and so I mean everyone in the family had to look for the money …so my family have been supporting me financially and emotionally… it would be, 'Okay, I need money for this I need money for that'… they'll just listen and then if they need to give me a hug they will….the kind of support that they have been- just being able to be there and listening to my problems. [Participant 7, as part of her response regarding opportunities and people who have helped her overcome her challenges].

These participants' social networks seemed to provide them with emotional/ motivational support through actions of encouragement and general support when participants were experiencing challenges. They also served to provide these participants with material resources when needed by participants, to help them circumvent and overcome their challenges.

The quotes discussed demonstrate that participants' social networks helped promote their resilience by providing them with the motivational and/or material support that could help them manage and/or overcome the challenges they were experiencing.

7.2: Social networks as sources of informational/instructional support regarding resilience-promoting resources. While Theme 3 touched on how social networks may have promoted participants' resilience by informing them of how to solve their challenges, social networks may also have promoted participants' resilience by providing them with information/guidance regarding other resources they could access to help them overcome their challenges. This can be seen in participants' accounts of interactions with others who were experiencing, or had experienced, similar challenges. This is evident in the following quotes from Participants 10 and 14:

> P10: …if I have uhm, a problem with something else, one student is having a problem with the same thing that I am; you know what I'm saying? Ja, so going online uhm, talking about issues that- that are the same; you hear what I mean? So it- it- it- it kind of connects you – all you guys and you reach a certain uhm, conclusion and – or you – it keeps on pending but you spoke to people. You have got ideas now; it's no longer that blank – you-you-you- if you have to think; you know which uhm, is the right way to think about it. [Participant 10, in response to what resources helped him overcome his challenges].

> P14: Uhm so talking about your day to day challenges, day to day emotions, there are people who have been in those kinds of situations so they have experienced them and they see things in more than one dimension so in a way they can guide me or show me. Well at

> the end of the day it's up to me what I do so they will tell me, 'You can either do this or do that' but at the end of the day this is how this is so ja. That's how. [Participant 14, in response to how she would describe the role that other people have played in helping her overcome the challenges she faced].
>
> R: So with the specific challenges that you mentioned earlier, have people played a role in any way to help you overcome them?
>
> P14: Yes. Um in terms of, for example, academics; you'd find out they will tell me, 'You need to do this, try studying like this and not like that because this takes time and it's shorter therefore you can absorb it better'. Uhm 'Look at this kinds of books or look at this website and that.'

These quotes suggest that the social networks formed with others who have faced similar challenges, provided information/instruction with regards to resources that could help participants overcome their own challenges. Specifically, instead of trying to blindly find the resources which they could use to overcome their challenges, these interactions provided these participants with information and guidance as to tried-and-tested resources that could help them overcome their challenges. This provided them with the knowledge of what resources they could use to help them overcome their challenges, and where/how to access these resources. Although these resources may not have been used directly, they provided these participants with a starting point, or guideline, that they could use in overcoming their challenges. In this way, it seems that the informational/instructional support provided from these social networks promoted these participants' resilience.

The quote from Participant 14 also indicates the role of informational/instructional support in promoting resilience is supported by instances of how some participants' social networks, while not directly providing them with material resources required to overcome their challenges, provided information/instructions which enabled them to access these resources. Specifically, Participant 14 indicates that her interaction with others provided her with the information regarding what study materials she should look for, which may help her overcome her challenges. The following quotes from Participants 6 and 12 provide further evidence related to this:

> P6: Uhm bursaries and-and relationships, building relationships was important because you know people now, you know who to contact to get a bursary. You could send an email to someone and say I've not gotten a bursary, I need funding… [Participant 6, as part of

his response regarding any opportunities that were made available to him that helped him overcome his challenges].

P12: When I finished Matric I had a gap year because I didn't think I was going to come to Wits at the first place because I didn't think I was that person; like I was just able to come. But then when I took a gap year one of my friends was in UJ so she told me about NSFAS and all that so I just came and applied. [Participant 12, in response to whether she experienced financial challenges in coming to University, and what made her apply for financial aid to circumvent this].

As can be seen in these quotes, it seems that these participants' knowledge of the material resources they could use to help them overcome their challenges, as well as knowing where and how to access these resources, was provided through the relationships they had with other people. In this way, such support seemed to promote these participants' resilience.

This subtheme thus indicated that the social networks' informational/instructional support provided participants with the knowledge of what resources they can use to overcome their challenges and where they can access these resource, thereby promoting participants' resilience. The two subthemes above thus indicate that social support may have played a key role in promoting participants' resilience. This is explored further in the next subtheme.

7.3: Social support as a key resilience-promoting resource. For five of the 14 participants, social support was seen as essential in helping them overcome their challenges, and thus promoting their resilience. This can be seen in the following quotes from Participants 6 and 11:

P6: So- so whatever situation, I think, looking forward, being open, getting out of your comfort zone and accepting; accepting it's fundamental. Accepting that, 'I am in a difficult situation'. … That's where we integrate, that's why there's a community. So social support structures are there to help people achieve what they want to achieve…It's fundamental that we embrace it, we embrace it and ja. [Participant 6, as part of his concluding response regarding factors that helped him overcome his challenges].

P11: …for me foundation is the most important thing because it helps me deal with everything, because everything you- if you just have your core of friends and family around you, then that- I think you can face anything that life gives you. [Participant 11, as

part of her response to what solutions she came up with to help her overcome her challenges].

As can be seen from these quotes, seeking and receiving support from their social network was key in helping these participants overcome their challenges, since the social network was seen to provide an overarching support structure that could help them overcome any challenge that they had experienced, or would experience.

While only five out of the 14 participants directly emphasised social support as being essential in helping them overcome their challenges, four other participants seemed to allude to this by indicating they had experienced/were experiencing difficulties in seeking and/or receiving social support, and that this absence of social support was a challenge. This seemed to hinder their resilience at the time. This is evident in the accounts provided by Participants 5 and 14 regarding the challenges they had experienced in their lives:

P5: … I also feel that if I had more support uh from my family I feel that I would have done better [in University], because my family they are very- they are critics, so you know it is criticism that kind of like brings you down and you lose self-confidence….after that when I failed, when I came back, the challenges that I faced was the- ja, was the lack of support from family like I said. That is the biggest challenge. That was one of the biggest challenge.

P14: ...As much as I have been here for a long time, and I know who I am, it's very important to have people around you. Not necessarily friends but just people you know, people you can just have a laugh a minute a day with so that becomes a challenge for me and because it's difficult to meet new people. I don't get, um should I say network. The right information that I need I can't get that because I don't know people; so some of the things you get them from just knowing people.

These quotes indicate that both participants reported difficulties in accessing social support from parts of their social network; this support was not accessible to Participant 5, and Participant 14 faced challenges in accessing this support despite it being available. This seemed to result in an absence of support, which was experienced as a challenge. This can be seen in Participant 5 indicating that the lack of familial support as one of the biggest challenges he experienced and Participant 14 indicating that her difficulties in forming friends meant she could not get the "right information that I need". These participants thus seemed to emphasise the role that social support may have had in protecting them from

experiencing (further) challenges in their lives. In this way, these participants' accounts seem to have emphasised the role that social support could have played in promoting their resilience. Some participants who reported similar experiences regarding receiving or seeking social support, managed to find solutions to their difficulties in accessing social support. This then formed one of the factors that helped these participants overcome other challenges.

This subtheme thus suggests that the support received from social networks may have played a key role in promoting these participants' resilience. This theme thus indicates that the social support, including psychosocial and informational/ instructional support, seemed to be a key resilience-promoting resource for most participants.

Summary of qualitative results. This section of the results chapter indicated that WM-related processes featured in participants' accounts of their resilience-related experiences, with social factors influencing how some of these processes promoted resilience. In addition to these processes, personal characteristics and social factors also seemed to play a key role in promoting participants' resilience. Social support in particular seemed to be a key resource that promoted participants' resilience.

Conclusion

This chapter presented the results obtained from the quantitative and qualitative phases of the study. The results of the correlations between the AWMA and ARM-RRC measures were largely statistically non-significant. However, the qualitative findings indicated that WM-related processes were among the resources that contributed to participants' resilience. In addition, social support also seemed to be a key resilience-promoting resource. The next chapter will discuss these results in an integrated manner, in relation to the relevant literature. In doing so, the implications that these results may have regarding resilience theory and interventions for young Black South African adults from disadvantaged backgrounds, will be highlighted.

Chapter Five: Discussion

This study investigated the role of WM in the resilience of Black South African young adults using a mixed method approach. This chapter discusses and interprets the findings obtained from the quantitative and qualitative phases of the study. The findings of each phase are briefly discussed in relation to the study's research questions. These findings are then discussed in detail, both separately and in an integrated manner, particularly in relation to the literature reviewed. This is followed by a discussion of the study's limitations and strengths. The chapter concludes with an outline of the study's theoretical and practical implications.

This study explored the role of WM in the resilience of Black South African young adults by 1) quantitatively investigating whether the components of WM, as conceptualised by Baddeley (2000), are related to resilience for Black South African young adults and by 2) qualitatively investigating how WM processes, as conceptualised by Baddeley (2000), feature in Black South African young adults' accounts of their resilience; and how socio-cultural factors feature in these accounts. Based on the literature reviewed, it was hypothesised that WM would be positively implicated in resilience. However, the results from the quantitative phase indicated that the WM scores obtained by participants were mostly not significantly related to their resilience subscale and question cluster scores. In contrast, the qualitative phase found that WM-related processes featured as resilience-promoting resources in participants' accounts of their resilience; and that the manner in which these processes promoted resilience were sometimes shaped by the social context. Other resources (namely, persistence and diligence, positivity, spirituality and social support) were also found to promote participants' resilience. The discrepancy between the findings obtained in the quantitative and qualitative phases may thus be due to the quantitative measurement of WM (AWMA) not capturing the elements of WM processes that enable resilience. The study's findings thus suggest that WM may have played a positive role in the resilience of participants, but this role may have been shaped by the socio-ecological environment. These findings are discussed in detail below, particularly in relation to existing literature in order to help contextualise and better understand these findings.

Discussion of Quantitative Results

The quantitative phase did not unanimously support the study's hypothesis, as the results obtained in this phase regarding the role of WM in resilience were equivocal. Supporting the study's hypothesis, Digit Recall (an element of Verbal STM) was found to be

significantly and positively correlated with spiritual resilience resources. This contradicts research which found verbal WM performance to be similar across resilient and non-resilient adults (Wingo et al., 2010); however, this may be because Wingo et al. (2010), did not use a socio-ecological resilience-specific measure, and measured verbal and visuospatial WM using one subtest of each. This finding of the current study supports most literature which has suggested that WM is positively related to resilience (see Andreotti et al., 2013; Evans et al., 2016; Levens et al., 2016; Wekerle et al., 2012). The Digit Recall subtest taps the phonological store of the multicomponent WM model (Alloway et al., 2008); this finding thus suggests that this component may be positively related to spiritual resilience resources such as spiritual/religious beliefs and actions (Ungar & Liebenberg, 2013). As the phonological store has been positively implicated in vocabulary and literacy acquisition in children (see Baddeley, 2003; 2012), and long term learning in young adults (Ghani & Gathercole, 2013), the store may have allowed for spiritually-related verbal information (that could be used to manage/overcome adverse situations) to be learned and stored in LTM throughout participants' development. This information could then be activated and briefly held in the store when needed. Consequently, this may have helped participants learn about, and engage in, verbal spiritual activities which helped promote their resilience, such as praying to a higher power or reading religious texts. This finding is supported by the qualitative results which indicated that these spiritual activities promoted participants' resilience. Similar activities have been identified as promoting the resilience of Black South African youth in other studies (see Theron, 2016a). Thus Verbal STM, a microsystemic individual factor, may be positively implicated in resilience through its interaction with macrosystemic spiritual ideologies that concretely manifest as microsystemic resilience resources (Bronfenbrenner, 1979; Ungar et al., 2013).

The only other significant relationship between the WM and resilience tests was a negative one. Block Recall (a measure of Visuospatial STM) and Spatial Recall (a measure of Visuospatial WM) significantly and negatively correlated with physical caregiving resources. These findings initially seemed to align with literature which suggested that WM and resilience are negatively related (see Hackman et al., 2010; Melor, & Anderson, 2016; Quidé et al., 2016; Reuben et al., 2016; Schweizer & Dalgleish, 2016; Shonkoff et al., 2012). However, as visuospatial memory involves the storage and manipulation of visuospatial information (Baddeley, 2012), and as physical caregiving resources refer to the provision of family support and having access to food when hungry (Ungar & Liebenberg, 2013; see

Appendix B), these findings do not make theoretical sense. As there seems to be no convincing explanation for these findings, and that many correlational analyses were run in this study, it is possible that these findings might be Type I errors (Beines, 2012). It is thus also possible that the significant result found between spiritual resources and an element of Verbal STM may have been a Type I error.

Also in contrast to the study's hypothesis and other findings, most of the correlations between the WM and resilience scores were non-significant. This contrasted with literature which indicated that WM and resilience are positively related, and that WM may in fact promote resilience (see Andreotti et al., 2013; Evans et al., 2016; Levens et al., 2016; Wekerle et al., 2012; Wingo et al., 2010). Rather, these findings appeared to corroborate literature which found that adversity-related stress negatively affected WM capacity, and which consequently suggested that WM may not be related to resilience (see Hackman et al., 2010; Quidé et al., 2016; Reuben et al., 2016; Schweizer & Dalgleish, 2016; Shonkoff et al., 2012). Although the non-significant correlations obtained in this study suggests that there is no relationship between WM and resilience, these findings do not provide conclusive evidence for this. These findings may have been as a result of the small sample size used in the quantitative phase, which may have led to low power and increased the probability of Type II errors (Rosenthal, 2012). These findings may also have been due to random error (Beines, 2012). Alternatively, these non-significant findings may be as a result of failing to consider the severity of the adversity, and temporal distance since the adversity was experienced, when examining the relationship between WM and resilience. This is because research has indicated that EF may not be impaired amongst individuals who experienced low levels of adversity (Sameroff & Rosenblum, 2006); a finding that supports the socio-ecological model of resilience's principle of differential impact which indicates that resilience resources may have an effect on individuals exposed to low, but not high, adversity and vice versa (Ungar et al., 2013). Research has also indicated that the use of WM processes (specifically updating and evaluating of emotional information) when exposed to adversity may improve as the temporal distance of the adverse experience increases (Levens et al., 2016). The passing of time may allow individuals to learn from their experience and become more adept at utilising these WM processes to adjust to the situation (Levens et al., 2016). It is thus possible that the severity of the adversity experienced by participants, and the temporal distance since the adversity was experienced, may have resulted in the non-significant findings obtained in this phase of the study.

As is evident from this discussion, the findings of the quantitative phase are equivocal, primarily suggesting that WM was not related to, and thus did not play a role in, participants' resilience. The qualitative findings may provide a more in-depth account of whether and how WM played a role in participants' resilience. It is towards these findings that this discussion now turns.

Discussion of Qualitative Results

In the qualitative phase, numerous resilience-promoting resources were identified in participants' accounts of their resilience. Of these, three appeared to be directly related to WM, namely: self-talk, setting and focusing on goals, and finding multiple solutions to a problem.

Most participants' accounts indicated that self-talk promoted their resilience. Self-talk seemed to promote resilience by enabling them to motivate themselves to overcome their challenges, and to reflect on their challenges in order to problem-solve. Participants specifically worked with and manipulated verbal information to self-motivate or problem-solve, while holding the challenges they were experiencing in mind. The use of self-talk in promoting resilience may thus rely on the function of the phonological loop and central executive (Baddeley, 2000). The central executive may have enabled participants to direct their attention to the necessary verbal information, with the phonological loop enabling them to then store and manipulate this information in order to self-motivate or problem-solve during adverse experiences (Baddeley, 2000). In this way, WM may have promoted these participants' resilience. This supports theoretical evidence that WM may facilitate resilience through self-talk (Wekerle et al., 2012). However, the current study does not fully support the theoretical evidence of how WM may promote resilience through self-talk. While theoretical evidence suggests that self-talk may promote resilience by reducing the impact of the visual memory of adverse experiences (Wekerle et al., 2012), the current study did not find whether self-talk actually promoted participants' resilience in this manner. Rather, the self-regulatory function of self-talk (see Alderson-Day & Fernyhough, 2015; Vygotsky, 1986) seemed to help promote participants' resilience in the current study. The self-regulatory function of self-talk guides individuals' cognition and behaviour; this occurs more so when they are faced with demanding or challenging experiences which require conscious reflection (Alderson-Day & Fernyhough, 2015; Vygotsky, 1986). In this way, self-talk may assist individuals with problem-solving (Alderson-Day & Fernyhough, 2015; Vygotsky, 1986) and may serve as a

useful motivational tool (Alderson-Day & Fernyhough, 2015). This reflects how self-talk seemed to operate in promoting participants' resilience in the current study. The self-regulatory function of self-talk, especially covert self-talk, operates through the phonological loop (Alderson-Day & Fernyhough, 2015; Baddeley, 2003). It thus seems that this WM component helped facilitate the process by which self-talk promoted participants' resilience. As EF broadly is positively linked to self-talk (Alderson-Day & Fernyhough, 2015) and is implicated in self-regulation (see Hofmann et al., 2012), high EF may also have helped facilitate the process by which self-talk promoted participants' resilience. Social factors may also have contributed to this process, as self-talk develops through the internalisation of socially-communicated cultural knowledge (Vygotsky, 1986).

Another resource identified as promoting participants' resilience, which appeared to be directly related to WM, was setting and focusing on goals. Similarly, a review of South African resilience research found goal-orientation to be a personal resilience-promoting resource (see Theron & Theron, 2010). In the current study, the setting and focusing on personal goals seemed to help motivate participants to overcome their challenges, such that they engaged in goal-directed behaviour to overcome these. As the components of WM (Baddeley, 2000) allow individuals to store and manipulate information in ways that enable them to engage in goal-directed behaviour (D'Esposito; 2007; Diamond, 2013), WM may have promoted their resilience by enabling them to engage in this way. While the literature reviewed did not indicate that this function of WM may promote resilience (see Andreotti et al., 2013; Evans et al., 2016; Levens et al., 2016; Wekerle et al., 2012; Wingo et al., 2010), this finding of the current study provides evidence supporting this literature as it also indicates that WM may promote resilience. As efficient EF also enables individuals to develop, set and plan short-term, long-term or abstract goals, and to flexibly initiate, execute, monitor and regulate the behaviour required to achieve these goals (Lezak, Howieson, Bigler, & Tranel, 2012), efficient EF may have facilitated the process by which setting and focusing on goals promoted participants' resilience. This seems likely since the primary components of EF are underpinned by a common EF-factor which enables individuals to maintain and manage goals and goal-related information that is then used in lower-level processing (Miyake et al., 2000; Miyake & Friedman, 2012). Some scholars also argue that the primary purpose of EF is to facilitate goal-directed behaviour (see Barkley, 2012). That EF may have facilitated the process by which setting and focusing on goals promoted participants' resilience supports local and international literature which suggests that good EF promotes

resilience (eg., see Bonanno et al., 2015; Feder et al., 2009; Masten & Wright, 2010; Rutter, 2013; Theron, 2016a; Theron & Donald, 2013; Wu et al., 2013).

The social context seemed to influence the process by which EFs, like WM, promoted participants' resilience by enabling them to set and work towards goals that helped them overcome their challenges. This is because some participants' personal goals were found to be driven by the broader goal of helping others within their social network. Participants seemed to formulate social goals on the basis of their interactions with various ecological settings (the microsystemic family level or the macrosystemic country level) where these goals shaped their personal goals in microsystemic settings. The setting of, and focusing on, a goal thus seems to have promoted participants' resilience by operating through the interactions between EF-related resources present in the microsystem, and socio-motivational factors present within and beyond the microsystem (Bronfenbrenner, 1979). This supports literature which suggests that EF, like WM, can promote resilience through socio-ecological collaboration (see Malindi & Theron, 2010b; Theron, 2013; Theron et al., 2013; Theron & Theron, 2014).

The last resilience-promoting resource which seemed to directly relate to WM was finding/generating multiple solutions to challenges. As mentioned previously, this corroborates literature which suggests that efficient WM systems may promote resilience by enabling individuals to generate and evaluate multiple possible novel solutions to adverse circumstances (Evans et al., 2016; Williams et al., 2009). It seems this may have specifically involved the efficient functioning of the episodic buffer and the central executive (Baddeley, 2000). This is because the buffer is able to construct new cognitive representations and subsequently facilitate problem-solving, a function that the central executive enables by influencing the content of the buffer through regulating the spread of attention (Baddeley, 2000). As other EFs also facilitate problem solving (Miyake et al., 2000), effective EF may also have promoted participants' resilience by enabling them to find multiple solutions to their problems. This supports theoretical evidence that EF may promote resilience by enabling individuals to assess incoming information, and flexibly consider varying courses of action, in order to solve problems arising from adversity (Masten & Wright, 2010). This finding also supports reviews of resilience research which have indicated that problem-solving ability is a key resilience-promoting resource amongst South Africans (see Theron & Theron, 2010), including young Black South Africans (see Theron, 2016a).

For some participants, the process of finding/generating multiple solutions to their challenges was influenced by their direct social network. These participants were able to find solutions to their problems not only through their individual EF abilities such those related to WM, but also through their relationships with others in their microsystems (Bronfenbrenner, 1979; Ungar et al., 2013) who held valuable information that assisted participants to solve their problems. This finding supports literature which has indicated that, while problem-solving may promote resilience, it is necessary for the socio-ecological environment to help youth to attain the information required to problem-solve (see Malindi & Theron, 2010a; Theron, 2015). It also supports the findings of Theron et al. (2013) that Basotho youths' ability to solve problems was observed (by community-affiliated adults) to be dependent on the support that they received from their social systems. It thus seems that although WM may have promoted participants' resilience by enabling them to find multiple solutions to a problem, this may have been dependent on the mesosystemic support that they received (Bronfenbrenner, 1979).

The discussion of the above findings thus suggests that efficient WM ability may have enabled participants to engage in the processes of self-talk, setting and focusing on goals, and finding multiple solutions to a problem, and that these in turn may have promoted their resilience. However, the processes by which these resources promoted resilience may have been shaped by the social context. This is in accordance with the socio-ecological model of resilience's principle of cultural moderation, which indicates that the socio-cultural context influences how individuals navigate to, and negotiate for, resilience resources (Ungar et al., 2013). The qualitative findings also indicate that these may not be the only resources which promoted the resilience of these participants. This is because other resources such as persistence and diligence, positivity, spirituality and social support were also identified as promoting resilience. These findings are now discussed.

Persistence and diligence were among the personal resources identified as promoting participants' resilience. Specifically, participants' awareness of the utility of persistence and diligence in challenging circumstances, and their possession of either/both abilities, seemingly promoted their resilience. This finding reflects international resilience literature (see Archana, Parkash, & Kumar, 2016), as well as South African literature which has indicated that determination (Theron, 2016a) and perseverance (Theron, 2013) are amongst the key personal resilience resources for Black South Africans. While this suggests that persistence and diligence were microsystemic personal resources that promoted participants'

resilience, these factors were sometimes shaped by participants' interactions with their social network. These social networks informed participants of the utility of persistence and diligence in overcoming challenging circumstances, and encouraged participants to use these abilities in the face of their challenges. This suggests that experienced significant others enabled participants to learn about the utility of persistence and diligence in overcoming challenging circumstances (cf. Feuerstein & Lewin-Benham, 2012). Such mediated learning may have positively influenced participants' motivation and cognition, and subsequently behaviour (cf. Feuerstein & Lewin-Benham, 2012). It is thus possible that WM facilitated the process in which persistence and diligence promoted participants' resilience. It also seems that persistence and diligence facilitated participants' resilience through mesosystemic interactions, as the information and support these participants received regarding these abilities in one or more microsystemic settings were translatable to the microsystemic settings where the challenges were experienced (Bronfenbrenner, 1979). Persistence and diligence may thus have been socially-motivated resilience promoting resources for participants.

Positivity was another resource identified as promoting participants' resilience, though internal and external means. Internal positivity was found to be an innate, microsystemic ability which motivated participants to overcome challenging circumstances, sometimes also enabling the positive reappraisal/reframing of these circumstances. Similarly, reviews of international resilience literature have indicated that positive emotions and thinking help promote resilience (see Ong, Bergeman, & Chow, 2010; Wright, Masten, & Narayan, 2013). South African literature has also indicated that positive reappraisal/attitude is amongst the personal resources that have been found to promote South African citizens' resilience (Theron & Theron, 2010), including Black South African adults (Theron, 2013). Working memory may have helped facilitate this process as it is positively related to secondary control coping, a form of coping that comprises of positive thinking and cognitive restructuring strategies (Andreotti et al., 2013; Evans et al., 2016). Participants may thus have used secondary control coping to become resilient, as has previously been found (see Archana et al., 2016). In terms of external positivity, external support was found to encourage the use of internally-sourced positivity to overcome challenges, and externally-sourced positivity was found to guide and encourage participants to overcome their challenges. This supports research that family influenced Black South African university students' cognitive appraisal of adverse situations, thereby affecting their meaning making and in turn, their resilience (Theron & Theron, 2014). This suggests that participants' relationships with others

in their ecological environment, including the support they were provided and able to use through mesosystemic interactions, promoted their resilience (Bronfenbrenner, 1979). Positivity thus appeared to be an internally- and externally-sourced resilience-promoting resource for most participants.

Another resource that was identified as promoting participants' resilience was personal and social spirituality. International literature has also indicated that spirituality may contribute to resilience (see Masten, 2014b). In terms of personal spiritualty, personal spiritual beliefs and actions provided participants with a personal support structure that facilitated their resilience. This included praying to a higher being and reading the Bible. It thus seems that macrosystemic spiritual ideologies featured concretely in the lower levels of the socio-ecological environmental in terms of participants' individual spiritual beliefs and actions and these then helped promote their resilience (Bronfenbrenner, 1979; Ungar et al., 2013). In terms of social spirituality, participants who shared macrosystemic spiritual beliefs and/or activities with others in microsystemic settings, seemed to find support through this sharing (Bronfenbrenner, 1979). This support promoted their resilience. These findings corroborate research which has found personal and social spiritual beliefs and actions to be key to the resilience processes of Black South African young people (see Theron, 2016a for a review). This suggests that personal and social spirituality, by providing personal and social support, promoted the resilience of most participants.

The final common resource identified as having promoted most participants' resilience was seeking and receiving social support. Social networks seemed to facilitate resilience by providing participants with encouragement, material resources such as food and money, and information/instruction regarding what resources participants could access to overcome their challenges and where to access them. Similarly, a review identified that the valuing of active social support systems was part of Black South African youth's resilience processes (Theron, 2016a). These youth drew on the available social support (emotional and/or material) offered by extended family systems, or adult community members who acted in a kin-like manner (Theron, 2016a). In the current study, social support was identified as being a key resilience-resource for some participants. Other participants seemed to allude to the importance of this resource, by indicating they had experienced difficulties in seeking and/or receiving social support. The absence of social support was a challenge that placed participants at risk. This suggests the level of support provided by significant others in participants' various microsystemic settings may have interacted with their microsystemic

personal characteristics (Bronfenbrenner, 1979). These interactions may have facilitated participants' resilience only if there was adequate social support, and they had the ability to access this. These findings support international literature which indicates that social relationships are key to resilience (see Ungar, 2013a; 2013b).

These qualitative findings suggest that there are many resources, including but not limited to WM-related processes, which promoted participants resilience. They also indicate that WM, at least as an EF component, may have contributed to the processes by which these resources promoted resilience. Although each resource seems to have been universally-identified as resilience resources, each resource was shaped by factors unique to these participants' socio-cultural context. These findings thus suggest that WM was one resource which promoted participants' resilience, and that its impact in promoting their resilience cannot be divorced from their socio-ecological environment.

Mixed Method Findings

The quantitative and qualitative findings discussed can be examined together to indicate the role of WM in participants' resilience. While the largely non-significant quantitative findings suggest that WM did not play a role in participants' resilience, the qualitative findings suggest that WM-related processes played a positive role in resilience, by promoting participants' resilience. These discrepant findings may be explained by examining the quantitative and qualitative findings together. As the qualitative findings indicate that these processes may be influenced/shaped by the environmental context, the difference between the quantitative and qualitative findings may have been as a result of using the AWMA to measure WM in the quantitative phase. As the AWMA is an individualistic measure of WM, this measure would have been unable to measure socially-driven, WM-related resilience processes, resulting in the non-significant findings obtained in the quantitative phase. Hence, WM may have played a positive role in participants' resilience, but this role may have been influenced by social factors that were not measurable using an individualistic WM measure.

This seems to be further supported by other qualitative findings which suggest that WM may have contributed to the operation of other resources that were identified as promoting participants' resilience. The significant and positive relationship between an element of Verbal STM and spiritual resources seems to reflect this. This may contradict the explanation provided above regarding the discrepant findings obtained across the phases, as

this raises the question of why WM did not contribute to the operation of other resilience resources measured in the resilience measure (RRC-ARM). However, contrary to the presence of RRC-ARM items which directly measured spiritual resources, it is possible that the other resilience resources identified in the qualitative phase, which WM may have contributed to, were not directly measured in the RRC-ARM. This may account for the primarily non-significant correlations between the working memory (AWMA) scores and scores obtained on other subscales and questions clusters of the RRC-ARM.

When integrating the qualitative and quantitative findings together, it becomes apparent that experimentally measuring WM in resilience research may not be the best way of investigating whether WM plays a role in resilience. This is because the manner in which WM may influence resilience cannot be considered separately from the socio-ecological environment. This is reflected by the other qualitative findings, where WM was found to be one of a set of resources, and perhaps not the most important, that promoted participants' resilience. The findings thus suggest that WM played a positive role in participants' resilience, but this role was shaped by socio-cultural factors.

There may be alternative explanations for the findings discussed above, and consequently for any tentative conclusions made regarding the role of WM in resilience. Firstly, as literature indicated that a broad set of EFs underpinned the WM-related resilience processes identified in the qualitative phase, the difference between the quantitative and qualitative findings may lie in the fact that, in the WM test, participants were tapping general EF ability as a resilience resource. This is supported by the inter-correlations found between the verbal and visuospatial components of the WM test, as indicated in the results. While the qualitative phase allowed for the role of general EF ability in promoting resilience to be identified, this was not possible in the quantitative phase since only WM was measured in this phase. Given that general EF ability seemed to underpin the WM-related resilience resources identified in the qualitative phase, and that WM is an inextricable component of EF (see Hofmann et al., 2012; Miyake et al., 2000), it is perhaps through general EF ability that WM may play a role resilience. Therefore, general EF ability may have been positively related to, and promoted, participants' resilience. Secondly, it is also possible that WM may not have played a role in participants' resilience. Although the qualitative findings provided evidence for WM playing a positive role resilience, because the identification of the WM-related resources in the qualitative phase were shaped by existing literature and researcher expectations, these findings may be biased. Steps were taken to ensure as far as possible that

all findings were clearly supported by the data, while being cognizant of biases present. The findings thus largely seem to provide evidence that WM, as a possibly inextricable component of EF, played a positive role in the resilience of participants.

Limitations and Suggestions for Future Research

Although the findings discussed offer some evidence for WM playing a positive role in resilience, these should be considered in relation to the limitations of this study. These limitations are now discussed, together with recommendations for future research.

One limitation of this study (particularly the quantitative phase) is that its primary focus was on how an individual resource (WM) was related to resilience. This may have resulted in an overwhelming focus on measuring resilience as a person-centred construct and a neglect of socio-cultural factors which contributed to participants' resilience. This is a concern since these latter factors may play a greater role in resilience (see Theron, 2016b; Ungar, 2013a). However, some of the study's methodological choices compensated for this, as will later be discussed. Secondly, some of the designs used in this study were limited. The cross-sectional design was problematic, as resilience is a process characterized by constant change over time (Theron, 2016a; Van Rensburg et al., 2015). Future research should adopt longitudinal designs when investigating the relationship between WM and resilience. The need for longitudinal research on this topic is highlighted by research which indicates that the relationship between WM and adversity may change with time (Levens et al., 2016), suggesting that the relationship between WM and resilience may also change over time. The correlational design used in the quantitative phase was also limiting as it prevented causal conclusions from being drawn and increased the study's vulnerability to threats to internal validity (Stangor, 2014). However, this design seemed appropriate to use, since there is a dearth of research regarding the relationship between the components of WM and resilience. A correlational design may have helped to elucidate the nature of the relationship between these variables, a necessary investigation since a pre-condition of drawing causal inferences is that the variables of interest correlate with each other (Stangor, 2014). Nevertheless, it is recommended that future research adopt more complex designs to investigate the relationship between WM and resilience.

A limitation applicable to both phases of the study may be the provision of incentives to participate, as incentives may yield volunteer participants who have characteristics that differ from others in the population of interest, and may be an artifact in the research (see

Rosenthal & Rosnow, 2009/1974). As discussed in the 'Sample and Sampling Strategy' subsection of Chapter 3, there were other concerns regarding the samples and sampling methods used. While these sampling choices were justified, the non-random sampling of a very specific group of individuals may impact the study's ecological validity. The small size of the sample used in the quantitative phase was particularly problematic in relation to this. As discussed, this may have also accounted for the primarily non-significant results obtained in the quantitative phase. Future quantitative research investigating the relationship between WM and resilience should use more diverse samples, and attempt to use probability methods to obtain these. The composition of the qualitative sample as a smaller subset of the quantitative sample may also be problematic since this may have compromised the validity of the mixed method findings to some extent (Creswell & Plano Clark, 2011). However, this allowed for in-depth investigation of the phenomena of interest in the qualitative phase where a larger sample may have hindered this. The qualitative phase may also be critiqued in that the research was not participatory in nature, which may have enabled a richer emic account of participants' resilience resources (see Theron & Theron, 2010).

The quantitative phase also had a number of other limitations. The use of the RRC-ARM to measure resilience may be a limitation because the RRC-ARM's psychometric properties are still under investigation (Ungar & Liebenberg, 2013), with no South African research as yet available. Future research should investigate the RRC-ARM's psychometric properties in the South African context. Although the RRC-ARM was found to have a high overall internal consistency reliability in this study, an additional limitation were the low internal consistency reliabilities found for some of the RRC-ARM's question clusters. This may have been due to the small number of items that each of these question clusters comprise of (Nunnally & Bernstein, 1994). Another limitation of the quantitative phase may be that the types, quantity, severity and impact of risks associated with a low SES/disadvantaged background were not measured. This is limiting as these factors may have influenced participants' resilience processes (see Ungar, 2015; Van Rensburg et al., 2015). Future quantitative resilience research regarding the relationship between WM and resilience should ensure that these factors are measured and analysed. Further limitations of the quantitative phase lie with the data analysis. Firstly, the conversion of the data to z-scores may have resulted in a loss of meaning and variability provided by the raw scores (Kline, 2000; Roodt, 2013). Secondly, the examination of only one variable (WM) in relation to resilience, in addition to the small sample size, in this phase prevented the use of sophisticated statistical

analysis which is a critique of quantitative resilience research (see Van Rensburg et al., 2015). It is thus recommended that future quantitative resilience research utilise other methods of data transformation (see Kline, 2000; Roodt, 2013), and conduct more sophisticated research regarding the relationship between WM and resilience.

Strengths

While this study has its limitations, it is not without its strengths, some of which may have compensated for the limitations discussed above. A primary strength is that minimal international research has investigated the relationship between WM and resilience (Curtis & Cicchetti, 2003; Wingo et al., 2010), with seemingly no research having investigated the relationship between these constructs in the South African context. This is concerning since the processes by which resources may influence resilience are shaped by the socio-cultural context (see Theron, 2015; Ungar, 2011). Very little research with Black South African young adults has investigated how universally-identified resilience resources, such as EF, are shaped by their socio-cultural context (Masten & Wright, 2010; Theron, 2016b). This study thus addressed this gap by investigating the relationship between these constructs among Black South African young adults from disadvantaged backgrounds. Focus was accorded to this group since they were more likely to grow up in contexts where exposure to adversity is greater (Dass-Brailsford, 2005; Du Preez, 2013). They may thus benefit from interventions that could be developed from such research. A key strength of this study thus lies in its significant contribution to the literature regarding the relationship between WM and resilience amongst Black South African young adults.

Other strengths of this study lie in some of its theoretical and methodological approaches. Firstly, the socio-ecological model of resilience as the theoretical framework of resilience, allowed for an understanding of how resilience was conceptualised and operationalised in this study. This was in line with recommendations that resilience be defined in this manner (see Theron & Theron, 2010; Ungar, 2011; Ungar et al., 2013). The adoption of this framework also helped this study to avoid the limitations and critiques, including ethical concerns, associated with adopting person-centred conceptualisations of resilience (see Van Rensburg et al., 2015). This was furthermore enabled by quantitatively measuring resilience using the RRC-ARM, a socio-ecological measure of resilience. Thus, although there may be some concern regarding the use of the RRC-ARM to measure resilience in the quantitative phase, the use of this instrument may be considered a strength

given the critiques associated with failing to measure resilience in this manner (see Van Rensburg et al., 2015). The use of this measure may thus also have served to balance the person-centred focus in the quantitative phase. An additional strength of using this measure was that resilience was measured using a resilience-focused instrument. This is absent in most other resilience research (see Theron & Theron, 2010; Van Rensburg et al., 2015).

A number of strengths of this study lie in its mixed method design. The need for adopting mixed method designs in resilience research has been highlighted by experts in the field (Theron & Theron, 2010; Ungar, 2012a). Such designs are likely to produce more credible findings, as they may provide a better account of how resilience can be understood in specific cultural contexts (Ungar, 2003). The use of a mixed method design may have also served to provide a counterbalance for the quantitative and qualitative methods (Creswell & Plano Clark, 2011; He & Van de Vijver, 2011). For example, the qualitative phase allowed for investigating participant's accounts of what resources, including but not limited to WM, promoted their resilience and how they did so. This helped to compensate for the quantitative phase's primary focus on WM in relation to resilience. The use of this sophisticated design may thus have compensated for the more basic research and analyses used in the quantitative phase. As the qualitative phase also involved asking participants of any challenges they had experienced throughout their lifespan, this somewhat compensated for the cross-sectional nature of the study, as well as the quantitative phase's lack of measurement regarding the types, quantity, severity and impact of risks associated with coming from a low SES/disadvantaged background. The adoption of these theoretical and methodological approaches thus enabled the study to address the gaps in the research regarding whether, and how, WM may play a role in the resilience of Black South African young adults.

Conclusion

In conclusion, the findings of this study suggest that WM, as conceptualised by Baddeley (2000), may have played a positive role in participants' resilience. The impact of WM on the resilience of these participants seemed to be shaped by socio-cultural factors, where WM was just one amongst many resources that facilitated their resilience. These findings have valuable theoretical and practical implications. Theoretically, they support the socio-ecological model of resilience, which indicates that there are multiple pathways to resilience, and that resilience occurs through an individual's reciprocal interactions with the environment (Ungar et al., 2013). The findings also support the theory's tenet that there are

individual, relational and contextual factors which work together to promote their resilience (Ungar, 2011). The findings of this study may thus be used to develop contextually-relevant theoretical understandings of how WM may be related to, and perhaps promote, the resilience of Black South African young adults (see Ungar, 2005). The study's findings may also have practical value. Black South Africans are more likely to grow up in disadvantaged circumstances, and consequently be exposed to adversity and its effects (see Dass-Brailsford, 2005; Du Preez, 2013).These effects may possibly be exacerbated by other risk factors they may face by being young adults in South Africa (see Dass-Brailsford 200; Mokgele, & Rothmann, 2014; Statistics South Africa, 2016). The study's findings regarding the relationship between WM and resilience of these young adults may thus contribute to developing resilience-promoting interventions for this group (Masten & Wright, 2010). Given that universally-identified resilience processes such as EF are shaped by the socio-cultural context (Theron, 2015; 2016b; Ungar, 2012), the global lack of research on how specific EF components like WM may be related to resilience (Curtis & Cicchetti, 2003; Wingo et al., 2010), and the limitations of the current study, it is important that future research investigates how these cognitive processes feature in the resilience of individuals from various cultural contexts.

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Appendices

Appendix A

Demographic Questionnaire

CODE | | | | |

Demographic Questionnaire

Full Name: _____

Gender: M F Date of Birth: D D M M Y Y Y Y

Student Number: _____

Cell No.: _____ Email: _____

Home Language: _____ School Language: _____

Current Degree & Faculty:_____

Previous degrees or qualifications: _____

Current year of study (1st, 2nd, 3rd): _____

How many years have you been at university? _____

Did you ever fail a grade at school? If so, which one? _____

Did you attend pre-primary school? _____

Living Amenities & Caregiving

Educational and occupational status of your parents or primary caregivers:

Mother: Level of Education		**Father: Level of Education**	
No schooling		No schooling	
Less than primary school completed		Less than primary school completed	
Primary school completed		Primary school completed	
Secondary school not completed		Secondary school not completed	
Secondary school completed		Secondary school completed	
Tertiary education completed		Tertiary education completed	
Other		Other	
Current occupation:		Current occupation:	

Marital status of primary caregivers:

Married	
Living together as husband and wife	
Widow/widower	
Divorced/separated	
Never married	

Number of caregivers in the household (please tick):

0	
1	
2	
>2	

Living Standards Measure:

Please answer the following questions according to your circumstances while growing up, and not in your current student accommodation if these are different.

Question	Answer	
1. I have the following in my household:		
TV set	TRUE	FALSE
VCR	TRUE	FALSE
DVD player	TRUE	FALSE
M-Net/DStv subscription	TRUE	FALSE
Hi-fi/music centre	TRUE	FALSE
Computer / Laptop	TRUE	FALSE
Vacuum cleaner/floor polisher	TRUE	FALSE
Dishwashing machine	TRUE	FALSE
Washing machine	TRUE	FALSE
Tumble dryer	TRUE	FALSE
Home telephone (excluding a cell)	TRUE	FALSE
Deep freezer	TRUE	FALSE
Fridge/freezer (combination)	TRUE	FALSE
Electric stove	TRUE	FALSE
Microwave oven	TRUE	FALSE
Built-in kitchen sink	TRUE	FALSE
Home security service	TRUE	FALSE
3 or more cell phones in household	TRUE	FALSE
2 cell phones in household	TRUE	FALSE
Home theatre system	TRUE	FALSE
2. I have the following amenities in my home or on the plot:		
Tap water in house/on plot	TRUE	FALSE
Hot running water from a geyser	TRUE	FALSE
Flush toilet in/outside house	TRUE	FALSE
3. There is a motor vehicle in our household	TRUE	FALSE
4. I am a city dweller	TRUE	FALSE

5. I live in a house, cluster or town house	TRUE	FALSE
6. I live in a rural area outside Gauteng and the Western Cape	TRUE	FALSE
7. There are no radios, or only one radio (excluding car radios) in my household	TRUE	FALSE
8. There is no domestic workers or household helpers in household (both live-in & part time)	TRUE	FALSE

When you lived at home, how many days a week was your parent/guardian/caregiver at home when you did the following things?

1. When you woke up in the morning?	No days	1 Day	2 Days	3 Days	4 Days	5 Days or more	Not applicable
2. When you came home from school or work?	No days	1 Day	2 Days	3 Days	4 Days	5 Days or more	Not applicable
3. When you went to bed at night?	No days	1 Day	2 Days	3 Days	4 Days	5 Days or more	Not applicable

Think of the person that is most like a mother and most like a father to you, that you spend a lot of time with. Who are these people? Please mark ONLY one "X" in *each* column.

	A. My mother figure is my . . .	B. My father figure is my . . .
Biological mother/father	1	1
Adoptive mother/father	2	2
Stepparent, girlfriend/boyfriend or partner of legal guardian	3	3
Foster mother/father	4	4
Grandparent, aunt/uncle, or other relative	5	5
Another person (please specify)	6	6
Nobody	7	7

Thinking of the mother and father figures you identified above, how much affection do you receive from each of these people? Please mark one "X" in *each* column.

	A. Mother figure	B. Father figure
A great deal	3	3
Some	2	2
Very little	1	1
None at all	0	0
Not applicable	99	99

Overall, how would you describe your relationship with the mother and father figures you identified above? Please mark one "X" in *each* column.

	A. Mother figure	B. Father figure
Very close	3	3
Somewhat close	2	2
Not very close	1	1
Not applicable	99	99

Does your childhood primary caregiver have any mental illness?

YES	NO

If yes, please state what_____

Your health:

Do you have any chronic illness?

YES	NO

If yes, please specify_____

Do you know your HIV status? Please circle one:

HIV positive HIV negative Unknown

If HIV positive, are you currently taking antiretroviral treatment?

YES	NO

Please state the length of time that you have been on this medication_____

THANK YOU FOR YOUR TIME AND CO-OPERATION

Appendix B

RRC-ARM Complete Scale, Subscales, Question Cluster Divisions

OPTION 1: SECTION C

To what extent do the sentences below describe you? Circle one answer for each statement.

	Not at All	A Little	Some -what	Quite a Bit	A Lot
1. I have people I can respect in my life	1	2	3	4	5
2. I cooperate with people around me	1	2	3	4	5
3. Getting and improving qualifications or skills is important to me	1	2	3	4	5
4. I know how to behave in different social situations	1	2	3	4	5
5. My family have usually supported me through life	1	2	3	4	5
6. My family know a lot about me	1	2	3	4	5
7. If I am hungry, I can get food to eat	1	2	3	4	5
8. I try to finish what I start	1	2	3	4	5
9. Spiritual beliefs are a source of strength for me	1	2	3	4	5
10. I am proud of my ethnic background	1	2	3	4	5
11. People think that I am fun to be with	1	2	3	4	5
12. I talk to my family/partner about how I feel	1	2	3	4	5
13. I can solve problems without harming myself or others (e.g. without using drugs or being violent)	1	2	3	4	5
14. I feel supported by my friends	1	2	3	4	5
15. I know where to get help in my community	1	2	3	4	5
16. I feel I belong in my community	1	2	3	4	5
17. My family stands by me during difficult times	1	2	3	4	5
18. My friends stand by me during difficult times	1	2	3	4	5
19. I am treated fairly in my community	1	2	3	4	5
20. I have opportunities to show others that I can act responsibly	1	2	3	4	5
21. I am aware of my own strengths	1	2	3	4	5
22. I participate in organized religious activities	1	2	3	4	5
23. I think it is important to support my community	1	2	3	4	5
24. I feel secure when I am with my family	1	2	3	4	5
25. I have opportunities to apply my abilities in life (like skills, a job, caring for others)	1	2	3	4	5
26. I enjoy my family's/partner's cultural and family traditions	1	2	3	4	5
27. I enjoy my community's culture and traditions	1	2	3	4	5
28. I am proud to be a citizen of _____ (insert country)	1	2	3	4	5

Individual

Individual: Personal Skills

2. I cooperate with people around me
8. I try to finish what I start
11. People think that I am fun to be with
13. I can solve problems without harming myself or others (e.g. without using drugs or being violent)
21. I am aware of my own strengths

Individual: Peer Support

14. I feel supported by my friends
18. My friends stand by me during difficult times

Individual: Social Skills

4. I know how to behave in different social situations
15. I know where to get help in my community
20. I have opportunities to show others that I can act responsibly
25. I have opportunities to apply my abilities in life (like skills, a job, caring for others)

Relationship with Primary Caregiver

Caregiver: Physical Caregiving

5. My family has usually supported me through life
7. If I am hungry, I can get food to eat

Caregiver: Psychological Caregiving

6. My family knows a lot about me
12. I talk to my family/partner about how I feel
17. My family stands by me during difficult times
24. I feel secure when I am with my family
26. I enjoy my family's/partner's cultural and family traditions

Context

Context: Spiritual

9. Spiritual beliefs are a source of strength for me
22. I participate in organized religious activities
23. I think it is important to support my community

Context: Education

3. Getting and improving qualifications or skills is important to me
16. I feel I belong in my community

Context: Cultural

1. I have people I can respect in my life
10. I am proud of my ethnic background
19. I am treated fairly in my community
27. I enjoy my community's culture and traditions
28. I am proud to be a citizen of _____ (insert country)

Appendix C

Interview Schedule

Introduction:

Hi.

I am Nabeelah, we spoke over the phone/email. Thanks for agreeing to participate in my study. Before we begin, I just want to reassure you that I will keep anything that you say during the course of this interview, confidential. Only my supervisor and I will have access to what is said, and she too will keep anything said confidential. Once the study has been completed, all recordings of the interview will be deleted. Although I have met with you directly; confidentiality will be maintained as any personal information you provide will not be put in the report.

This study is completely voluntary and you are free to withdraw at any time. Please note that the results of the interview will be reported as general trends or themes and no individual identifying information will be included. You are also free to refuse to answer any of the questions during the interview. A summary of the final report will be made available to you upon your request, approximately 12 months after the conclusion of the interviews. Should you require any other information, do not hesitate to email me, and I will try to answer your queries as best I can.

Before we begin, I need you to please read and sign these two consent forms (See Appendices G and H).

Thanks. If you are okay with it, we can now begin the interview.

Interview Schedule:

Interview Schedule:

1. Please can you tell me a little about the personal challenges that you have experienced in your life?

2. Can you tell me a little bit about how you have overcome these challenges?

Probing Questions:

- Can you describe the solutions that you developed to overcome these challenges?
- What would you say helped you come up with these solutions?
- What resources do you think helped you overcome these challenges, and how did you access these resources? For example, any personal characteristics or social factors that have helped you overcome these challenges.

3. Would you say that there were instances where your solutions were threatened by further challenges, or did not immediately work? How did you deal with such instances?

4. Can you describe any opportunities that were made available to you, that helped you overcome these challenges?

5. Can you tell me a little bit about your goals and aspirations, and whether having these goals/aspirations has helped you overcome the challenges you have faced?

Probing Questions:

- Can you please describe how these goals and aspirations have helped you overcome the challenges you have faced? Can you give me an example of how a goal/aspiration has helped you overcome a challenge you have faced?
- OR Can you please tell me a little about why having these goals/aspirations did not help you overcome the challenges that you have faced?

6. Please can you tell me a little bit about the plans you have made to achieve these goals and aspirations? This can include day-to-day plans aimed at achieving larger goals. For example, the planning strategies you have used to help you keep up with academic demands, in order to achieve your degree.

7. Can you give me an example/examples of any challenges/difficulties you have faced, that have affected these plans? How did you deal with this?

8. How would you describe the role that other people have played in helping you overcome these challenges, if any?

Probing Questions:

- Can you tell me a little about whether, and how, your relationships with family/friends/loved ones has helped you overcome these challenges?

9. What role has cultural values or religious beliefs played, in helping you overcome these challenges?

10. Do you know of other people who have faced similar challenges? How have they dealt with these challenges?

11. Can you tell me a little bit about the challenges faced by your community, and how your community has dealt/is dealing with these challenges?

12. Would you like to add any additional comments or information you feel we have not discussed thus far?

Thank you for your time and assistance.

Appendix D

Ethics Clearance Certificate

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

HUMAN RESEARCH ETHICS COMMITTEE (SCHOOL OF HUMAN & COMMUNITY DEVELOPMENT

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER: MPSYC/16/001 IH**
PROJECT TITLE:	The relationship between working memory and psychological resilience
INVESTIGATORS	Bemath Nabeelah
DEPARTMENT	Psychology
DATE CONSIDERED	30/05/16
DECISION OF COMMITTEE*	Approved

This ethical clearance is valid for 2 years and may be renewed upon application

DATE: 30 May 2016

CHAIRPERSON
(Professor Brett Bowman)

cc Supervisor:

Prof. K Cockroft
Psychology

DECLARATION OF INVESTIGATOR (S)

To be completed in duplicate and **one copy** returned to the Secretary, Room 100015, 10th floor, Senate House, University.

I/we fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure be contemplated from the research procedure, as approved, I/we undertake to submit a revised protocol to the Committee.

This ethical clearance will expire on 31 December 2018

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Appendix E

Information/Invitation Letter

School of Human and Community Development
Private bag 3, Wits 2050, Johannesburg, South Africa
Tel: 27 (0)11 717 4511

Dear Student,

My name is Nabeelah, and I am currently completing my Master's degree in Social and Psychological Research. In 2012, you participated in a research project that aimed to identify some of the abilities that predict academic performance in high potential university students. You completed a computerised memory assessment, and some written questionnaires about your language proficiency and home circumstances.

I am conducting further research in this area in order to complete my degree, and would like to know more about the things that help you to cope in life and to succeed academically. Consequently, I am asking whether you would be willing to participate in my study. Please note that my study comprises of two parts; however, should you volunteer to participate in Part 1 of the study, this has no bearing on you having to participate in Part 2. In exchange for your participation in both parts of this study, you will receive a payment of R150.00 to reimburse you for any travel expenses incurred, and to compensate you for your time. A payment of R75.00 will be made for participation in each part. Please find further details regarding each part of the study, below.

Part 1:

In this part of the study, I would like you to fill out two brief questionnaires. The first one is about personal, relationship and environmental resources that help you cope in life. This will

take approximately 10-15 minutes. I would also like you to review the demographic questionnaire that you filled in, in 2012 and let me know whether any of your circumstances have changed. This should not take more than 10 minutes. It will be necessary for you to come to an office on the University campus to fill out the questionnaires. Should you be willing to participate, but unable to come to the University campus, an online questionnaire can be made available.

Should you agree to participate, your personal information will be treated as confidential, and no-one else will know your responses on the questionnaires. I will keep your information securely and transfer it to an anonymous database for further analysis. Your anonymity is guaranteed when the findings from this study are published or presented, as only group results will be referred to. Please note that as this study forms part of a larger project, we would like to store (archive) the additional results obtained in this study alongside your previous results. This will only be done if you give permission for this take place.

You are free to leave the study at any time should you wish to, and you will experience no penalty whatsoever should you choose to leave.

Please note that if at any point you feel as if you require someone to talk to, please feel free to contact the Emthonjeni Community Psychology Clinic or the Student Centre for Careers and Counselling Development Unit (contact details provided below) which offer free counselling.

A summary of the final report will be made available upon request, approximately 12 months after the interviews have taken place.

Should you also be interested in participating in Part 2 of the study, please continue reading onto the next section. If not, please refer to the part of this letter titled ‘Further Information’. This section will provide information regarding the steps to take for receiving answers to queries you may have, and for indicating whether you would like to participate in this part of the study.

Part 2:

In this part of the study, I would like to ask you to participate in an interview. The interview will involve me asking you a few questions regarding the challenges that you have faced in your life, how personal, relationship and environmental resources have helped you cope with these challenges.

Should you be willing to participate, your participation will involve an interview that will take place on the University campus that will take approximately an hour. Should you come to the University for Part 1, this part of the study will take place directly after Part 1 is completed.

Should you agree to participate, you are free to refuse to answer any questions you may feel uncomfortable with. You are free to leave the study, as well as withdraw any information you provide, at any time should you wish to. You will experience no penalty whatsoever should you choose to do so.

It should be noted that the interview will be audio-recorded and later transcribed. All information recorded from the interview will be transcribed. All recordings and transcripts will be kept in a safe and secure place. Only my supervisor and I will have access to the recordings and transcripts during the duration of the study, and any information obtained from this will be kept completely confidential. In order to ensure that your anonymity is maintained, you will be referred to by a pseudonym in the transcription and final report.

Please note that as this study forms part of a larger project, we would like to store (archive) your interview recordings and transcripts alongside your previous results. As mentioned in Part 1, these results will be transferred to an anonymous database where a participant code will be allocated to the recordings and transcripts. Other researchers working on the larger project may have access to the recordings and transcripts once the study is completed. However, all information will be used in a confidential and anonymous way. Nevertheless, these will not be archived without your permission.

Please note that if at any point you feel as if you require someone to talk to, please feel free to contact the Emthonjeni Community Psychology Clinic or the Student Centre for Careers and Counselling Development Unit (contact details provided below) which offer free counselling.

A summary of the final report will be made available upon request, approximately 12 months after the interviews have taken place.

Further Information:

Should you have any further questions on this research please do not hesitate to contact me. My contact details appear below my signature.

Thank you for considering taking part in the research project. If you are interested, please reply to this email and I will set up a time for you to complete the questionnaire on campus. If you are not interested, kindly reply to this email with the words NOT INTERESTED in the subject line so that I know that you have received the email.

Kind Regards,
Nabeelah Bemath (Researcher)
Email: nabeelah21@yahoo.com

Supervisor:
Kate Cockcroft (Professor)
Email: kate.cockcroft@wits.ac.za
Tel: 011 7174511

Emthonjeni Community Psychology Clinic contact details:

For more information, please email esther.price@wits.ac.za or katherine.bain@wits.ac.za or to make an appointment, please phone Tsego on (011) 717 4513.

Student Centre for Careers and Counselling Development Unit contact details:

Tel: 011 717 9140 / 32

Email: info.ccdu@wits.ac.za

Appendix F

Consent Form (Quantitative Phase)

By filling in and signing this document I agree to participate in the study. I understand that I can leave the process at any time without any negative consequences, and I allow the researcher to use the data confidentially and anonymously.

I give the researcher permission to archive the results from this study, alongside my previous results:

Yes ☐ No ☐

Signed: _____ Date: _____

I also acknowledge that I have received the R75 stipend as a contribution to my transport costs to the venue, and the time I spent in participating in this project.

Date of Receipt: _____ Amount: _____

Signed: _____ Date: _____

Appendix G

Consent Form for Qualitative Phase (Interview)

By filling in and signing this document I, _____hereby consent to being interviewed for this study. I understand that:

• Participation is voluntary

• I have the right to withdraw from the study at any point without any negative consequences

• My identity, and any other information I reveal, will be kept confidential.

• I do not have to answer any questions that I do not wish to.

• I understand that I will be asked to give permission for my interview to be audio-recorded as per the conditions discussed in the separate consent for recording form.

• I give the researcher permission to archive the results from this study, alongside my previous results:

Yes ☐ No ☐

Signed: _____ Date: _____

I also acknowledge that I have received the R75 stipend as a contribution to my transport costs to the venue, and the time I spent in participating in this project.

Date of Receipt: _____ Amount: _____

Signed: _____ Date: _____

Appendix H

Consent Form for Qualitative Phase (Recording)

I, _____ hereby give my consent for my interview to be recorded. I understand that:

•The recording will be kept confidential and will only be accessible to the researcher and her supervisor. The recording may also be made available to other researchers granted access to the archive if I give permission for my data (recording and transcript) to be stored in the archive

•I am free to mention if I am uncomfortable with a specific response being recorded.

• I will be referred to by a pseudonym in the transcription and write up (that is, as Participant A or Participant B, etcetera); all identifying information will be kept confidential.

• I give the researcher permission to archive the recordings from this study, alongside my previous results:

Yes ☐ No ☐

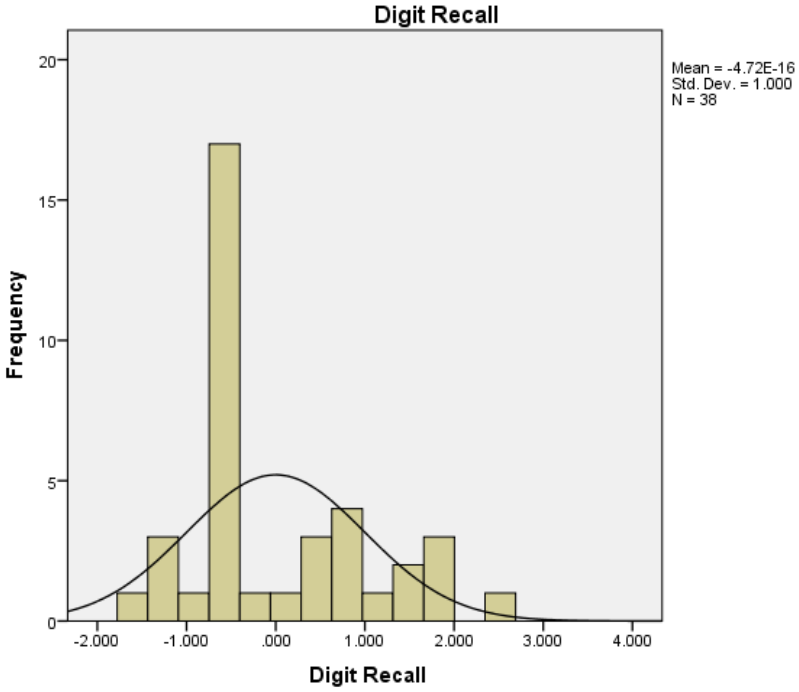
• I give the researcher permission to use direct quotes from the interviews, in their research report and any publications that may arise from this research:

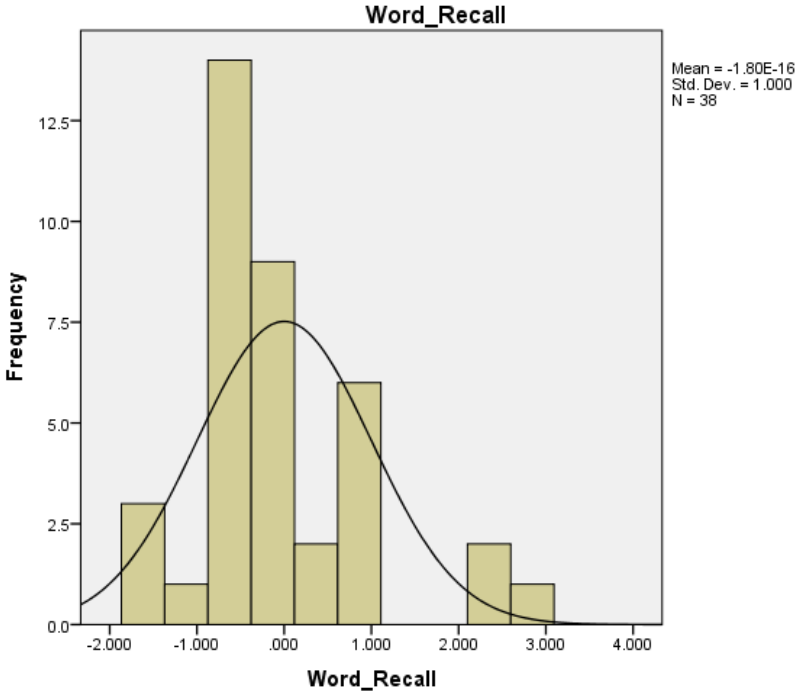
Yes ☐ No ☐

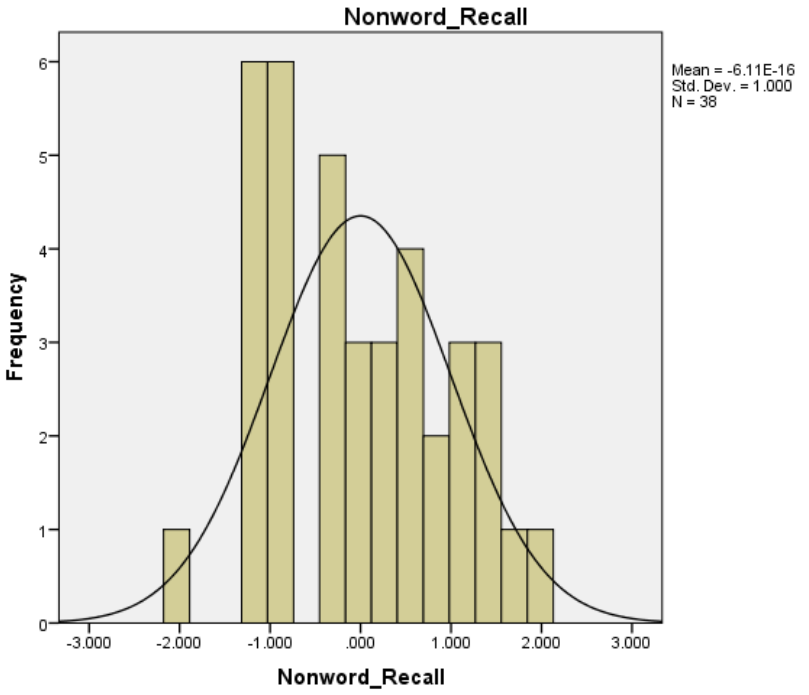
Signature_____ Date_____

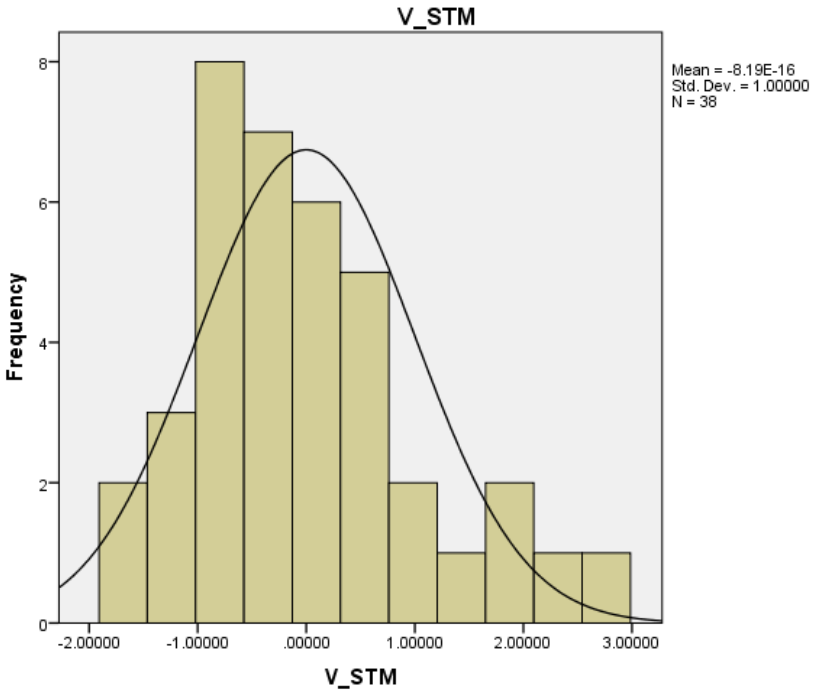
Appendix I

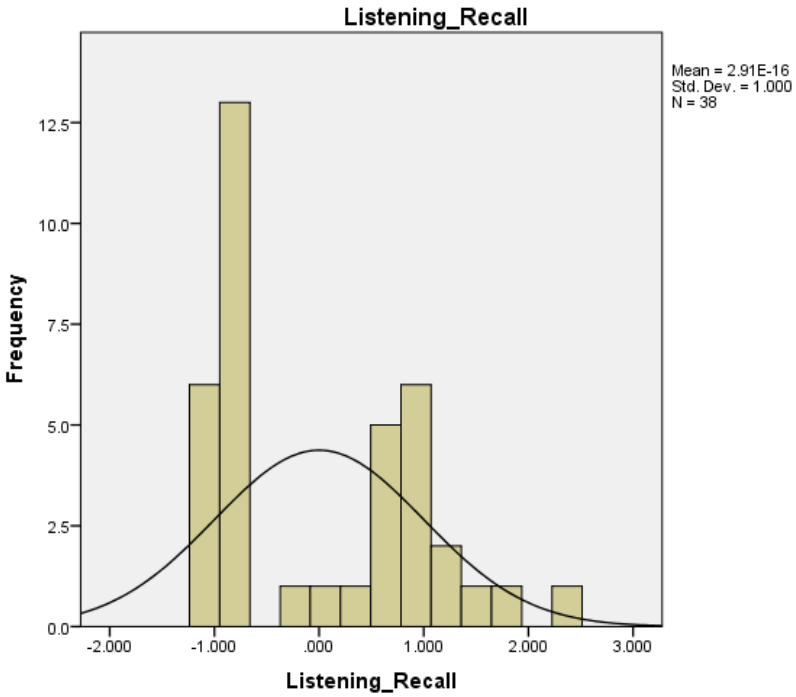
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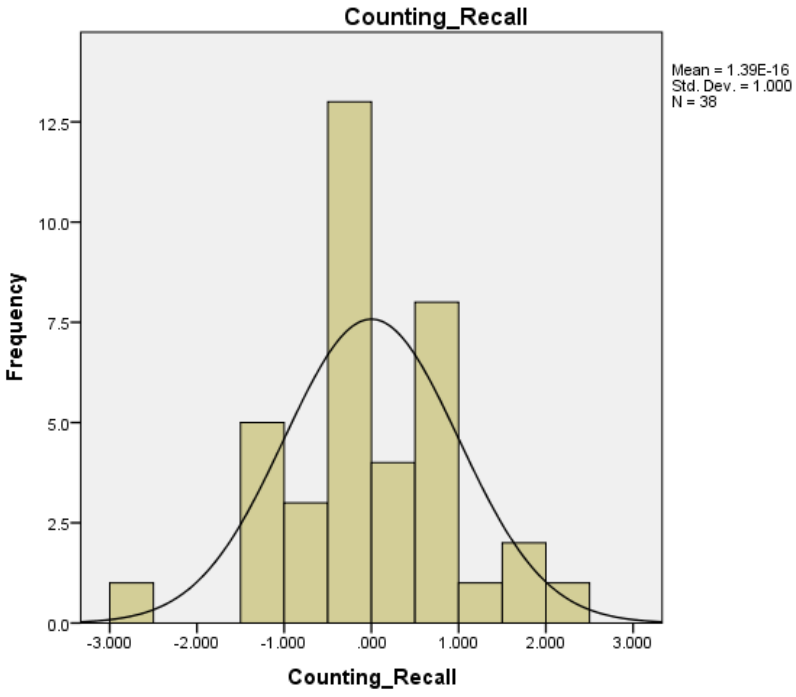


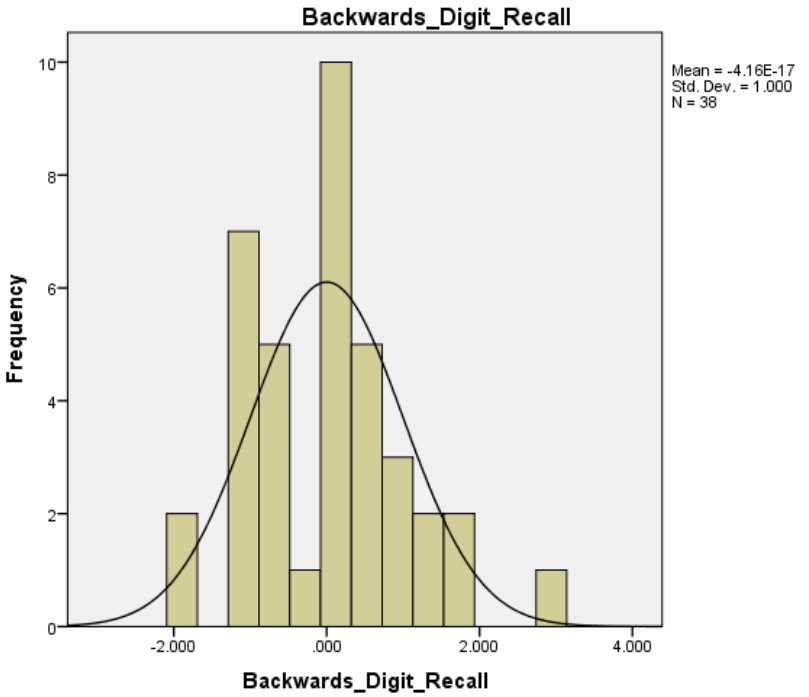


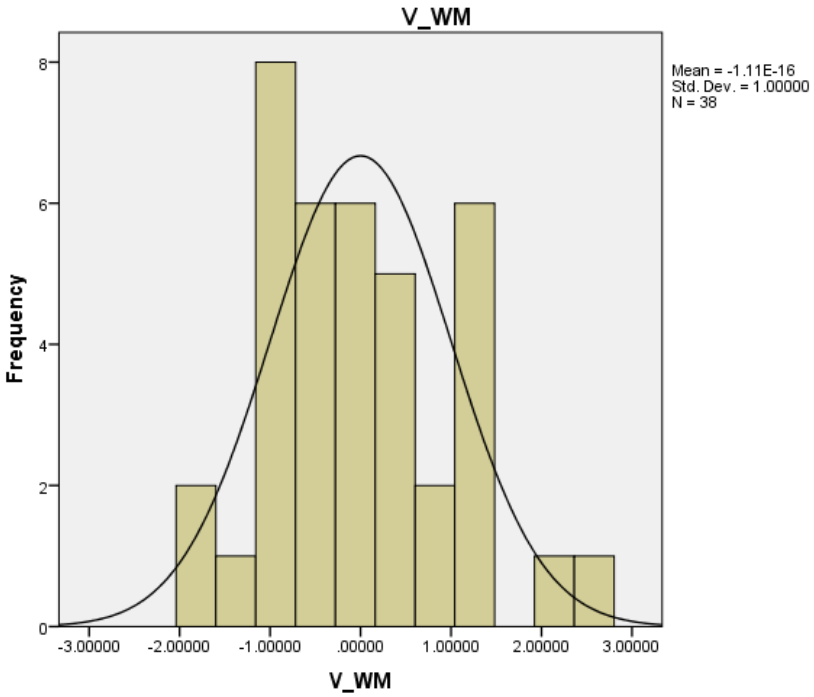

Nonword_Recall
Mean = -6.11E-16
Std. Dev. = 1.000
N = 38
Frequency
0
1
2
3
4
5
6
-3.000
-2.000
-1.000
.000
1.000
2.000
3.000
Nonword_Recall

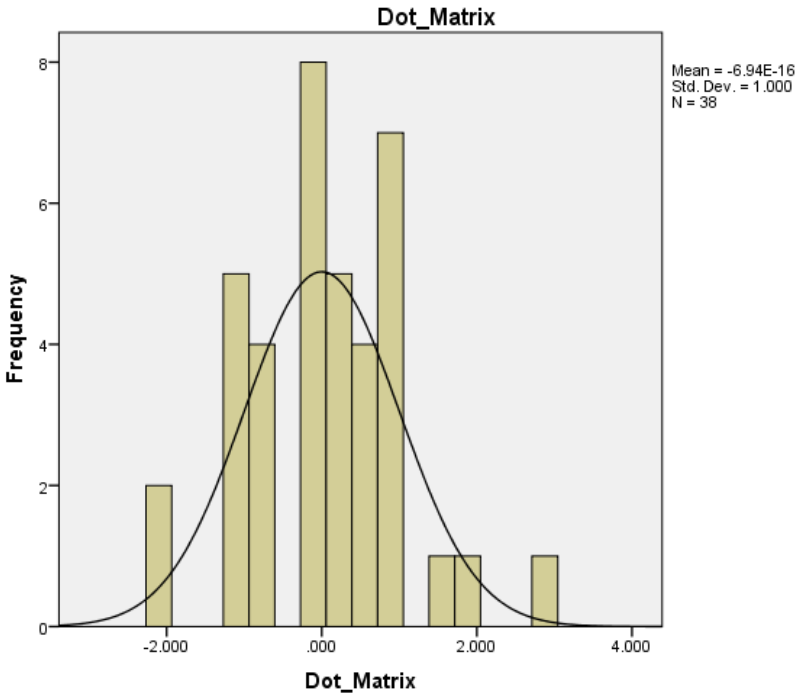

V_STM
Mean = -8.19E-16
Std. Dev. = 1.00000
N = 38
Frequency
0
2
4
6
8
-2.00000
-1.00000
.00000
1.00000
2.00000
3.00000
V_STM

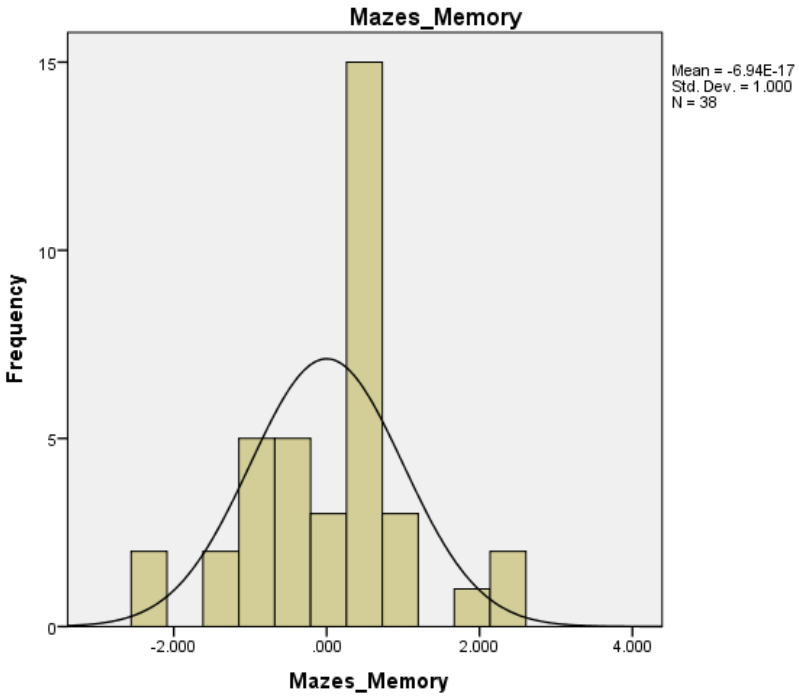

Listening_Recall
Mean = 2.91E-16
Std. Dev. = 1.000
N = 38
Frequency
12.5
10.0
7.5
5.0
2.5
0.0
-2.000
-1.000
.000
1.000
2.000
3.000
Listening_Recall

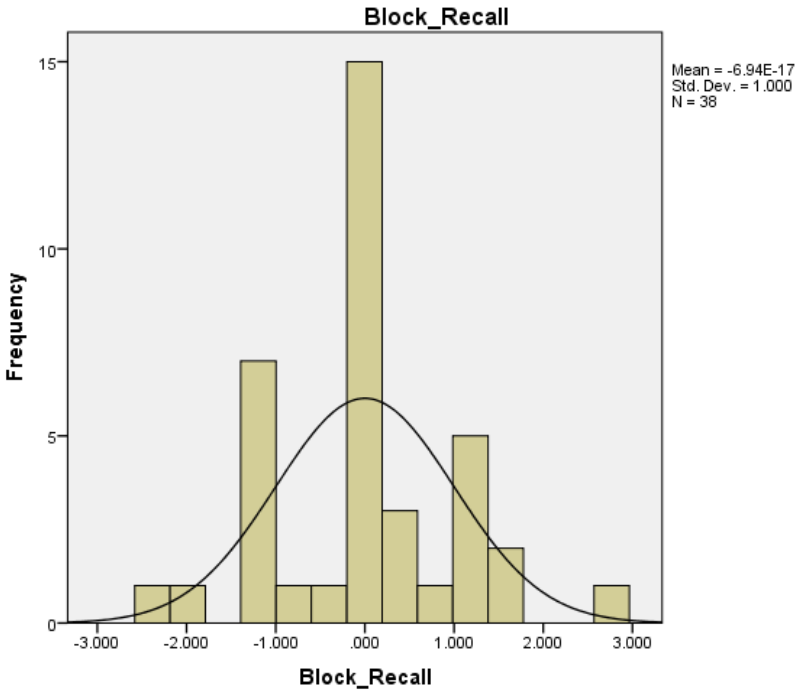

Counting_Recall
Mean = 1.39E-16
Std. Dev. = 1.000
N = 38
Frequency
12.5
10.0
7.5
5.0
2.5
0.0
-3.000
-2.000
-1.000
.000
1.000
2.000
3.000
Counting_Recall

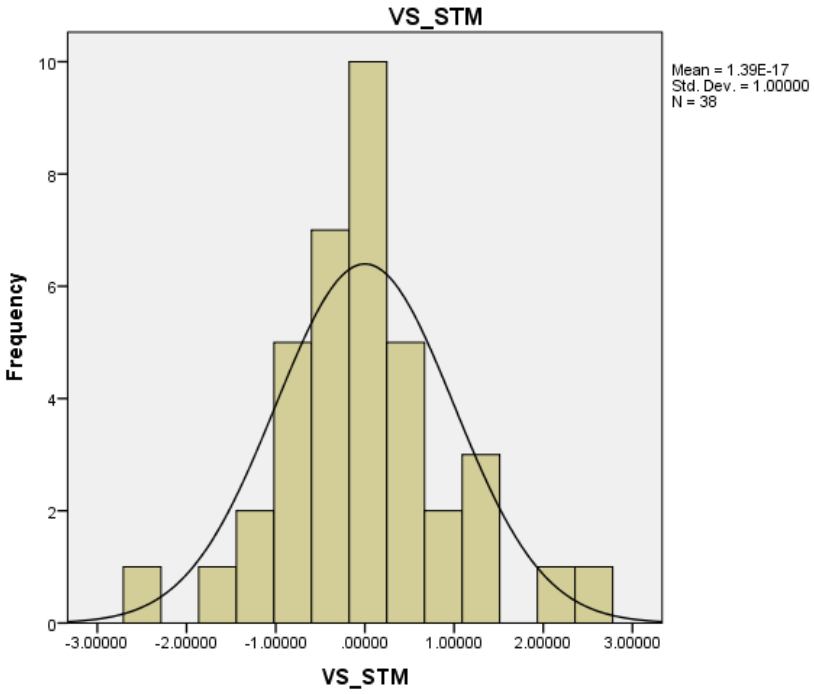

Backwards_Digit_Recall
Mean = -4.16E-17
Std. Dev. = 1.000
N = 38
Frequency
10
8
6
4
2
0
-2.000
.000
2.000
4.000
Backwards_Digit_Recall

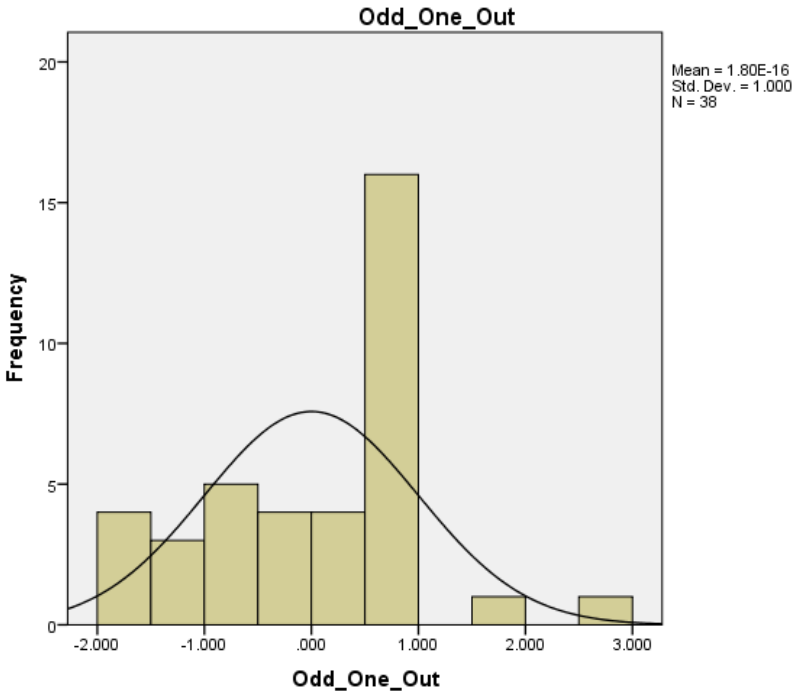

V_WM
Mean = -1.11E-16
Std. Dev. = 1.00000
N = 38
Frequency
8
6
4
2
0
-3.00000
-2.00000
-1.00000
.00000
1.00000
2.00000
3.00000
V_WM

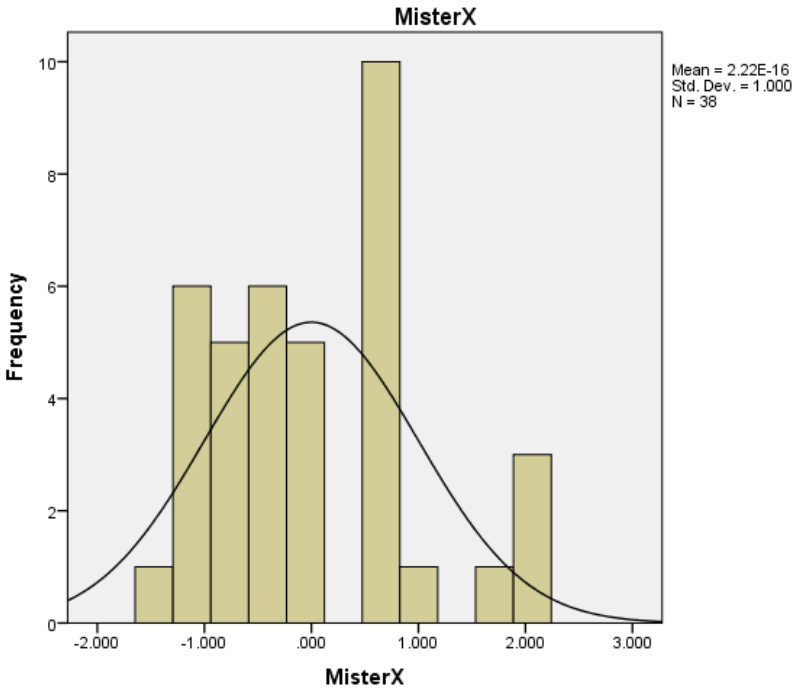

Dot_Matrix
Mean = -6.94E-16
Std. Dev. = 1.000
N = 38
Frequency
0
2
4
6
8
-2.000
.000
2.000
4.000
Dot_Matrix

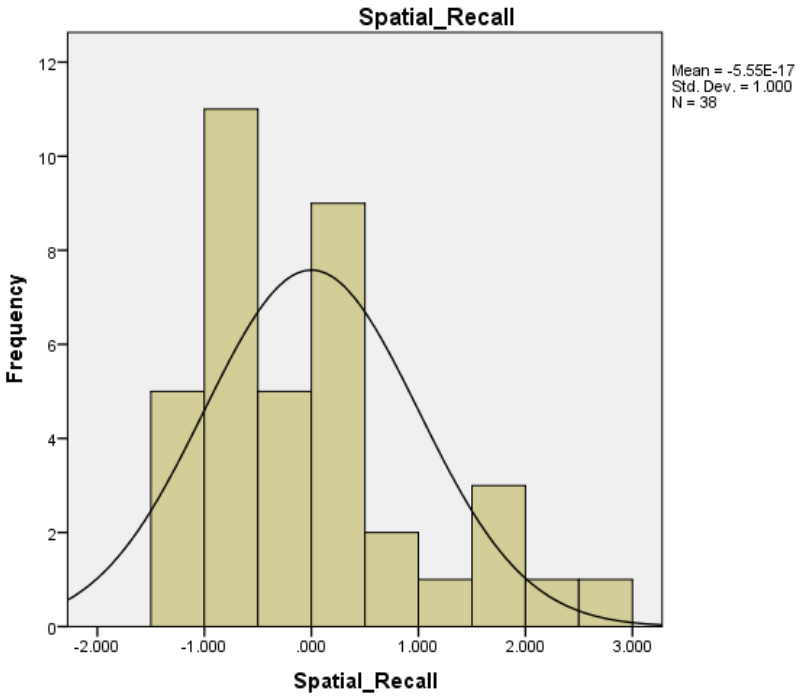

Mazes_Memory
Mean = -6.94E-17
Std. Dev. = 1.000
N = 38
Frequency
0
5
10
15
-2.000
.000
2.000
4.000
Mazes_Memory

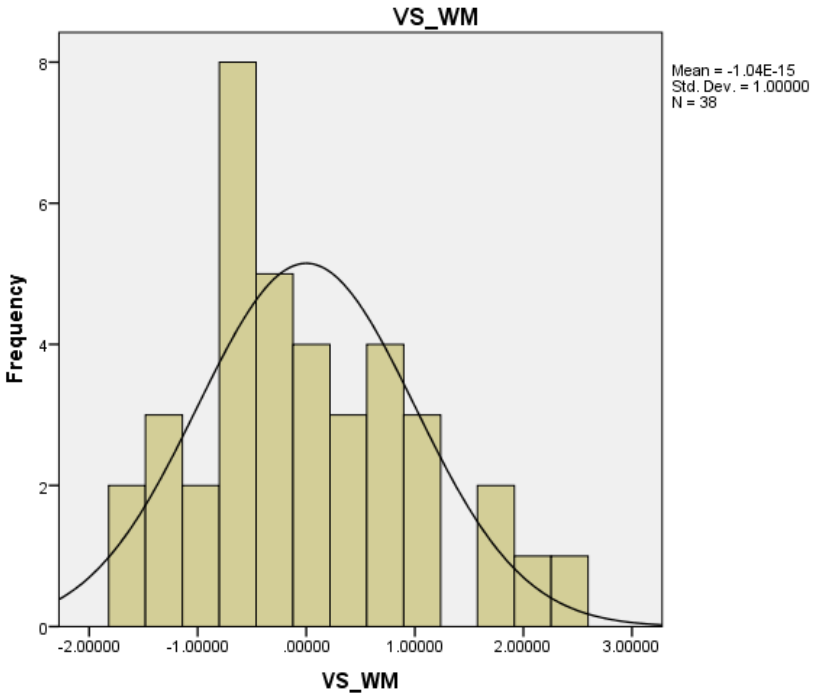

Block_Recall
Mean = -6.94E-17
Std. Dev. = 1.000
N = 38
Frequency
15
10
5
0
-3.000
-2.000
-1.000
.000
1.000
2.000
3.000
Block_Recall

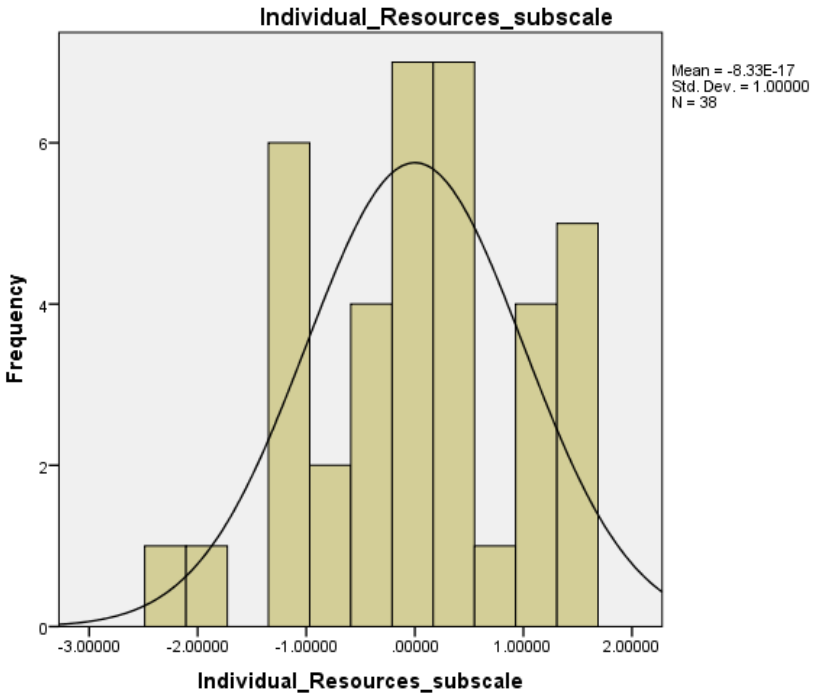

VS_STM
Mean = 1.39E-17
Std. Dev. = 1.00000
N = 38
Frequency
10
8
6
4
2
0
-3.00000
-2.00000
-1.00000
.00000
1.00000
2.00000
3.00000
VS_STM

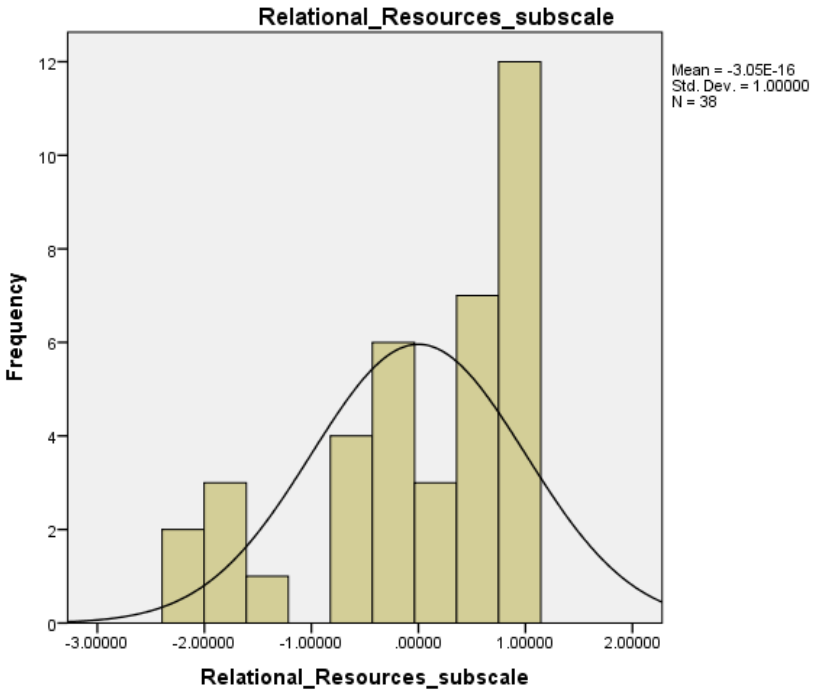

Odd_One_Out
Mean = 1.80E-16
Std. Dev. = 1.000
N = 38
Frequency
20
15
10
5
0
-2.000
-1.000
.000
1.000
2.000
3.000
Odd_One_Out

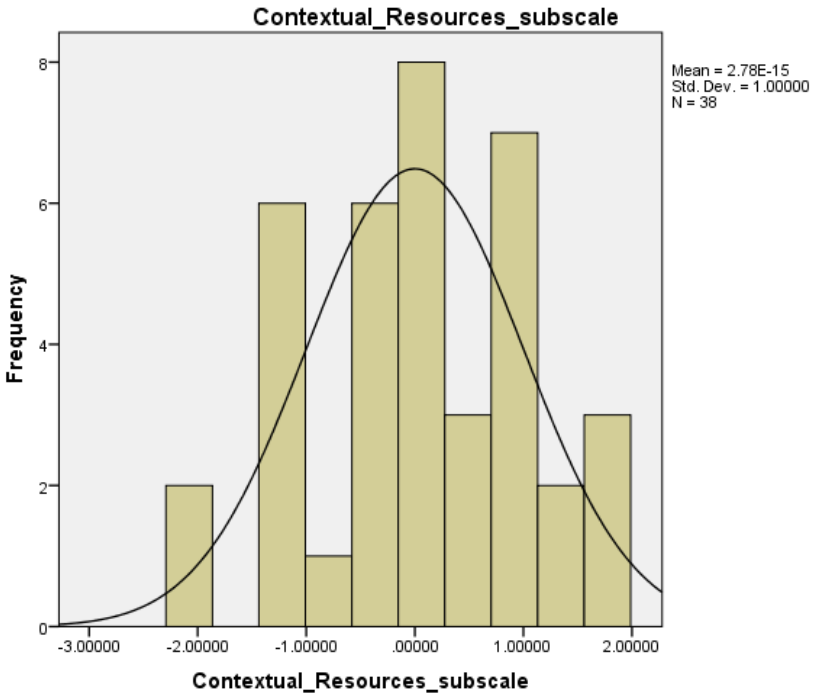

MisterX
Mean = 2.22E-16
Std. Dev. = 1.000
N = 38
Frequency
10
8
6
4
2
0
-2.000
-1.000
.000
1.000
2.000
3.000
MisterX

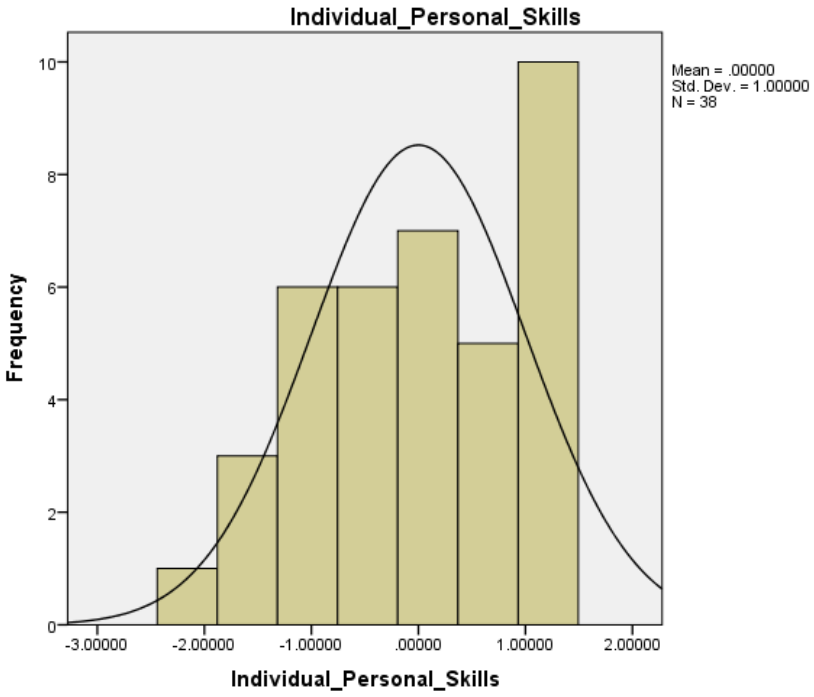

Spatial_Recall
Mean = -5.55E-17
Std. Dev. = 1.000
N = 38
Frequency
Spatial_Recall
0
2
4
6
8
10
12
-2.000
-1.000
.000
1.000
2.000
3.000

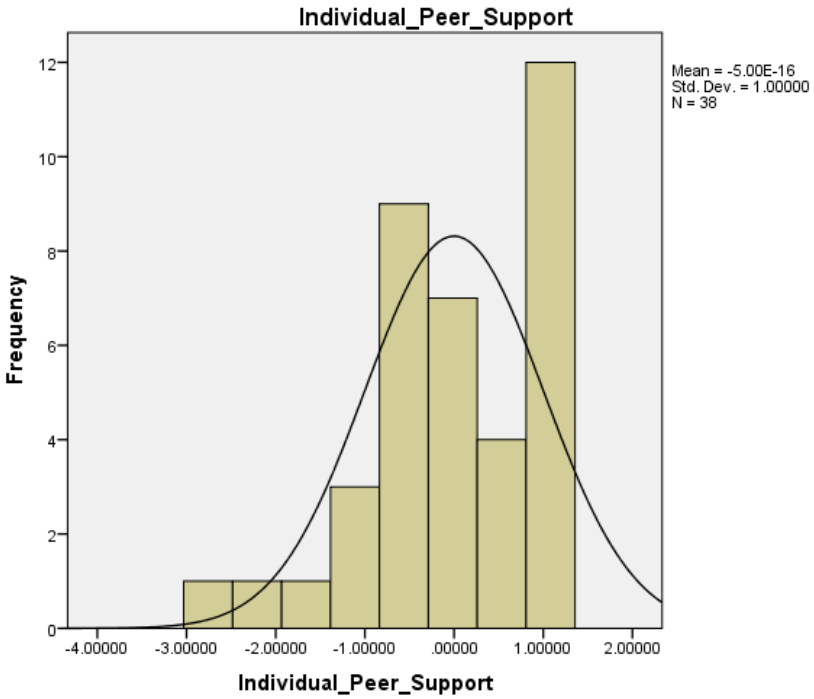

VS_WM
Mean = -1.04E-15
Std. Dev. = 1.00000
N = 38
Frequency
VS_WM
0
2
4
6
8
-2.00000
-1.00000
.00000
1.00000
2.00000
3.00000

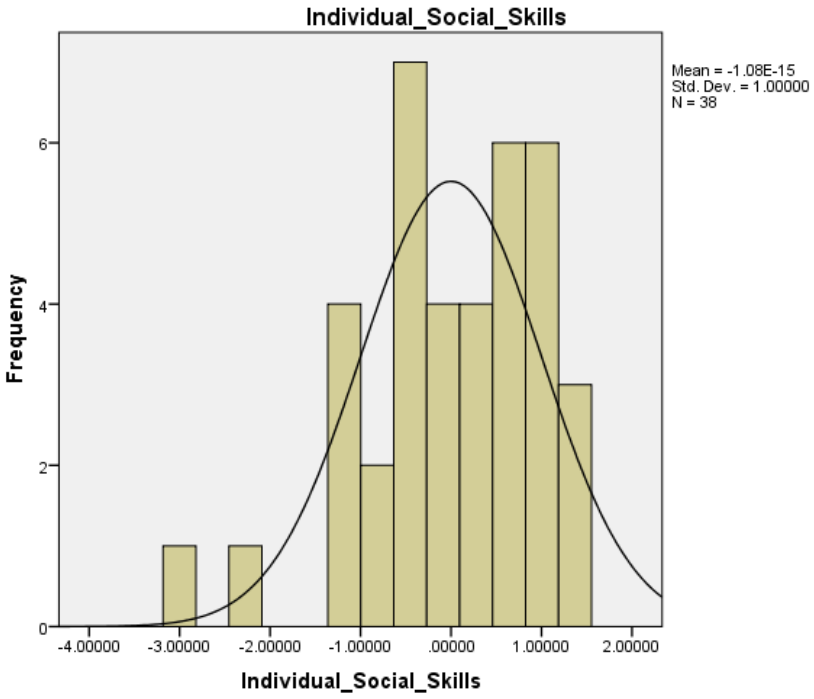

Individual_Resources_subscale
Mean = -8.33E-17
Std. Dev. = 1.00000
N = 38
Frequency
0
2
4
6
-3.00000
-2.00000
-1.00000
.00000
1.00000
2.00000
Individual_Resources_subscale

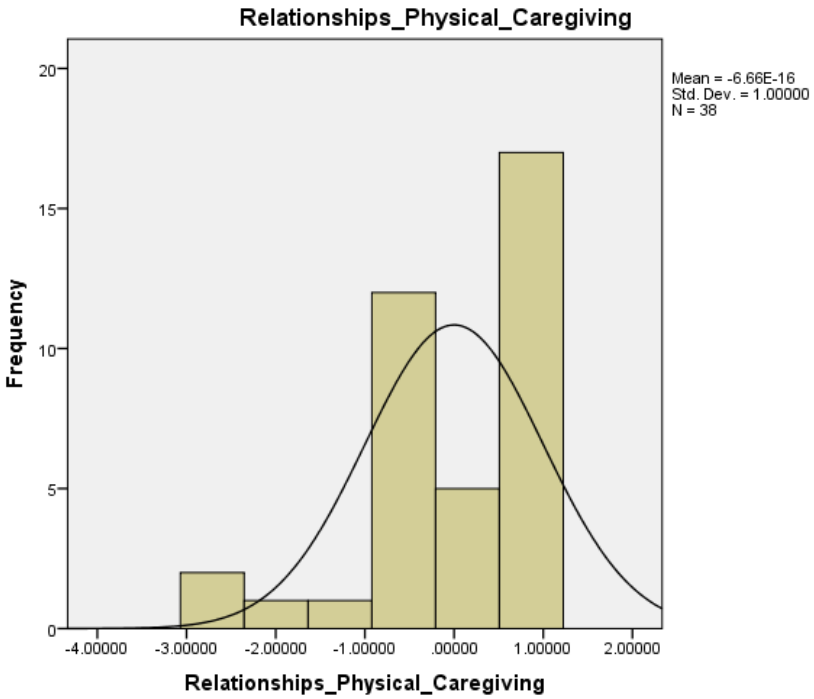

Relational_Resources_subscale
Mean = -3.05E-16
Std. Dev. = 1.00000
N = 38
Frequency
0
2
4
6
8
10
12
-3.00000
-2.00000
-1.00000
.00000
1.00000
2.00000
Relational_Resources_subscale

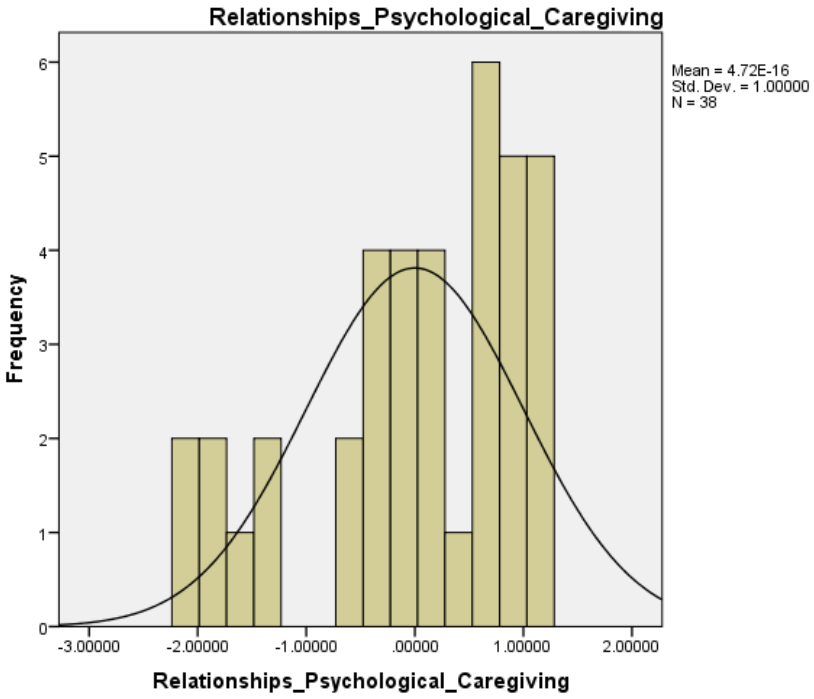

Contextual_Resources_subscale
Mean = 2.78E-15
Std. Dev. = 1.00000
N = 38
Frequency
0
2
4
6
8
-3.00000
-2.00000
-1.00000
.00000
1.00000
2.00000
Contextual_Resources_subscale

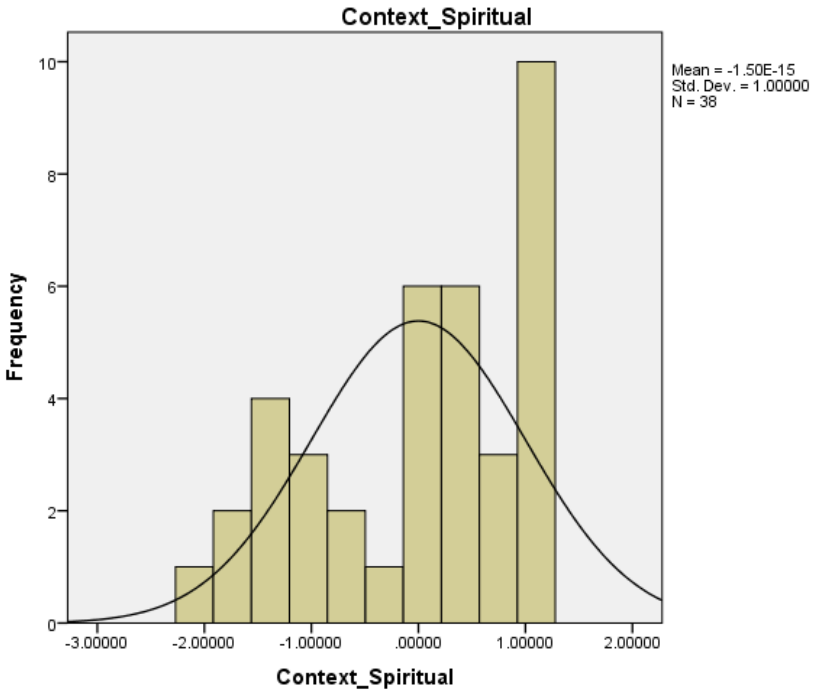

Individual_Personal_Skills
Mean = .00000
Std. Dev. = 1.00000
N = 38
Frequency
0
2
4
6
8
10
-3.00000
-2.00000
-1.00000
.00000
1.00000
2.00000
Individual_Personal_Skills

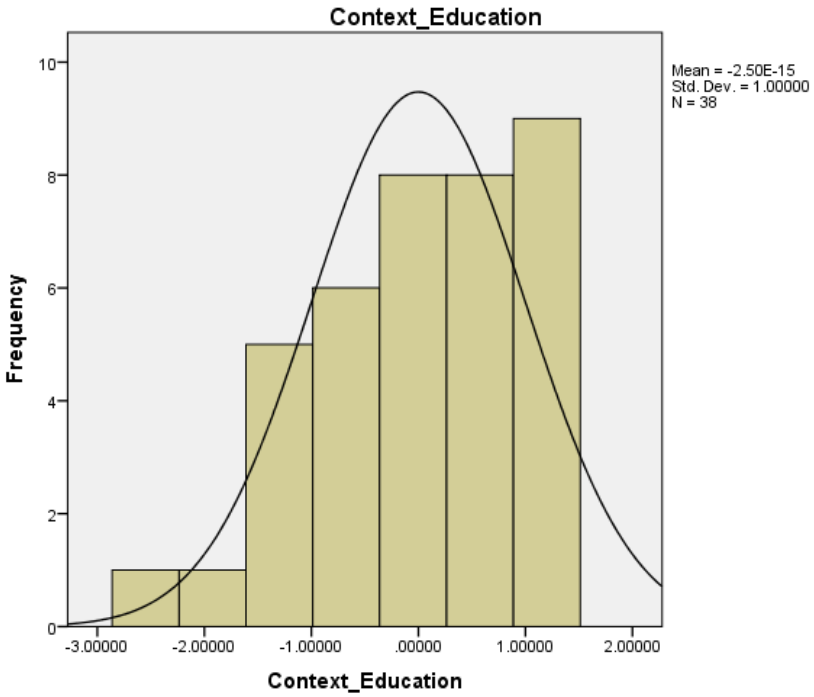

Individual_Peer_Support
Mean = -5.00E-16
Std. Dev. = 1.00000
N = 38
Frequency
0
2
4
6
8
10
12
-4.00000
-3.00000
-2.00000
-1.00000
.00000
1.00000
2.00000
Individual_Peer_Support

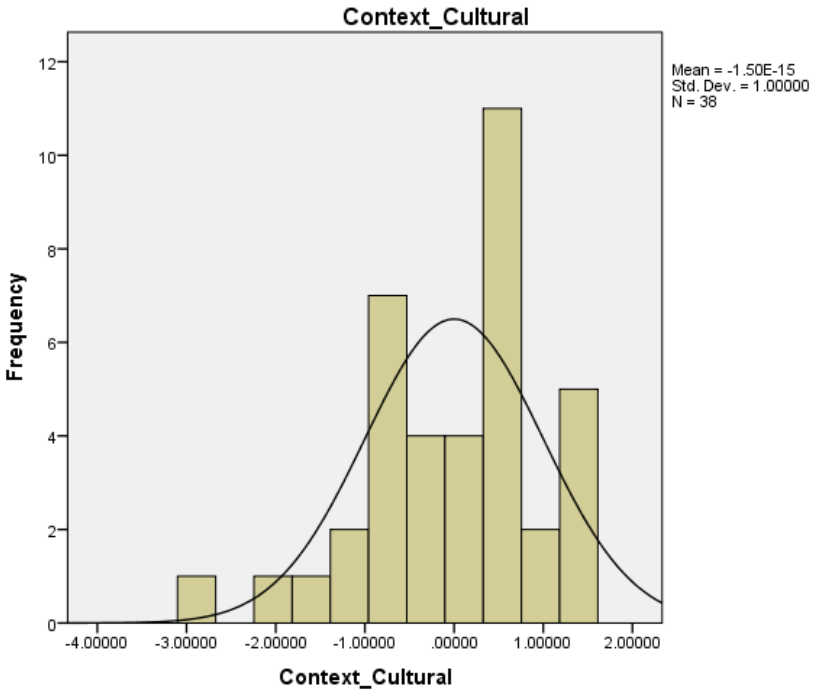

Individual_Social_Skills
Mean = -1.08E-15
Std. Dev. = 1.00000
N = 38
Frequency
0
2
4
6
-4.00000
-3.00000
-2.00000
-1.00000
.00000
1.00000
2.00000
Individual_Social_Skills


Relationships_Physical_Caregiving
Mean = -6.66E-16
Std. Dev. = 1.00000
N = 38
Frequency
20
15
10
5
0
-4.00000
-3.00000
-2.00000
-1.00000
.00000
1.00000
2.00000
Relationships_Physical_Caregiving


Relationships_Psychological_Caregiving
Mean = 4.72E-16
Std. Dev. = 1.00000
N = 38
Frequency
6
5
4
3
2
1
0
-3.00000
-2.00000
-1.00000
.00000
1.00000
2.00000
Relationships_Psychological_Caregiving


Context_Spiritual
Mean = -1.50E-15
Std. Dev. = 1.00000
N = 38
Frequency
0
2
4
6
8
10
-3.00000
-2.00000
-1.00000
.00000
1.00000
2.00000
Context_Spiritual


Context_Education
Mean = -2.50E-15
Std. Dev. = 1.00000
N = 38
Frequency
0
2
4
6
8
10
-3.00000
-2.00000
-1.00000
.00000
1.00000
2.00000
Context_Education


Context_Cultural
Mean = -1.50E-15
Std. Dev. = 1.00000
N = 38
Frequency
0
2
4
6
8
10
12
-4.00000
-3.00000
-2.00000
-1.00000
.00000
1.00000
2.00000
Context_Cultural

Appendix J

Six Steps of Thematic Content Analysis (Braun & Clarke, 2006; 2012)

Step 1: The interview is transcribed, and the researcher familiarises themselves with the data by repeatedly and actively listening to the audio recording, and reading the transcript.

Step 2: Aspects of the data that are meaningful with respect to the research question are coded; any aspect of the data applicable to a code will then be assigned to it. This can be done manually or by using computer software.

Step 3: Coded data will be analysed to identify points of similarity and correspondence across codes in order to identify themes and (if applicable) subthemes. This stage ends with the researcher considering how themes relate to each other, and constructing a thematic map.

Step 4: Initial themes are recurrently reviewed and refined by checking themes against extracts of data assigned to them; this is done to explore if themes meaningfully capture the data with respect to the research questions. This process is also carried out in relation to the entire data set.

Step 5: The researcher names and defines each theme, selects extracts of data that best represent each theme to present/analyse, and interprets themes in a nuanced manner to understand the meanings located within the data.

Step 6: The researcher writes the final report by refining the analysis, integrating this with literature reviewed, and using themes in a logical manner to tell an interpretive story of the data with respect to the research question.