

Individual Differences of Career Choice: The Role  
of Cognition, Personality, Executive Function, Motivation, and Career Values

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## Abstract

Values are self-referentially important to the individual reflecting their underlying beliefs related to the meaningfulness placed on experience. Career values are the subjective importance placed on the meaning pursuant to a career. Previous research has identified several factors (e.g., intelligence and personality) shown to be associated with career outcome and success. The purpose of this study was to investigate the contribution that reasoning, working memory, executive function, personality, and motivation have on an individual's self-reported career values. To this end, 42 participants (14 actively employed community members and 28 secondary and post-secondary students) completed a series of performance-based measures and self-reported inventories assessing the domains previously described. Results identified 4 career factors that accommodated approximately 80% of the variance shared between individuals. The 4 career factors (Self-Directed, General Management, Skillful-Dedication, and Conservative) were predicted by distinct performance-based variables, personality characteristics, and sources of motivation. A strong emphasis on individual differences is discussed with respect to career values.

## Keywords:

Performance-based measures; reasoning; executive function; Wisconsin Card Sorting Task; working memory; personality; motivation; career values; career factors

### Co-Authorship (where applicable)

The candidate acknowledges that written work is the product of the individual whose name is attached to this dissertation. We do not disclose any additional authorship, nor contribution outside of the primary author, in the formalization of this document.

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## Table of Contents

### Table of Contents

Abstract.....	II
Keywords:.....	II
Co-Authorship (where applicable).....	III
Acknowledgements.....	IV
List of Figures .....	VII
List of Tables .....	X
List of Abbreviations .....	XI
1 Introduction .....	1
1.1 Intelligence.....	2
1.1.1 Neurobiological Basis of Intelligence .....	4
1.1.2 Influence of Intelligence on Career.....	6
1.2 Personality .....	8
1.2.1 Neurobiological Basis of Personality.....	9
1.3 Executive Function .....	13
1.3.1 Neurobiological Basis of Executive Function .....	14
1.3.2 Influence of Executive Function on Career.....	16
1.4 Motivation.....	17
1.4.1 Neurobiological Basis of Motivation.....	18
1.4.2 Influence of Motivation on Career.....	20
1.5 Career Values .....	21
1.5.1 Influence of Career Values on Career .....	24
2 Materials and Methods.....	25
2.1 Participants .....	25
2.1.1 Students .....	25
2.1.2 Community Members .....	26
2.2 Psychometric Test Battery .....	26
2.2.1 General Methods of Administration: .....	26
2.2.1.1 Methods of Administration for Students.....	27
2.2.1.2 Methods of Administration for Active Career .....	28
2.2.2 Tests of Global Intellectual Function: .....	29
2.2.3 Personality Inventory:.....	30
2.2.4 Measures of Executive Function: .....	31

2.2.5 Motivation:.....	33
2.2.6 Career Values: .....	33
2.3 Statistical Methods .....	34
2.3.1 Analysis of Collinearity – Regression of Factors.....	35
2.3.2 Analysis of Collinearity – Regression of 8 Career Values .....	36
3 Results .....	36
3.1.1 Descriptive Statistics – Community participants .....	36
3.1.2 Descriptive Statistics – Student Participants .....	39
3.2 Factor Analysis .....	42
3.3.1 Multicollinearity Results for Regression Using Factors.....	44
3.3.2 Regression Using Factors .....	44
3.4 One-way analyses distinguishing differences between the upper and lower 16% of the normal .....	46
curve for the four identified factors .....	46
3.5 Multicollinearity Results for Multiple linear regression analyses to predict each of the 8 .....	52
career values .....	52
3.5 Multiple linear regression analyses to predict each of the 8 career values .....	53
3.6 One-way analyses differentiating between upper and lower 16% of the normal curve for each of the	
8 career values .....	56
4 Discussion.....	64
4.1 Self-Directed Career Factor.....	64
4.2 General Management Career Factor .....	71
4.3 Skillful-Dedication Career Factor .....	75
4.4 Conservative Career Factor.....	77
4.5 Integration .....	78
5 Conclusion:.....	81
6 Limitations:.....	82
7 Future Directions: .....	83
8 References .....	84

## List of Figures

- Figure 1: Results comparing individuals scoring in the top and lower 16% of the distribution of scores on the Self-Directed Career factor across measures of Conscientiousness (top left) Enjoyment (top right), Challenge motivation (bottom left), Verbal Comprehension Index scores (bottom right). Error bars represent SEM. There were  $n = 5$  cases in the LOW category and  $n = 8$  cases in the HI category. .... 48
- Figure 2: Differences in performance on Working Memory Index standard scores between the upper and lower 16% of the distribution of scores in the General Management career factor. Errors bars represent SEM. There were  $n = 7$  individuals who formed the LOW category and  $n = 6$  cases representing the HI category. .... 49
- Figure 3: Differences in Enjoyment motivation raw scores (left) and Openness to Experience personality trait T-scores (right) between the upper and lower 16% of scores on the Skillful-Dedication Career factor. Error bras represent SEM. There were  $n = 8$  cases comprising the LOW category and  $n = 6$  cases comprising the HI category. .... 50
- Figure 4: Differences in Wisconsin Card Sorting Task (WCST) learning-to-learn standardized scores between the upper and lower 16% of scores on the Conservative Career factor. Erro bars represent SEMs. There were  $n = 6$  cases making up the LOW category and  $n = 2$  cases comprising the HI category. It should be noted, learning-to-learn scores could not be computed for some cases due to overall performance in the WCST. Results are likely to change in light of additional evidence. .... 51



Figure 5: Differences on Openness to Experience personality trait T-scores between the upper and lower 16% of scores on the Technical/Functional career value. Error bars represent SEMs. There was an equal representation of cases (n = 5) in both the LOW and HI categories. .... 57

Figure 6: Differences in self-reported challenge motivation raw scores between the upper and lower 16% of scores on the Autonomy/Independence career value. Error bars represent SEMs. There were n = 7 cases comprising the LOW category and n = 8 cases which made up the HI category..... 58

Figure 7: Differences on Wisconsin Card Sorting Task (WCST) learning-to-learn standardized scores (left) and Openness to Experience personality trait T-scores (right) between the upper and lower 16% of scores on the Security/Stability career value. Error bars represent SEMs. There were n = 9 and n = 6 cases in the LOW and HI categories for personality measures, respectively. There were n = 8 cases in the LOW category for measures of WCST learning-to-learn and n = 4 cases in the HI category on WCST learning-to-learn. Differences in sample size are due to computational limitations of the secondary scales on the WCST. .... 59

Figure 8: Differences on Verbal Comprehension Index standard scores (left) and self-reported enjoyment motivation (right) between the upper and lower 16% of scores on the Entrepreneurial creativity career value. Error bars represent SEMs. There was an equal representation of cases (n= 8) in both the LOW and HI categories..... 60

Figure 9: Differences in self-reported internal motivation (top), challenge motivation (bottom left), and enjoyment (bottom right) between the upper and lower 16% of scores on the

Service/Dedication to a Cause career value. Errors bars represent SEMs. There were  $n = 6$  cases which made up the LOW category and  $n = 7$  cases which composed the HI category. .... 62

Figure 10: Differences in self-reported internal motivation (top left), external motivation (top right), challenge (bottom left), and outward items (bottom right) between the upper and lower 16% of scores on the Pure Challenge career value. Error bars represent SEMs. There were  $n = 5$  cases and  $n = 6$  cases in the LOW and HI categories respectively. .... 63

Figure 11: Differences on Working Memory Index standard scores between the upper and lower 16% of respondents on the Lifestyle career value. Errors bars represent SEMs. There was an equal representation of cases ( $n = 6$ ) for both the LOW and HI categories. .... 64

List of Tables

Table 1: Summary of community members who participated in the research presented. Individual responses have also been presented for the reader..... 38

Table 2: Summary of students who participated in the research presented. Individual responses have also been presented for the reader. .... 40

Table 3: Comparison of student scores, community sample scores, and normative groups for performance-based measures, sources of motivation, and personality traits..... 41

## List of Abbreviations

- Analysis of Variances (ANOVA)
- Brodmann Area (BA)
- Career Orientation Inventory (COI)
- dorsolateral prefrontal cortex (dlPFC)
- functional magnetic resonance imaging (fMRI)
- Parietal-Frontal Integration Theory (PFIT)
- Posttraumatic Stress Disorder (PTSD)
- NEO Five-Factor Inventory-3 (NEO-FFI-3)
- Standard deviation (SD)
- Standard Error of the Estimate (SEE)
- Standard error of the mean (SEM)
- Test of Nonverbal intelligence 4<sup>th</sup> Edition (TONI-4)
- verbal comprehension index (VCI)
- Wechsler Adult Intelligence Scale 4th Edition (WAIS-IV)
- Wechsler Abbreviated Scale of Intelligence - 2nd edition (WASI-II)
- Wisconsin Card Sort Task (WCST)
- Working Memory Index (WMI)
- Work Preference Inventory (WPI)

## 1 Introduction

There are many factors that contribute to career selection and career performance. For instance, intelligence, personality, and motivation have been shown to correspond to the level of job-task complexity, financial gains, and personal success (Barrick, Stewart, and Piotrowski, 2002; Furnham, Eracleous, and Chamorro-Premuzic, 2009; Ree and Earles, 1992; Strenze, 2015). Similarly, personality type and vocational interest have been used by psychologists to assist individuals identify and outline potential career trajectories. However, the role of individual differences pertaining to factors such as intelligence, personality traits, motivation, and executive function may have been neglected in the prediction of career outcome and successful job-related performance. Typically, predictions of job-type and career success are based upon common sources of variance (e.g., what is shared amongst workers in a particular domain), possibly obfuscating the contribution of characteristics that are intrinsically unique to the individual.

Consider employment and the corresponding work environment as containing a series of problems requiring solutions. For any given situation there are multiple ways to approach the problem and generate helpful solutions. Not all people will solve problems or tasks, work-related or otherwise, using a single or shared strategy. That is to say, all individuals possess unique abilities and skills (e.g., individual differences) that serve as tools to solve problems in everyday life and completing work-related tasks. It is worthwhile then, to investigate what shared and unique abilities each individual holds within a given employment domain, how these individuals use their unique tools to solve work-related problems (e.g., success at a job), and how individual differences in navigating nuances of the working world can be used to help predict career outcomes for others.

## 1.1 Intelligence

Intelligence can be defined as an individual's ability to successfully navigate the nuances of everyday life. It is related to the ability and aptitude to retain, process, apply, and adapt knowledge or experience to novel events (Schneider and McGrew, 2012). General mental ability comprises the composite nature of specific mental abilities that gives rise to an individual's propensity to adapt to changing environmental demands (Schmidt and Hunter, 2004). The inter-relatedness (common factors) associated with performance on specific tests of mental ability were defined by Spearman as a general intelligence factor or "g-factor" (Spearman, 1927). The general intelligence factor arose as measures of specific mental ability display a high degree of association between tests. Despite evidence of common sources of variance, theories were later developed that argued the presence of distinct components (flavours) of intelligence. According to these multi-factor intelligence theories, intelligence could not be condensed to a single factor.

An example of a multi-factor framework of intelligence was suggested by Cattell (1963), who proposed a distinction between Crystallized and Fluid intelligence that were non-g related. In his framework, Cattell described Crystallized intelligence as concrete, fact-based application of acquired knowledge and/or experience to identify abstract relations (Cattell, 1987). While Fluid intelligence was operationalized as novel abstraction, the ability to adapt knowledge and/or experience to solve new problems (Unsworth et al., 2014). Crystallized and Fluid intelligence are not static and have been shown to evolve over time. According to Gross (2015), as people age their Crystallized intelligence becomes more well-developed while Fluid intelligence peaks in late adolescence and early adulthood. Despite the dichotomous Crystallized-Fluid categorization of

intelligence, both flavours have been shown to be interrelated or, alternatively, are said to share a general factor (Colom et al., 2009).

Another intelligence researcher, Sternberg (1985, Sternberg, 1995), proposed a model for multiple intelligences, known as the Triarchic theory of intelligence. Sternberg's model identifies and divides human intellectual ability into 3 axioms; analytical, experiential, and practical. Sternberg's model, despite demonstrating an overlap of factors reminiscent of a general factor, has been extensively developed and applied to learning in educational systems (Sternberg, 2000; Sternberg, 2001). Although learning plays an integral role in intellectual function (Colom et al., 2005a; Colom et al., 2005b) Sternberg's model may reflect preferences for learning style rather than general mental ability (Lemire, 2002). More recently, Gardner proposed a theory which identified multiple features of intelligence and developed a theoretical model consisting of 8 flavours of intelligence (Gardner, 1992; Gardner 1997).

Gardner's model, unfortunately, has not received much empirical support and, what support it has received, stems from results of self-reported measures of an individual's perceived aptitude within the context of each intelligence sub-category (Waterhouse 2006a; Waterhouse, 2006b). Further scrutiny of Gardner's theory of multiple intelligences lies in the lack of distinct and concrete operationalized definitions pertaining to each of his intelligence constructs (Waterhouse, 2006a; Waterhouse 2006b). Despite the lack of experimental support, Gardner's model is maintained by educators and laypeople as the most trending theory of intelligence, as the nature of the theory promotes the idea that intelligence can be developed (learned) provided the individual puts forth the necessary effort (Visser et al., 2006).

Despite criticisms against Gardner's model, it has received scientific support. Valliant (2021), in his book *Your Career Path: Having the Right Stuff* outlined research in support of Gardner's theory and discussed the theory's influence in directing career choice (or orientation) throughout life. Additional empirical support in favour of Gardner's model was offered by Shearer and Karanian (2017), who investigated 318 neuroscience reports investigating the neural correlates of multiple intelligences to determine if different regions could be associated with Gardner's 8 intelligences. Shearer and Karanian showed distinct brain regions and their underlying activity, were associated different intelligences that were congruent with Gardner's model.

#### 1.1.1 Neurobiological Basis of Intelligence

Materialism, as a philosophical school of thought, aims at identifying, conceptualizing, and associating the emergence of a "thing's" function to a space-occupying material (i.e., physical matter) as the mechanism through which the "thing" operates (Bunge, 2012). A materialist would argue that an individual's particular habit (i.e., pattern) of feeling, thinking, and behaving (responding) is the consequence of an emergent property of the brain. Furthermore, any function or experience related to the human being could be traced back, at least partially, to some measurable and observable consequence of coordinated and/or integrated brain function. The rational argument would then conclude that aspects of higher order processes (e.g., intelligence and personality) observed at the level of the individual are the consequence of emergent properties of the brain.

An emergent phenomenon is observed when an entity displays properties its component (unit) parts do not exhibit on their own (Bonabeau, Dessalles, & Grumbach, 1995a; Bonabeau,



Dessalles, & Grumbach, 1995b). These new properties or behaviours “emerge” when the unit-parts interact in a wider sum. Provided that intelligence is an emergent phenomenon and is derived from the activity of the central nervous system, there should exist a network or series of networks of coordinated brain activity that are highly related (and reliably associated) to traditional (psychometric) measures of intelligence. Jung and Haier (2007) developed an integrated theory to explain human intelligence from data derived from structural and functional brain imaging studies. The authors identified a series of cortical brain regions, distributed across the cerebral manifold, primarily involving the parietal and frontal regions. The activity incumbent with Parietal-Frontal Integration Theory (PFIT) was suggested to support regional activation (i.e., caudal-rostral association) distinguished into discrete stages of informational processing (Colon et al., 2010). These stages of informational processing (correlated to intelligence measures) involved activation of 1) the Temporal and Occipital association areas (Brodmann Area (BA): 18, 19; 37; 22), 2) the inferior (BA: 39 and 40) and superior (BA: 7) Parietal lobules, 3) Frontal regions involved with hypothesis testing (BA: 6, 9, 10, and 45-47), and 4) the anterior cingulate (BA:32) for behavioural monitoring (i.e., appropriate response selection and inhibition of inappropriate responses). Embedded within these findings, the authors identified regions of the dorsolateral prefrontal cortex (BA:9 and 45-47) as contributing most notably to intelligence (Jung and Haier, 2007).

If gray matter can be argued to be the generator of information, then white matter may contribute to the efficiency of information transmission across brain regions. Connective integration of PFIT structures are based upon structural connectivity of white matter fibers. Fasciculi (singular: fasciculus) are long association fibers that transmit regional information (modular brain activity) along the rostral-caudal axis. Again, the materialistic approach to

intelligence would dictate that the integrity of brain white matter connections contributes in some meaningful way to its emergent properties. Considering white matter is the structure through which electrical information is transmitted; it is assumed the relative efficiency of transmission would directly contribute to some measurable function; intelligence. Schmithorst et al., (2005) showed positive relationships between measures of white matter integrity (derived from indexes calculated from magnetic resonance imaging experiments) and intelligence as inferred by performance on Wechsler scales. The findings supported that bilateral white matter integrity of the longitudinal intrahemispheric connections associating components of the frontal and parietal regions (i.e., the superior longitudinal fasciculus and arcuate fasciculus) were most related to performance on measures of intelligence. Results from investigations conducted by Yu et al., (2008) revealed lateralized differences in white matter integrity between high intelligence and average intelligence participants. The differences observed were most prominent in the uncinate fasciculus. It is important to note the uncinate projects fibers between the rostral temporal pole (i.e., uncus) and the frontal cortices (Klingler and Gloor, 1960). Taken together, these findings support the hypothesis that transmission efficiency (white matter integrity) relating cortical (grey matter) areas of PFIT regions and the functional integrity of PFIT regions contribute in some meaningful way to intelligence.

### 1.1.2 Influence of Intelligence on Career

There is a large body of evidence examining aspects of general mental ability and its capacity to predict a number of aspects relevant to everyday life. General mental ability has been shown to predict learning, with low scores on measures of general intelligence (Standard score <70) associated with slow, simple, concrete step-by-step learning strategies (Schmidt, 2002; Schmidt and Hunter, 2004; Schmidt and Hunter, 2004; Gottfredson, 1986). Conversely, high score

on general mental ability (Standard scores >115) are generally associated with academic achievement at/or exceeding post-secondary level (Schmidt, 2002; Schmidt and Hunter, 2004; Schmidt and Hunter, 2004; Gottfredson, 1986; Gottfredson, 1998; Gottfredson, 2003; Hunter, 1986; Hunter et al., 1990; Hunter and Schmidt, 1996). General mental ability has also been shown to predict job or employment type. Lower measures of general mental ability are associated with jobs involving minimal complex independent reasoning and higher measures of general mental ability are associated with a greater degree of complex job-related tasks (Gottfredson, 1986; Gottfredson, 1998; Gottfredson, 2003; Hunter, 1986; Hunter et al., 1990; Hunter and Schmidt, 1996). Job success has been shown to be associated with measures of general mental ability. The degree of complexity (i.e., task requirements or demands) of the type of work being completed and one's degree of success at that job is congruent with measures of general mental ability (i.e., high scores on measures of general mental ability are associated with the ability to perform complex tasks and availability of resources to complete these tasks makes one more successful; Schmidt, 2002; Schmidt and Hunter, 2004; Schmidt and Hunter, 2004; Hunter, 1986; Hunter et al., 1990; Hunter and Schmidt, 1996). Predictability of job success based on general mental ability is greater for more complex jobs and, at the same time, is a weaker predictor for less complicated tasks (Gottfredson, 1986; Gottfredson, 1998; Gottfredson, 2003). Measures of general mental ability, comparing low scorers (Standard Score <70) to high scorers (Standard Score >115), have also been associated with increased risk of not completing secondary school education, receiving social assistance, incarceration, living in poverty, divorce rates, unemployment rates, and traffic accidents (Schmidt, 2002; Schmidt and Hunter, 2004; Schmidt and Hunter, 2004; Gottfredson, 1986; Gottfredson, 1998; Gottfredson, 2003; Hunter, 1986; Hunter et al., 1990; Hunter and Schmidt, 1996). In light of good predictability of job type and performance, general mental ability

is not the only factor which contributes to the strength of prediction of an individual's employment competence. Notably, other brain-derived processes, which in and of themselves are emergent processes (i.e., personality) have been implicated with vocational decision-making.

## 1.2 Personality

Other relationships exist with respect to job performance and career selection that are not, seemingly, influenced by general mental ability. For instance, there is some evidence to suggest personality is a predictor of performance and achievement in academics (Wantzel, 1993) and industry (Hunter and Schmidt, 1996; Barrick and Mount, 1996). Personality can be defined as the characterological traits reflecting patterns of cognition, emotion, and behaviour which have evolved from differential reinforcement of environmental and biological factors (Corr and Matthews, 2009). Researchers have shown personality, as assessed by the Five Factor Model of personality, predicts job performance (Blickle et al., 2008). Greater predictability of job performance is observed when individual personality factors were congruent with job demands (e.g., extraversion and performance in jobs requiring social skills were positively correlated, agreeableness were negatively associated with highly competitive jobs, etc.; Judge and Zapata, 2015). Academic performance, as measured by final exam grades, was associated with scores on personality factors assessing neuroticism and conscientiousness. Higher scores on the neuroticism scale were associated with impaired exam performance while higher scores on the conscientiousness scale were associated with improved academic performance (Chamorro-Premuzic et al., 2003). McHenry et al., (1990) argued for the inclusion of personality measures to improve predictive validity of batteries assessing planning and organizational skills. Research supports the contribution personality plays in success and performance in tasks of everyday life. It would be prudent then to include measures of personality when assessing features of job

performance and success as to accurately understand the motivations and resources available to be successful while employed.

Ackerman and Beier (2003) argued common factors present in measures of cognition, affect, and connotation may contribute to a common factor related to career choice and intellectual development. In a meta-analysis, O'Boyle and colleagues (2011), showed measures of emotional intelligence positively correlated with job performance, cognitive ability, and measures of personality. Furthermore, Coetzee and Schreuder (2011) showed a relationship between individuals' career anchors (values), as measured by the Career Orientation Inventory, emotional intelligence, and employability in service workers. Fox and Spector (2000) showed measures of emotional intelligence (e.g., empathy, self-regulation, and self-presentation), general intelligence, and practical intelligence were positively associated with interview outcomes in applicants. Ferris et al., (2001) showed a relationship between social skills and job performance that could differentiate between high and low general mental ability. Taken together, job performance and success seem to be multifaceted with one dimension (general mental ability, emotional intelligence, personality) only partially contributing to the gestalt. It may be prudent to consider multiple perspectives and individual preferences when selecting an appropriate career or educational path.

### 1.2.1 Neurobiological Basis of Personality

Biological and environmental factors contribute to the development of normal and abnormal personality traits (Roberts and Jackson, 2008; Depue, 1995; DeYoung, 2010). Research has demonstrated a high degree of heritability of personality traits in the Five-Factor Model

between parents and offspring and siblings (Power and Pluess, 2015; Jang, Livesley, and Vernon, 1996). Furthermore, personality disorders such as antisocial personality disorder, obsessive-compulsive personality disorder, and borderline personality disorder, have shown to have a high degree of heritability (Mason and Frick, 1994; Torgersen et al., 2012; Grove et al., 1990; Matthews et al., 2007). Environmental factors, such as early life trauma, affiliated peer groups, and appropriate attachments have been demonstrated to play a role in personality development (Reitz, Zimmerman, Hutteman, Specht, and Neyer, 2014; Specht et al., 2014; Bleidorn, Hopwood, and Lucas, 2018). Despite previous assertions that personality is unchanging, research has shown personality to be flexible and can be altered (to a degree) until after the third decade of life (Bleidorn et al., 2019). The degree to which personality can change diminishes as a function of age and is congruent with normal brain development (Hart, 2018).

Evidence gathered from lesion and neuroimaging studies have identified several neural substrates that contribute to the development of an individual's personality. Structures related to the neurobiological foundation of personality include the prefrontal cortex, the anterior cingulate, the insular cortex, the hippocampus and amygdala, and the mesolimbic dopamine pathway (Depue, 1996; DeYoung, Grazioplene, and Allen, 2021). Ostensibly, the most celebrated lesion study outlining the role prefrontal cortex plays in personality was the case of Phineas Gage. Gage's injury (the result of a work-related accident whereby a tamping rod punctured the orbit of his eye) led to significant changes in his characteristic manner of behaving, thinking, feeling, and relating that was evident to others. Other accumulated evidence that has identified the participation of the prefrontal regions to personality are derived from neuropsychological investigations of mild traumatic brain injuries and functional magnetic resonance imaging (fMRI) studies (O'Driscoll

and Leach, 1998; Gray and Burgess, 2004; Chow, 2000; Barrash, Travel, and Anderson, 2000). The anterior cingulate cortex has been shown to participate in behavioural monitoring and inhibitory control with respect to the way an individual responds to particular situations (Velanova, Wheeler, and Luna, 2008; Chan et al., 2011). While the insular cortex, in conjunction with other subcortical regions, has been implicated in empathetic responding (Singer, Critchley, and Preuschoff, 2009; Iacoboni and Lenzy, 2002; Valentini, 2010). Behavioural monitoring (i.e., managing appropriate responses to others) and empathy have been shown to play a major role in the ability to effectively navigate social interactions (Decety and Lamm, 2006; Santessi and Segalowitz, 2009). Research examining developmental (autism), and personality (antisocial) disorders characterized by poor behavioural monitoring and reduced empathy have shown structural and functional differences of the insula and anterior cingulate cortex as compared to controls (Uddin and Mennon, 2009; Doyle-Thomas et al., 2013; Jian et al., 2016; Kumari et al., 2014; Ly, Motzkin, Philippi, Kirk, Newman, Kiehl, and Koenigs, 2012).

Personality is inextricably linked to various aspects of learning and memory. The hippocampus has been identified as the neural substrate responsible for the encoding and reconstruction of semantic, episodic, and autobiographical information. Neuroanatomical connections of the mesiobasal temporal lobes functionally relate the amygdala with the hippocampus. Functionally, the amygdala has been shown to provide an affective label to experience; it provides emotional context to everyday life (Murray, Brosch, and Sander, 2014). Furthermore, the amygdala has been identified to play a role in aggressive behaviour (Coccaro, McCloskey, Fitzgerald, and Phan, 2007; Haller, 2018). Neuroanatomically, the amygdala and hippocampus are connected to other regions of the brain (the prefrontal cortex, anterior cingulate,

insula, etc.) that have been functionally associated with personality. Individuals with aggressive and antisocial personality traits have been observed to have structural and functional differences in their amygdalae as compared to “normal” individuals (Kaya, Yildirim, and Atmaca, 2020; Yang, Raine, Colletti, Toga, and Narr, 2010). Similar to the hippocampus, the mesolimbic dopamine system has been shown to play a role in reward anticipation and reward error prediction (Berridge, 2012; Murray et al., 2008; Lerner, Holloway, and Seiler, 2021) which attribute pleasure to particular stimuli. Hypo- or hyperfunction of the mesolimbic dopamine system have been shown to be involved with impulsivity, addiction, addictive personality, primary and secondary psychopathy, learning, and motivation (Pierce and Kumaresan, 2006; Pariyadath, Gowin, and Stein, 2016; Weiland et al., 2014; Buckholtz et al., 2010; Yildirim and Derksen, 2015; Yildirim, 2016).

There is an overlap between brain regions which contribute to personality and those that have been identified to play a role in specific mental abilities that contribute to general intelligence, most notably the prefrontal cortex and memory systems. Frontal regions contribute to decision-making, planning, mental flexibility, language, and working memory (Stuss, 2011; Fuster, 1999; Anderson, Jacobs, and Anderson, 2010). These aforementioned attributes are commonly assessed using traditional psychometric measures of intelligence (Wechsler, 2011). Furthermore, frontal regions are involved in tasks which assess Fluid intelligence while tasks of semantic and other aspects of declarative memory typically involve underlying temporal (hippocampal) regions devoted to memory (Jung and Haier, 2007). It seems that, although measures of intelligence and personality predict job performance, it may be that they are in fact measuring a common feature;



the brain. It stands to reason, career choice, performance, and success may be predicted by the overall structural-functional integrity of the brain.

### 1.3 Executive Function

The frontal lobes form the largest portion of the neocortex approximating 40% of the cerebral manifold (Crosby, 1963; Parent, 1996). Researchers have shown the frontal lobes continue to develop (i.e., have demonstrated neurogenesis and synaptic plasticity) until the ages of 25 – 30 years (Damasio, Anderson, and Tranel, 1993; Miller and Cummings, 2017). Functionally, aspects of the frontal lobes have been identified to coordinate and contribute to language (production and affectivity), reasoning, motor movements, planning, goal-directed behaviour, mood, personality, and executive function (Damasio and Anderson, 2003). Furthermore, aspects of working memory, fluid and crystallized intelligence, and mental flexibility have been ascribed to the frontal lobes (Gilbert and Burgess, 2008; Roca et al., 2010; Oosterman et al, 2010). According to Alvarez and Emroy (2006), executive functions are typically classified as “higher-order” cognitive processes. Higher-order cognition acts to supervise and regulate lower-level processes that are associated with goal-directed and future-oriented behaviour. Both empirical and theoretical research have further dissected processes belonging to executive function to include tasks such as a) inhibition and task switching (Baldo et al., 2001; Burgess et al., 1998; Miyake et al., 2000; Rabbitt, 1997; Sergeant et al, 2002; Troyer et al., 1998; Welsh, 2002), b) working memory (Baralo and Knight, 2002; Barcelo and Rubia, 1998; Barkley, 1996; Denekla, 1996; Dunbar and Sussman, 1995; Pennington et al., 1996; Sergeant et al., 2002; Stuss et al., 1998; Stuss et al., 2001; Welsh, 2002; Zelazo et al., 1997) and c) sustained and selective attention (Barcedo, 2001; Barkely, 1996; Manly and Robertson, 1997; Stuss et al., 1998; Stuss et al., 2001). Other researchers have dichotomized

executive function into 1) metacognitive functions (e.g., planning, inhibiting, and working memory) and 2) emotional/motivational executive functions (e.g., fulfillment of biological needs according to some pre-existing condition; Ardilla, 2008).

### 1.3.1 Neurobiological Basis of Executive Function

Integrity of the dorsolateral prefrontal cortex (dlPFC) is important to the integrity of executive function (Yuan and Raz, 2014; Tandetnik et al., 2021). Deficits associated with structural (functional) changes in the dlPFC are marked by an inability to organize appropriate (adaptive) responses to a complex or novel stimulus (Kuehne, Heimrathm Heinze, and Zaehle, 2015). Manes et al., (2002) associated the ventral and dorsal portions of the prefrontal cortex with rational decision-making. Fuster (1997a; 1997b; 2002) argued the lateral prefrontal cortex acts as a zeitgeber (time giver) for the cognitive, behavioural, and linguistic facets of goal-directed actions. Also associated with executive functions, the orbitofrontal and medial frontal systems have been shown to be related to disinhibition, inappropriate behaviours, dysregulation of personality, emotional lability, and distractibility (Stuss and Knight, 2002). Taken together, these data would suggest frontal systems (i.e., dlPFC and orbitofrontal regions) contribute, at least in part, to executive functions. Despite the idea that executive function is highly related to frontal lobe function (and integrity) Alvarez and Emroy (2006) showed frontal and non-frontal regions were associated with measures of executive function (Wisconsin Card Sorting Test, Phonemic Fluency, Stroop Test). The authors purported executive functions (i.e., working memory, inhibition, and selective attention) work in concert to select appropriate solutions most effectively to complex problems. It would seem then, that executive function is an emergent property designated to evaluate the appropriateness of solutions and apply these solutions to the problems of everyday life.

Regions of the prefrontal cortex, namely the dlPFC and orbital and ventromedial areas, have been identified to play a role in personality in addition to being integral to executive function. Evidence which supports claims of prefrontal cortex involvement in personality are derived from lesion studies, neuroimaging, and correlative neuroanatomy (Luu, Collins, and Tucker, 2000; Litzman, Hecht, Freeman, Shapiro, and Hopkins, 2015; Canli, Zhao, Desmond, Kang, Gross, and Gabrielli, 2001). Neuropsychological test data has evidenced changes in social and affective perception, emotional regulation, attention, and behavioural monitoring as a consequence of closed head injury involving the frontal regions (Fellows and Farah, 2003; Bornhofen and McDonald, 2008; Beer, John, Scabini, and Knight, 2006). Neuroanatomical studies have demonstrated connection between the amygdala and orbitofrontal and ventromedial regions in humans and higher order primates (Kringelbach and Rolls, 2004; Klingler and Gloor, 1960). Concerted activity of these aforementioned frontal and sub-cortical regions have been shown to be involved with moral reasoning and empathy (Boccia et al., 2017; Raine and Yang, 2006). Significant differences in activity (connectivity) of the orbitofrontal and ventromedial prefrontal cortices and amygdala are observed in individuals with psychopathy and antisocial personality disorder (Raine and Yang, 2006; Blair, 2007). Individuals with obsessive-compulsive personality have also been shown to have functionally different frontal lobe activity as compared to normal individuals (Schmidtke, Schorb, Winkelmann, and Hohagen, 1998). Results of neuroimaging studies have demonstrated the mesolimbic dopamine pathway exerts its influence on regions of the prefrontal cortex (Cho and Strafella, 2009). For instance, differences in mesolimbic dopamine and frontal lobes have been related to the behavioural (drug-seeking) and cognitive (obsessions, compulsions, cravings) features of substance dependence (Kalivas and Volkow, 2005; Koob and Volkow, 2016; Adinoff,

2004). Furthermore, reduction in frontal lobe-related behavioural inhibition has been observed in impulsive individuals (Chen et al., 2007; Floden, Alexander, Kubu, Katz, and Stuss, 2008). Higher capacity to delay gratification (e.g., ability to voluntarily delay immediate reward and persist in goal-directed behaviour for future reward) has been shown to be related to higher executive function, lower impulsivity, and greater behavioural monitoring (Zayas, Mischel, and Pandey, 2014; Kocka and Gagnon, 2014).

### 1.3.2 Influence of Executive Function on Career

Another frontal lobe-related ability, devised to assist an individual navigate and adapt to the stressors placed on them by vocational circumstances, is reportedly described as mental flexibility. Mental (cognitive) flexibility is the capacity of an individual to manage multiple competing stimuli or to navigate factors which create interference of normal cognitive features (Wecker et al., 2005). Cognitive flexibility has also been linked to resilience, or the ability to defend against and recover from adverse circumstances (Hart et al., 2014). Mental flexibility and resilience have been associated with decreased self-reported measures of depression, anxiety, and increased favourable outcomes in patients diagnosed with cancer (Hulbert-Williams et al., 2015). Furthermore, resilience has been demonstrated to reduce the risk of developing post-traumatic stress disorder (PTSD) in nursing staff (Mealer et al., 2012) and was related to lengthier employment.

Mental flexibility decreases with age (Wecker et al., 2005) and may contribute to the experience of a reduction in motivation to continue working in older adults. Peeters et al., (2008) conducted a meta-analysis examining aspects which contributed to the motivation of older adults to continue working. What was shown was that most age-related factors negatively contributed to

the motivation of older adults to continue working. Normal aging is associated with progressive decline in overall cognitive processes and general biological integrity. Such age-related factors include: a reduction in speeded processing, reduction of fluid intelligence, increase in crystallized intelligence, increased difficulty in learning new material, decreased memory retention, reduced mobility, and decreased perceptual acuity (e.g., reduce visual acuity; Schaie and Willis, 2010).

It may be that, at an age where individuals are entering and actively participating in the rigours of employment, there is a greater need for flexibility in order to learn the skills necessary to be successful in a chosen career. That is to say, individuals early in their careers require and actively use (practice) aspects of mental flexibility and fluid problem-solving (intelligence) due to the novelty of experiences they are being subjected to in the work environment. With increased exposure to and experience with the demands of their respective professions, individuals rely less on mental flexibility and fluid problem-solving. In essence, they have effectively learned the most appropriate solutions needed to successfully solve the problems and challenges present in the work environment. As such, there is less emphasis on flexibility and fluidity and more demand placed on aspects of crystallized problem-solving (i.e., memory of what worked previously) and interpersonal interactions (e.g., how to effectively meet the needs of others if one is in a managerial position). The latter case is governed more by personality and mood which are generally reified and stable in later life (Specht et al., 2014; Bleidorn et al., 2019). What may be ever-present however is the drive (motivation) to complete work-related tasks for some (intrinsic, extrinsic, secondary) reward.

#### 1.4 Motivation

In essence motivation can be operationally defined as the process that initiates, maintains, and guides goal-directed behaviour. Several models have been proposed to describe the underlying mechanisms associated with the individual aspects of motivation. For instance, Maslow proposed a drive-needs theory of motivation whereby an organism is motivated (driven) to attain goals that fulfill biological, self-referential, and social needs (Maslow, 1955). The incentive motivational theory proposed the behaviour of an organism is driven by desires for reinforcement while Vroom's expectancy theory (1964) suggests the effort of an individual will lead to success and success will spawn reward. More recently, McClelland (2005) proposed persons are motivated by three needs that are required to be fulfilled in order to experience the sensation of reward; 1) achievement (completing a task or challenge; attaining a goal), affiliation (to be social and have meaningful interpersonal interactions), and power (influencing the behaviour or thoughts of another individual). Despite the nuanced differences between perspectives in the mechanism of motivation, one can classify motivation as falling into two broad categories: Extrinsic and Intrinsic. Extrinsic motivation infers the driving force behind a person doing something is external to that individual. Conversely, if the driving force for a person's behaviour is said to have originated from the internal processes of that individual then the motivation is inferred to be intrinsic.

#### 1.4.1 Neurobiological Basis of Motivation

Research conducted by Depue and Collins (1999) argued incentive motivation, a subset of motivation classified as extrinsic, is governed by neurobiological substrates circumscribed to the behavioural activation and reward systems. The authors outlined a corticolimbic-striatal-thalamic network that was responsible for the 3 processes related to motivation. First, the network integrates the contextual salience of extrinsic reward by relying on the functional aspects of the medial-orbital cortex, amygdala, and hippocampus. Second, the network encodes the intensity

(meaningfulness) of the rewarding stimulus through activation of the nucleus accumbens, ventral pallidum, and ventral tegmental area. Lastly, the network communicates the need to approach the rewarding stimulus with the motor cortex.

We have discussed the role of the structures outlined by Depue and Collins (1999) in their corticolimbic-striatal-thalamic network previously. Ostensibly, the orbitofrontal and ventromedial prefrontal cortex participates in moral reasoning, empathy, and impulsivity. Structural and functional abnormalities of these regions have been associated with the development of disordered personalities (e.g., antisocial personality disorder) (Raine and Yang, 2006). Furthermore, the orbitofrontal regions are shown to participate in the anticipation of a reward (e.g., expectancies) (Kahnt, Heinze, Park, and Haynes, 2010; Cox, Andrade, and Johnsrude, 2005). Reward-paired cues initiate reward-seeking behaviours involving independent motivational and cognitive processes (Nadler et al., 2011; Liljehol and O'Doherty, 2011). Research conducted by Yun, Wakabayashi, Fields, and Nicola (2004) showed reward-predictive (incentive) cues influenced goal-directed behaviour that involved dopamine-dependent firing of nucleus accumbens neurons from projections originating in the ventral tegmental area.

Eccles (1995) stated individual differences in behaviour, particularly achievement-related behaviour, have been linked to expectancies. Expectations for success (reward) and related constructs have been placed in a central role in cognitive theories of motivation such as attribution theory (e.g., Weiner et al., 1971), self-efficacy theory (Bandura, 1986), the self-worth perspective (Covington, 1984), and classic expectancy/value theory (Aktinson, 1957). According to Bandura (1988) people motivate themselves and guide their actions anticipatorily through cognitively

mediated strategies. Cognitive strategies used for self-motivation involve aspects of forethought, goal setting, and self-evaluation of one's own actions (Bandura, 1981). Goals increase an individual's cognitive-affective reactions to personal outcomes defining self-perceived success (Bandura, 1986; 1991b). Bandura (1981) posited making satisfaction with oneself conditional on a self-defined level of performance encourages the individual to persist in a given behaviour until their standards are satisfied. It was further postulated that the satisfaction of attaining, and dissatisfaction of missing self-assigned standards provides incentives for self-directed and corrective actions (Bandura, 1981). A sense of personal efficacy, perceived competence in completing and mastering challenges to a level meeting the standards outlined by the individual, likely generates greater interest in that activity (Bandura, 1981). In essence, the individual solidifies their agency in affecting change through their efforts; effort becomes incentivized, and the individual expects their efforts to generate reward by meeting their self-imposed standards. Although the source of motivation and reinforcement (one arising from external reward-paired cues and the other from internal cognitive processes) differ they likely involve overlapping neurobiological substrates. Evidence to support this hypothesis comes from the work done by Halbout and colleagues (2018) who examined cue-induced reward seeking and retrieval in rats whose dopaminergic projections to the nucleus accumbens from the ventral tegmental area were inhibited. The authors showed chemical inhibition of ventral tegmental neurons attenuated reward seeking behaviour.

#### 1.4.2 Influence of Motivation on Career

Motivation plays a role in employment performance regardless of whether it is driven by extrinsic or intrinsic factors. For instance, research conducted by Oto, Roe, Subiraj, Baluku, and Garrid-Vasquez (2017) examined associations between intrinsic (e.g., job satisfaction) and



extrinsic (e.g., position and salary) on career ambitions (e.g., achievement motivation and strong career orientation) among psychologists. The authors showed, over time, intrinsic motivation predicted extrinsic success such that greater job satisfaction was related to higher paid and more prestigious positions. In a review, Gerhart and Feng (2015) outlined that both extrinsic and intrinsic motivation serve to increase job success and performance in the workplace. The authors opined extrinsic motivation was associated with improved workplace performance while intrinsic motivation served to influence creativity. It was suggested a balance between intrinsic and extrinsic motivation would, according to self-determination theory, enhance congruence impacting success. The data presented, along with evidence of neurobiological overlap between networks mediating intrinsic and extrinsic motivation, suggest complementary processes influencing job-related performance and persistence.

### 1.5 Career Values

In a system that relies heavily on the exchange of personal time and the execution of specific skills in order to complete a series of tasks directed to attain a goal for monetary compensation, choosing a career that is best suited to the individual is paramount. Career choice is an individual's decision to pursue a given career or job type based on some self-referential criteria. Traditional careers have dominated industrial employment because most organizational structures support it (Sullivan, 1999) However, accessibility of information and education has provided the opportunity for different generations to pursue multidirectional (boundaryless) careers (DeFillippi and Arthur, 1994). Essentially, with more opportunity for education, access to information, and accumulation of work-related experience individuals find themselves with more options to select from as possible careers to pursue.

Several models have been proposed and developed to assist persons identify potential career options that may be most appropriate to their individual needs, preferences, and abilities. For instance, the most widely used and researched model in career assessment is Holland's General Occupational Interests model. Holland's model posits people will select a job type based upon shared interests of samples of people working in that field (Holland, Johnson, and Francis, 1994; Reardon and Lenz, 1999). Using shared interests as the selection criteria for a career is predicated by the assumption that people sharing common interests have some overlapping characteristics (e.g., personality, motivation, aptitude and ability) that are identified upon self-reflection and self-reporting and are required to be employed in a given position (Reardon and Lenz, 1999; Nauta, 2010). Conversely, Bandura's Social Cognitive Model (1981) posits an individual selects a particular career based upon their reinforcement history, expectancies and expectations, self-control, self-efficacy, and behavioural capability rather than shared interests. Personality theorists, on the other hand, argue individuals gravitate toward a particular career that is inherently congruent with their basic personality makeup (Eakman and Eklund, 2012). Both Bandura's model and the personality-based perspective on career choice have been argued to support Holland's General Occupational Interest model thus inextricably linking personality, self-efficacy, and reinforcement (the latter two being related to motivation) to career choice (Schaub and Tokar, 2005).

An alternative model was proposed in the 1990's by Schein who developed a value-based model for career choice. Rather than focusing on the convergence of shared interests, which may be transient and vary according to several changing internal and external pressures, Schein's model focuses on three core facets; 1) self-perceived work talent and ability, 2) self-identified motives

and needs, and 3) internal (subjective) career values and needs (Schein 1990; Schein 1996). Overall, Schein's model reflects an individual's self-concept and personality as it relates to employment (Coetzee and Schreuder, 2014), emphasizing the role of individual differences in job selection. Schein's model also accommodates change, underscoring the interaction between individual differences and the working environment. As such, an individual's values can be wholly reinforced (provided the individual-work environment interaction is fully congruent with their values), lead to conflict (in the event the interaction between individual differences and the work-environment is wholly incongruent), or promote growth and adaptation (when minor discrepancies or incongruences exist in the interaction between an individual's values and their work-environment). Thus, according to Schein's model, career values, much like personality, ability, and motives, can evolve under dynamic conditions.

The dynamism of Schein's value-based model allows for, at least theoretically, a great deal of accommodation and latitude when choosing a career and would be better suited for pursuit of boundaryless careers. A multidimensional (boundaryless) approach to career selection suggests the development of multiple and translatable skills, those that can be applied to several problems, would facilitate performance and overall career success. However, unlike Holland's model, Schein's approach lacks the specificity to pair an individual with or categorize an individual in a particular career based upon their self-reported career values. For instance, Nordvik (1996) examined the relationship between Myers-Briggs Type Indicators, Holland's Vocational interests, and Schein's career anchors in Norwegian adults. Results showed distinct Myers-Briggs factors predicted Holland codes (in congruence with the theoretical framework of Holland's model) however neither vocational interest nor Myers-Briggs Type Indicators were related to any of

Schein's career anchors. Schenk (2003) reviewed studies investigating career anchors (highest ranked career value) across different work environments. The author reported any given work environment (career/position), where one would expect to find a homogeneity of values, what is in fact observed is a wide distribution of career anchors. The findings reported by Schenk (2003) may be a consequence of the interaction between individual and the work environment where individual differences are exacerbated and tooled to fit the demands of the position as suggested by Coetzee and Schreuder (2014). Alternatively, it may be that a particular career or position has embedded within its structured tasks and demands, the flexibility to be congruent (or support) many personal career values.

#### 1.5.1 Influence of Career Values on Career

The strength of any model is its ability to make accurate predictions of outcomes. Work by Tremblay, Dahan, and Giancchini (2014) aimed to investigate relationships between life and career success and career anchor type. The authors showed stronger management anchors were related to objective career success (e.g., promotions and salary). An indirect relationship between career success and stronger lifestyle anchors was reported however the lifestyle anchor was directly related to measures of life successes outside the working environment. Coetzee and Schreuder (2011) investigated the relationship between emotional intelligence, job satisfaction, and career anchors among service workers. The authors showed job satisfaction was predicted by pure challenge and service/dedication to a cause career anchors. Additionally, managerial competence and lifestyle career anchors differentially predicted career trajectories (e.g., advancements, salary, company hierarchy) among Swiss managers across a 15-year period (Gubler, Biemann, Tschopp, and Grote, 2015).

We have outlined several factors that are shown to be associated with career success (performance) and choice. Remarkably, measures of these facets have examined shared sources of variance or commonalities amongst individuals to predict outcomes. At the outset of this document, we proposed examining individual differences among persons and how these discrete sources of variance contribute to career selection and success. Again, the idea is each individual possesses a unique repertoire of skills and abilities necessary to successfully navigate the stressors of everyday life. Curiously, our interest lies in determining whether it is more important to possess certain skills that are congruent with the skillsets of persons who are already in a given career or the manner in which an individual can adapt their unique skills to situations that arise throughout their career to be successful.

There were several aims for this investigation. First, we aimed to determine whether participants share common career values. Second, we aimed to evaluate which variables (e.g., performance-based measures, personality characteristics, and motivation) can predict shared values. Lastly, we aimed to examine what performance-based measures, personality characteristics, and sources of motivation predict Schein's 8 independent career values from this sample.

## 2 Materials and Methods

### 2.1 Participants

#### 2.1.1 Students

Student participants were recruited from Laurentian University undergraduate programs, community college programs (e.g., College Boreal, Cambrian College), and community college (i.e., Trillium College, CTS Canadian Career College), and secondary school associated with the

Rainbow school board in the Greater Sudbury Area. All respondents were pooled from secondary and post-secondary institutions. A total of 28 students ( $n = 28$ ) participated in the research outlined. Students were compensated for their participation by 1) receiving 2% bonus marks to be applied, at the discretion of their professors or course instructors under their presiding institution, to their grade in psychology courses or an equivalent course and 2) entered a raffle for a \$50.00 gift card. Recruitment was conducted using online social media platforms (i.e., Facebook), online recruitment platforms (i.e., SONA, Redcap), and other approved means (i.e., word of mouth, departmental postings).

#### 2.1.2 Community Members

Participants from the community and actively employed were recruited using online social media platforms (i.e., Facebook), electron advertising platforms, and other approved means of recruitment (i.e., word of mouth). There was a total of  $n = 14$  individuals from the community who participated in this research. Participants were compensated for their participation by being entered into a raffle for a \$50.00 gift card.

### 2.2 Psychometric Test Battery

#### 2.2.1 General Methods of Administration:

All respondents who participated in this investigation were administered the same psychometric test battery. The psychometric battery included tests designed to evaluate aspects of an individual's cognition, personality characteristics, executive functions, motivations, and career values. Different demographics questionnaires were administered to the secondary school students, post-secondary students, and community members. The test battery used in this

investigation included tests designed to measure global intellectual function (Wechsler Abbreviated Scale of Intelligence; test of Nonverbal Intelligence – Form A), personality characteristics (NEO Five Factor Inventory – 3), executive function (Wisconsin Card Sorting Test – 64 Card Version; Wechsler Working Memory Index), motivation (Work Preference Inventory), and career values (Career Orientation Inventory). All psychometric measures were administered to each participant. The order of administration was designed to minimize 1) interfering effects between tests, 2) the degree to which each system under investigation was being taxed, and 3) the effects of test-taking fatigue. The order of administration was: Specialized demographics questionnaire (secondary student, post-secondary student, and community members), TONI-4, WASI-II Vocabulary subtest, WAIS-IV Digit Span subtests, WASI-II Similarities subtest, WAIS-IV Arithmetic subtest, WSCT-64, WPI, COI, NEO-FFI-3. The order of administration did not differ between groups. Participants were encouraged to take breaks if required however they were advised breaks would not be allowed if they had already started a test. All tests were administered and scored by a registered and competent psychometrist under the supervision of a registered clinical psychologist.

#### 2.2.1.1 Methods of Administration for Students

Students were recruited from secondary and post-secondary institutions. Only students aged 16 or older were considered eligible to participate. In addition to the psychometric test battery outlined in Section 2.2.1 – Psychometric Battery – General Methods of Administration, students were asked to complete a demographics questionnaire. Student demographics aimed at collecting information pertaining to age, sex, gender orientation, years of post-secondary education completed, and declared or projected academic major of student respondents. Furthermore,

students were asked to list and rank their top 5 prospective professions or aspiring careers. Finally, descriptions of the 8 career anchors outlined in the Careers Orientation Inventory (COI) were provided and students were asked to order, in terms of saliency, the 3 values which they perceived as the most important to them for their future careers. Similar demographics questions were posed to secondary school students with minor alterations. First, secondary school students were asked to indicate their current grade, and only those aged 16 and older were included in the participant pool. Second, secondary school students were asked to select, from a series of forced-choice options, their intended post-secondary pursuits.

#### 2.2.1.2 Methods of Administration for Active Career

In addition to the psychometric test battery outlined in Section 2.2.1 – Psychometric Battery – General Methods of Administration, community members were asked to complete a demographics questionnaire distinct from that of the students. Community respondents were asked to provide information pertaining to their age, sex, and gender orientation and were asked questions pertaining to education and employment history. With respect to education, participants drawn from the community were asked to indicate the number of years of education they received specifying whether any post-secondary education was completed. In the event any post-secondary education was completed, respondents were asked whether they obtained a diploma, certificate, or degree and what specialization (i.e., major) was associated with their accreditation. Questions pertaining to employment history asked whether the respondent ever changed/alterd their career or career trajectory, and how often they made these changes. We defined a career in terms of length of time employed in a given position that exceeds 10 years and/or required any specialized training or upgrading that was completed in order to be employed in a given position. We did not consider



continuing education or specialized training that would be considered an adjunct to a position as a criterion for a career change. Respondents were asked the length of time they have been employed in their current position, or how long they were employed in their last position before retiring, whether they had the opportunity for advancement, and what position(s) they are planning to apply for or are looking to be promoted to. Community members were asked to rate their perceived success and overall job satisfaction on a 11-point Likert scale ranging from Not at All to Very Much So. Respondents were provided brief descriptions of the 8 COI career anchors and asked to rank-order what they perceived to be their 3 most important values (i.e., personal values). In addition, these same respondents were asked to rank-order 3 of the 8 COI anchors that their current or past (if retired) careers satisfied the most (i.e., professional values). Inclusion criteria for community members were: 16 years of age and older, employed, or retired.

### 2.2.2 Tests of Global Intellectual Function:

The Wechsler Abbreviated Scale of Intelligence 2<sup>nd</sup> edition (WASI-II) was developed by David Wechsler to evaluate cognition (Wechsler, 2011). The WASI-II was designed to assess performance of 2 domains: Verbal Comprehension and Perceptual Reasoning and provides insight on general intellectual ability. We selected 2 subtests from the WASI-II, Vocabulary and Similarities, to administer to participants in order to assess their Verbal Comprehension. According to the manual, the Vocabulary subtest is designed to assess an individual's word knowledge, verbal concept formation, crystallized intelligence, fund of knowledge, learning ability, long-term memory, and extent of language development (Wechsler, 2011). According to the manual, the Similarities subtest is designed to assess verbal concept formation and reasoning, crystallized intelligence, abstract reasoning, auditory comprehension, memory, associative and

categorical thinking, verbal expression, and distinction between essential and nonessential features (Wechsler, 2011). When combined, the Vocabulary and Similarities subtests yield a composite score assessing verbal reasoning, comprehension, conceptualization, and crystallized intelligence; the Verbal Comprehension Index (Wechsler, 2008). The Test of Nonverbal Intelligence – 4<sup>th</sup> Edition (TONI-4), is a language free measure designed to assess intelligence, aptitude, abstract reasoning, and problem solving (Brown, Sherbenou, and Johnsen, 2010). According to the manual, the TONI-4 is a good representation of general mental ability and fluid intelligence (Brown, Sherbenou, and Johnsen, 2010). There are two versions of this test, and all participants were administered Form A only.

### 2.2.3 Personality Inventory:

The NEO Five-Factor Inventory-3 (NEO-FFI-3) is a 60-item, abbreviated measure specifically designed to assess an individual's endorsement of personality characteristics described in the Five-Factor model of personality (McCrae and Costa, 2010). The NEO-FFI-3 asked participants to rate the degree to which they agree to items comprising the 5 personality domains: Neuroticism, Extraversion, Openness, Conscientiousness, and Agreeableness. Terracciano and McCrae (2006) showed that the dimensions assessed using the Five-Factor Model of personality are relatively stable throughout life, are highly influenced by genetics, and are related to such features as emotional-well being, career and academic performance, and psychiatric and personality disorders.

#### 2.2.4 Measures of Executive Function:

Estimates of executive function were evaluated using two measures: Wisconsin Card Sorting Test – 64 Card Version (WCST-64) and Wechsler Working Memory Index (WMI). According to the manual, the WCST was originally developed in 1948 by Berg as an instrument to assess abstract reasoning and set shifting in response to changing stimuli (Heaton et al., 1993). In essence, the WCST is considered a measure of executive function relying on the ability to maintain an appropriately developed problem-solving strategy across changing conditions for a future goal (Heaton et al., 1993). The authors of the manual report the WCST requires strategic planning, organized search, ability to profit from feedback to shift set, goal-directed future-oriented behaviour, working memory, and impulse control (Heaton et al., 1993; Kongs, Thompson, Iverson, and Heaton, 2000) and is thus considered comparable to other tests which measure executive function. The WCST-64 is an abbreviated version of the original WCST that only relies of the first 64 stimulus cards and maintains the same task requirements of the original WCST (Kongs, Thompson, Iverson, and Heaton, 2000). Using only the first 64 cards improves the efficiency of test administration, reducing the task completion time from 20-30 for the full version to approximately 10 minutes for the WCST-64. The WCST-64 has comparable validity and test-retest reliability as the WCST (Kongs, Thompson, Iverson, and Heaton, 2000). The interrater reliability of the WCST ranges from 0.88- 0.96, with moderate test-retest reliability (mean = 0.60 generalized coefficient), and very good construct validity (Kongs, Thompson, Iverson, and Heaton, 2000).

The WMI is a composite score generated from performance on three subtests: digit-span, arithmetic, and letter-number sequencing. The digit-span subtest is composed of three tasks: Digit-

Span Forward, Digit Span Backward, and Digit Span Sequencing. In Digit Span Forward condition, participants are asked to repeat back a series of numbers in the order in which they were presented. Digit Span Backward prompts the participant to repeat back a series of digits in the reverse order in which they were presented. Finally, Digit Span Sequencing participants are required to read a sequence of numbers and recall them in ascending order. Combined, these three tasks are designed to assess aspects of cognitive flexibility, mental alertness, rote learning and memory, attention, encoding, auditory processing, working memory, transformation of information, mental manipulation, and visuospatial imaging. The arithmetic subtest requires the participant to mentally solve arithmetic problems within a restricted timeframe. According to the test manual (Wechsler, 2008) arithmetic involves mental manipulation, concentration, attention, short-term memory, long-term memory, numerical reasoning ability, and alertness. Additional research has implicated arithmetic in fluid reasoning and sequential reasoning (Groth-Marnat, 2003; Kaufman and Lichtenberger, 1999, 2006; Sattler, 2008b). The Letter-Number Sequencing task is an optional subtest where participants are required to read a string of letters and numbers prior to being asked to arrange the letters in alphabetical order and the numbers in ascending order. According to manual (Wechsler, 2008), Letter-Number Sequencing taps into aspects of sequential processing, mental manipulation, attention, concentration, memory span, and auditory short-term memory. Other research suggests Letter-Number Sequencing involves fluid intelligence and cognitive flexibility (Crowe, 2000; Groth-Marnat, 2003; Kaufman and Lichtenberger, 1999, 2006; Sattler, 2008b). The WMI is an index of the Wechsler Adult Intelligence Scale 4<sup>th</sup> Edition (WAIS-IV) that provides insight into an individual's working memory. According to the WAIS-IV test manual (Wechsler, 2008) working memory is the ability to maintain information and manipulate said information to produce a desired result. Research indicated working memory is essential to

fluid reasoning and executive function (Beuhner et al., 2006; Kaufman and Lichtenberger, 2006; Ribaupierre and Lecerf, 2006; Slathouse and Pink, 2008; Unsworth and Engle, 2007). According to the manual, the WMI is correlated (0.37 – 0.63) with the subcomponents of Delis-Kaplan Executive Functions System (D-KEFS) a collection of nine tests designed to assess verbal and nonverbal executive functions.

#### 2.2.5 Motivation:

The Work Preference Inventory (WPI) is a 30-item self-reported measure that is used to assess intrinsic and extrinsic motivation in the workplace. Respondents were asked to rank the degree to which a statement is true as it applies to them and is rated on a 4-point Likert scale (Amabile et al., 1994). The authors of the test discussed the WPI has Cronbach alphas range from .70-.75 on their primary intrinsic and extrinsic scales, and .62-.73 on its secondary scales and a test-retest reliability ranging from .73-.89 (Amabile et al. 1994).

#### 2.2.6 Career Values:

Individual perspective on the importance of career self-concept (values) was evaluated with the use of the Career Orientation Inventory (COI). Career self-concept refers to the motives and values an individual has for their employment and is categorized into 8 domains as assessed by endorsement on self-reported items on the COI. The 8 career domains (anchors) include: autonomy/independence (freedom from organisational rule), technical/functional competence (motivation for skill development), general managerial competence (application of management of others), entrepreneurial/creativity (need to create or build), lifestyle (integration of aspects of an individual's lifestyle), pure challenge (testing one's abilities against self or others),

service/dedication to a cause (aligning personal values with work to helping society), and security/stability (need for job security). The COI has been used as a research tool to investigate relationships between career anchors, job satisfaction and success (Van Vuuren and Fourie, 2000; Coetzee and Schreuder, 2009).

### 2.3 Statistical Methods

Data rendered from psychometric measures of cognition (WASI-2 Verbal Comprehension, Vocabulary, and Similarities; TONI-4), executive function (WCST-64; WMI), and personality (NEO-FFI-3) were scored according to their respective manuals and standardized relative to demographically corrected norms. Resultant T-scores for global measures and independent components/sub-tests were computed and entered as variables for analysis (interval data). Response content from demographic questionnaires were categorized (nominal data) in accordance with job descriptions lifted from Careers Canada, and all other data was coded as nominal variables for analysis. Results of the COI and WPI were scored according to their manuals and raw scores are reported for each of their corresponding subscales. All statistical analyses were conducted in SPSS 22 statistical software and graphical representations of the data were constructed in Microsoft Excel 2016.

There were  $n = 28$  students (secondary and post-secondary combined) and  $n = 14$  community members. Although the sample size was small the data collected was rich. We decided to conduct detailed analyses of the data to evaluate its richness, depth, and possible meaningfulness. Thus, both student and community members were lumped together for analyses ( $n = 42$  participants). Several reasons for a low yield are presented. The sparsity of community

members (and students) may, in part, be due to the time commitment for participation (2+ hours). Recruitment also posed a limiting factors to this study as it was conducting in the wake of the COVID-19 pandemic and was facilitated remotely. Furthermore, some participation was lost due to scheduling conflicts and/or non-attendance.

### 2.3.1 Analysis of Collinearity – Regression of Factors

Multicollinearity was assessed among each predictor variable for each of the 4 factor scores following three phases of diagnostics. First, zero-order correlations were visually inspected among all predictor variables (e.g., performance-based measures, personality characteristics, and sources of motivation). A zero-order correlation coefficient of greater than or equal to 0.90 was used to identify possible collinearity among predictor variables. Second, we evaluated Tolerance and the Variance Inflation Factor (VIF) statistics to further assess potential sources of collinearity. A cut-off of less than or equal 0.1 was set as the criteria for measures of Tolerance to suggest the possibility of collinearity among predictor values. In addition, a cut-off criteria of greater than or equal to a VIF of 10 was used to signal the possibility of high levels of linear dependencies among predictor variables. Lastly, we evaluated the collinearity diagnostics provided by SPSS software, in this manner we examined the condition index statistics (indicator of potential dependencies among predictors). For the condition index statistic, a cut-off of greater than or equal to a value of 30 was set as an indicator to suggest possible collinearity among predictor variables. Provided a condition index statistic of 30 or greater was determined, we evaluated the variance proportions of each predictor variable and used a cut-off criterion of 0.50 or greater as a threshold to indicate possible dependency among predictor variables.

### 2.3.2 Analysis of Collinearity – Regression of 8 Career Values

Multicollinearity was assessed among each predictor variable for each of the 8 career values following three phases of diagnostics. First, zero-order correlations were visually inspected among all predictor variables (e.g., performance-based measures, personality characteristics, and sources of motivation). A zero-order correlation coefficient of greater than or equal to 0.90 was used to identify possible collinearity among predictor variables. Second, we evaluated Tolerance and the Variance Inflation Factor (VIF) statistics to further assess potential sources of collinearity. A cut-off of less than or equal 0.1 was set as the criteria for measures of Tolerance to suggest the possibility of collinearity among predictor values. In addition, a cut-off criterion of greater than or equal to a VIF of 10 was used to signal the possibility of high levels of linear dependencies among predictor variables. Lastly, we evaluated the collinearity diagnostics provided by SPSS software, in this manner we examined the condition index statistics (indicator of potential dependencies among predictors). For the condition index statistic, a cut-off of greater than or equal to a value of 30 was set as an indicator to suggest possible collinearity among predictor variables. Provided a condition index statistic of 30 or greater was determined, we evaluated the variance proportions of each predictor variable and used a cut-off criterion of 0.50 or greater as a threshold to indicate possible dependency among predictor variables.

## 3 Results

### 3.1.1 Descriptive Statistics – Community participants

A summary of the sample population is presented in table 1. The average age for community members used in this was 38 (SD = 13). Male participants accounted for 35.7% of the sample. The average number of years of education was 17 (SD = 4). Of the sample, 14.29%



attained a high school diploma, 21.43% attained a college diploma, 21.43% attained a Bachelor's degree, and 42.85% completed graduate training programs. All participants in the active career group were employed (none of the participants were retired). The average perceived success, on a 10-point Likert scale, was 7.67 (SD = 1.77) while overall job satisfaction, as endorsed on a 10-point Likert scale, averaged at 7.71 (SD = 2.16). A report of all individual cases is also presented in Table 1. A large portion of the community sample was drawn from a local medical research facility (e.g., Medicare). Furthermore, the employees of the medical research center assisted the investigators promote the research discussed in this dissertation. Thematically, the community participants may be described to share some characteristics in common, namely service and public relations.

Table 1: Summary of community members who participated in the research presented. Individual responses have also been presented for the reader. No participants from community disclosed being retired at the time of participation.

Summary of Sample Characteristics							
Age (Years)	Sex	Years of Education	Highest Degree attained	Years Employed in Current Career	Employment Status	Perceived Success	Job Satisfaction
Mean – 38 SD - 13	Male – 35.7% Female – 64.3 %	M – 17 SD - 4	High school – 14.29% College Diploma – 21.43% Bachelor’s degree – 21.43% Graduate training – 42.85%	Mean – 10 SD – 10	Employed – 100%  Retired – 0%	Mean – 7.67 SD – 1.77	Mean – 7.71 SD – 2.16
Individual Participant Characteristics							
Age	Sex	Years of Education	Highest Degree attained	Years Employed in Current Career	Current Position/Title	Perceived Success	Job Satisfaction
63	Female	14	College	12	Registered Early Childhood Ed.	10	8
56	Male	17	College	12	Dispatcher/Sales	10	10
30	Female	18	Graduate	3	counsellor	7	10
37	Female	12	High School diploma	17	service worker	8	5
28	Female	18	Graduate	2	medical researcher	8	10
26	Female	18	Graduate	1.5	medical researcher	9	5
23	Female	18	Bachelor’s	2	medical researcher	6	8
51	Male	16	Bachelor’s	38	technologist	8	8
33	Female	16	Bachelor’s	4	medical researcher	8	8
59	Female	15	College	16	CEO	7	9
39	Female	18	Graduate	5	medical researcher	9.5	9
35	Male	29	Graduate	10	scientific researcher	4	6
27	Male	12	High school	6	Labourer	8	9
29	Male	18	Graduate	7	scientific researcher	5	3

### 3.1.2 Descriptive Statistics – Student Participants

A summary of the student sample population is presented in table 2. The average age of student who participated in this research was 21.72 years (SD – 6.71 years). Of the 28 students who participated 25% of the population (7) were males and 75% of the sample (21) were female. Two individuals who participated identified they wanted to pursue a college diploma (7.14 % of the sample) while the majority of student who participated (92.86%) identified they wished to complete a Bachelor’s degree. Individual cases are presented for each participant with their corresponding most preferred position they would like to pursue. Descriptive characteristics are presented in table 2. The vast majority of students who participated in this study were Laurentian University undergraduates. Some overlap with respect to degree specialization is observed (Table 2), however each student identified unique positions they would like to maintain as future careers. In addition, a comparison of norms between students and community members (including manual normative samples) is presented in Table 3.

Table 2: Summary of students who participated in the research presented. Individual responses have also been presented for the reader.

<b>Summary of Findings</b>					
<b>Age</b>	<b>Sex</b>	<b>Years of Education</b>	<b>Degree Pursuing</b>		
Mean – 21.32 SD – 6.71	Male- 25% Female – 75%	Mean – 13.26 SD – 1.33	College – 7.14% Bachelor’s – 92.86%		
<b>Individual Findings</b>					
<b>Age</b>	<b>Sex</b>	<b>Years of Education</b>	<b>Degree Pursuing</b>	<b>Degree Specialization</b>	<b>Preferred Job/Position</b>
23	Female	16	Bachelor	Psychology	Therapist
16	Male	11	Bachelor		Business owner
18	Male	13	College	Arts & Science	Entrepreneur
19	Female	13	Bachelor	Health promotion	Musician
23	Female	13	Bachelor	Psychology	Medical Doctor
22	Male	13	Bachelor	Sports Psychology	Teacher
18	Female	12	Bachelor	Biomedical Biology	Anesthesiologist
19	Female	13	Bachelor	Nursing	Flight Attendant
18	Female	13	Bachelor	Psychology (Science)	Medical Radiologist
19	Female	13	Bachelor	Criminal Justice	Corporate Lawyer
19	Female	13	Bachelor	Sports Education	Teacher (Primary)
19	Female	13	Bachelor	Sports Psychology	Clinical Psychologist
19	Female	13	Bachelor	Health promotion	Military Medical Officer
20	Male	13	Bachelor	Sports and Physical Education	Midwife
20	Female	14	Bachelor	Social Work	Counsellor
19	Female	13	Bachelor	Sports Psychology	Neuroethics researcher
26	Male	16	Bachelor	Psychology	Musician
20	Female	14	Bachelor	Social Work	Social Worker - Hospital
19	Female	13	Bachelor	Nursing	Nurse practitioner
18	Female	12	Bachelor	Education	Teacher (secondary)
17	Female	11	College	Child and Youth Work	Paramedic
41	Female	16	Bachelor	Psychology	Psychologist
20	Female	13	Bachelor	Architecture	Architect
25	Female	14	Bachelor	Psychology	Actor
18	Female	12	Bachelor	Business Administration	Marketing Manager
46	Female	15	Bachelor	Psychology	Teacher
19	Male	13	Bachelor	Behavioural Neuroscience	Neurologist
17	Male	11	Bachelor	Biology/Chemistry	Physiotherapist

Table 3: Comparison of student scores, community sample scores, and normative groups for performance-based measures, sources of motivation, and personality traits.

	Variables	Students (n = 28)		Community Members (n = 14)		Normed Reference Group		Normative Sample Size
		Mean	SD	Mean	SD	Mean	SD	
Performance Measures	TONI-4 (Fluid)	99.96	8.79	98.92	10.27	100	15	2272
	VCI	96.21	9.99	97.50	7.62	100	15	1100 –children; 1200 – adults
	WMI	94.18	14.02	96.92	13.21	100	15	488
	WCST-ERSS	99.57	14.23	103.75	8.73	100	15	383
	WCST-PRSS	87.71	9.99	89.67	13.94	100	15	
	WCST-PESS	90.89	11.23	90.67	11.81	100	15	
	WCST-NPESS	102.86	25.18	99.50	30.76	100	15	
	WCST-CLRSS	96.25	13.93	100.50	7.60	100	15	
	WCST-L2L	-1.42	3.11	-1.14	2.04	-3.73	7.76	
	WCST-CAT	-0.07	1.09	0.35	0.75	0	1	
	WCST-Trial	-0.21	0.50	0.40	2.25	0	1	
WCST-FMS	-0.07	0.75	0.04	0.73	0	1		
Motivation	Mot-Int	43.04	5.55	43.17	13.27	NA	NA	Students = 1363; Adults = 1055
	Mot-Ext	38.25	4.39	31.67	4.68			
	Mot-Joy	26.46	2.74	27.00	2.56			
	Mot-Chal	20.36	3.87	22.75	3.44			
	Mot-Out	22.93	3.99	19.58	3.92			
	Mot-Comp	15.32	2.36	12.08	2.19			
Personality	NEO-N	54.11	9.41	48.74	11.33	50	10	500 adolescents (<21)
	NEO-E	48.79	11.31	48.74	13.73	50	10	
	NEO-O	53.09	11.08	63.91	7.74	50	10	
	NEO-A	51.12	16.94	57.61	9.08	50	10	635 (adults >21)
	NEO-C	54.65	9.41	51.32	10.58	50	10	

For table 3 the abbreviations are as follows: Legend: VCI - verbal comprehension index standard score WASI-2; TONI-4 - Test of Nonverbal Intelligence 4th Edition Index Score; WMI - WAIS-IV Working Memory Index Standard Score; WCST-ERSS - Wisconsin Card Sorting Task Total Number of Errors standard score; WCST-PRSS - Wisconsin Card-Sorting Task Perseverative Responses Standard score; WCST-NPESS - Wisconsin Card-Sorting Task non-perseverative Errors standard score; WCST-CLRSS - Wisconsin Card-Sorting Task Conceptual Level Responses Standard Score; WCST-L2L - Wisconsin Card-Sorting Task Learning-to-Learn Raw score; WCST-Trial - Wisconsin Card-Sorting Task Trials to complete first category z-score; WCST-CAT - Wisconsin Card-Sorting Task Number of Categories Completed z-score; WCST-FMS - Wisconsin Card-Sorting Task Failure to Maintain Set z-score; Mot-Ext - External Motivation Raw Score; Mot-Int - Internal Motivation Raw Score; Mot-Joy - Enjoyment Motivation Raw score; Mot-Chal - Challenge Motivation raw score; Mot-Out- Outward Items Motivation; Mot-Comp- Compensation Motivation raw score; NEO-N - Neuroticism T-score; NEO-E - Extraversion T-score; NEO-O - Openness to Experience T-score; NEO-A Agreeableness T-score; NEO-C- Conscientiousness T-score

### 3.2 Factor Analysis

The data collected presented a unique set of challenges for statistical analyses; data rich and sample poor. In order to evaluate and identify salient features of the sample population, raw data for each of the career values were subjected to factor analysis in order to reduce the data. All endorsed responses for each individual on the Career Orientation Inventory (COI) for the 8 career anchors were subjected to a principal component factor analysis with varimax rotation, Kaiser's criterion (eigenvalue >1) was used to identify 4 factors. A cut-off score of 0.40 or greater was set for loading coefficients for each factor identified. The Self-Directed Career Factor (Factor 1) accommodated 28.77% of the variance. Career values which loaded on factor 1 included: Autonomy/Independence (0.840), Entrepreneurial Creativity (0.876), and Pure challenge (0.702). The Management Career Factor (Factor 2) accommodated 20.917% of the variance. Variables which loaded on Factor 2 included: Managerial Competence (0.865), Service/Dedication to a Cause (-0.404), and Lifestyle (-0.695). The Skillful-Dedication factor (Factor 3) accommodated

16.05% of the variance. Variables that loaded on Factor 3 included: Technical/Functional Competence (0.804) and Service/Dedication to a Cause (0.722). Finally, the Conservative Career Factor (Factor 4) accommodated 13.11% of the variance. Variables that loaded on Factor 4 included: Security/Stability (0.938) and Lifestyle (0.448). The overall predictive power of the analysis explained 78.85% of the total variance. Factor scores for each participant were saved used in subsequent analysis. A summary of the results from factor analysis discussed above is presented in Table 3.

Table 3: Results of factor analysis. The nomenclature describing the Career factors is derived from results discussed above and presented here.

	Factors Identified							
	Self-Directed		General Management		Skillful-Dedication		Conservative	
	Variable	Loading Coefficient	Variable	Loading Coefficient	Variable	Loading Coefficient	Variable	Loading Coefficient
	Autonomy/ Independence	0.840	Managerial Competence	0.865	Technical/ Functional Competence	0.804	Security/ Stability	0.938
	Entrepreneurial Creativity	0.876	Service/ Dedication to a Cause	-0.404	Service/ Dedication to a Cause	0.722	Lifestyle	0.448
	Pure challenge	0.702	Lifestyle	-0.695				
Eigen Value	2.30		1.67		1.28		1.05	
Percent Variance Explained	28.77		20.91		16.05		13.11	

Due to a large number of variables, data for the 8 career anchors were factor analyzed (i.e., subjected to data reduction). Four factors were identified which explained ~80% of the shared variance. The four factors include: Self-Directed, Management, Skillful-Dedication, and Conservative factors.

### 3.3.1 Multicollinearity Results for Regression Using Factors

Collinearity statistics for Factor 1 (Self-Directed Factor) inferred no issues with collinearity among predictor variables. No predictors which entered the equation were correlated with another predictor at 0.90 or greater, tolerance statistics ranged from 0.902 - 0.946 for the four predictor variables entered to the equation and no predictor variables had a VIF which exceeded 10. The range of variances proportions of the four predictor variables which predicted the Self-Directed Factor scores was between 0.00 - 0.35. For the General Management Factor Score (Factor 2), 1 predictor was identified. There were no concerns regarding multicollinearity of this variable. The Skillful-Dedication Factor score (Factor 3) had 2 predictor variables which entered the equation. The correlation coefficients among these variables were less than 0.90. Tolerance for both variables was 0.931 and VIF for each variable was 1.07. Values for the Condition Index statistic did not exceed 30. Lastly, the Conservative Factor (Factor 4) had a single variable which entered the equation and no issues pertaining to collinearity were inferred.

### 3.3.2 Regression Using Factors

We sought to determine whether the four career factors representing the sample investigated could be predicted by performance-based measures, personality traits, and sources of motivation and is congruent with Aim 2 outlined in the introduction. To this end, multiple stepwise linear regressions were conducted with each of the 4 career factors as dependent variables and all performance-based measures, personality traits, and sources of motivation as predictor variables.

Multiple, independent, stepwise linear regressions were performed to identify which performance-based measures, personality characteristics, and sources of motivation could predict any factor scores identified. The results suggested Internal motivation ( $t = 6.126$ ,  $p = 2.0 \cdot 10^{-6}$ ),



Verbal Comprehension Index ( $t = -3.152, p = .004$ ), WCST perseverative responses Standard Score ( $t = 2.850, p = .009$ ), and Agreeableness ( $t = -2.650, p = .014$ ) were significant predictors of the Self-Directed (factor 1) Career Factor scores [ $F(1,29) = 11.34, p = 2.2 \cdot 10^{-5}, R^2\text{-adj} = .588; SEE = 0.639$ ]. The unstandardized predictive equation for the Self-Directed Career Factor is expressed as:

$$\text{Self-Directed Career Factor} = (0.143 \times \text{Internal Motivation}) + (-0.042 \times \text{Verbal Comprehension Index Score}) + (0.034 \times \text{WCST Perseverative Responses Standard Score}) + (-0.023 \times \text{Agreeableness T-score}) - 4.009$$

Results indicated the Working Memory Index score ( $t = -2.55, p = .017$ ) was the only variable identified to be a significant predictor of the Management Career Factor (Factor 2) scores [ $F(1,29) = 6.50, p = .017, R^2\text{-adj} = 0.159; SEE = 0.933$ ]. The unstandardized predictive equation associated with the Management Career Factor scores is expressed as:

$$\text{Management Career Factor} = (-0.036 \times \text{Working Memory Index Score}) + 3.339$$

Results inferred Openness to Experience ( $t = 3.426, p = .002$ ) and Conscientiousness ( $t = -2.539, p = .017$ ) were significant predictors of the Skillful-Dedication Career Factor (Factor 3) scores [ $F(2,29) = 7.310, p = .003, R^2\text{-adj} = .303; SEE = 0.855$ ]. The unstandardized predictive equation defining the Skillful-Dedication factor is expressed as:

$$\text{Skillful-Dedication Factor} = (0.053 \times \text{Openness to Experience T-score}) + (-0.001 \times \text{Conscientiousness T-score}) - 2.890$$

Results further suggested WCST raw learning-to-learn scores ( $t = -2.557, p = .016$ ) was the only significant predictor of the Conservative Career Factor (Factor 4) scores [ $F(1,29) = 6.57, p = .016, R^2\text{-adj} = 0.160; SEE = 0.916$ ]. The unstandardized predictive equation for the Conservative Career Factors scores is expressed as:

$$\text{Conservative Career Factor} = (-0.156 \times \text{WCST Raw Learning-2-learn}) - 0.313$$

In summary, the 4 career factors were predicted by distinct variables. The 4 career factors accommodated ~80% of the shared variance in the sample investigated. No concerns of linear dependencies among predictor variables were determined through diagnostics procedures evaluating multicollinearity. Effect sizes for the stepwise linear regressions ranged from 15.9% - 58.8%.

### 3.4 One-way analyses distinguishing differences between the upper and lower 16% of the normal curve for the four identified factors

There is the possibility that results of the stepwise linear regressions may have excluded salient information. Furthermore, the number of variables that were entered into this analysis were greater than the number of cases. In order to determine possible occluded differences among performance-based measures, personality traits, and sources of motivation, and to validate findings of regression analyses, one-way analyses of variances (ANOVAs) were conducted. Factors scores, for each of the 4 Career Factors, for each participant were subjected to z-transformation for standardization. Resultant z-scores for the 4 Career Factors for each participant were recoded into

nominal variables as either low ( $z\text{-score} \leq -1\text{SD}$ ) or high ( $z\text{-score} \geq +1\text{SD}$ ). Cut-off for low and high classification were selected as the distribution below and above these values represent the lower and upper 16% of individual scores within a normal distribution.

Serial one-way ANOVAs were conducted for each of the 4 Career factors. In these analyses, high and low factor scores (identified as those selected falling at or below a score of -1 SD and at or above a score of +1SD) were used as between subject factors while performance-based measures, personality characteristics, and sources of motivation were considered dependent variables.

Results investigating differences between high and low scores on the Self-Directed (Factor 1) Career Factor demonstrated significant differences on Conscientiousness [ $F(1,12) = 7.35$ ,  $p = .020$ ,  $\Omega^2\text{-est} = 0.40$ ], Challenge motivation [ $F(1,12) = 5.50$ ,  $p = .039$ ,  $\Omega^2\text{-est} = 0.33$ ], Enjoyment Motivation [ $F(1,12) = 4.93$ ,  $p = .048$ ,  $\Omega^2\text{-est} = 0.31$ ], WCST learning-to-learn standard score [ $F(1,12) = 6.57$ ,  $p = .037$ ,  $\Omega^2\text{-est} = 0.48$ ], and the Verbal Comprehension Index [ $F(1,12) = 5.00$ ,  $p = .047$ ,  $\Omega^2\text{-est} = 0.31$ ]. The differences obtained on Verbal Comprehension were being driven by higher scores ( $M = 107.40$ ,  $SEM = 5.07$ ) for individuals scoring low on the Self-Directed Career Factor as compared to Verbal Comprehension Index scores ( $M = 94.25$ ,  $SEM = 3.42$ ) of those scoring high on the Self-Directed Career Factor. Differences on WCST learning-to-learn standard scores were significantly lower ( $M = -0.06$ ,  $SEM = 0.12$ ) for individuals scoring high on the Self-Directed Career Factor as compared to those scoring low ( $M = 0.67$ ,  $SEM = 0.33$ ) on the same career factor. Scores on Enjoyment Motivation were significantly higher ( $M = 28.50$ ,  $SEM = 0.60$ ) for individuals falling within the high category of the Self-Directed career factor as compared to

those falling within the low category ( $M = 25.20$ ,  $SEM = 1.66$ ). A similar pattern of scores was identified between high Self-Directed Career Factor scores ( $M = 24.00$ ,  $SEM = 0.98$ ) and low Self-Directed Career Factor scores ( $M = 20.20$ ,  $SEM = 1.32$ ) for Challenge motivation. Lastly, high scorers on the Self-directed factor were significantly lower on the Conscientiousness personality characteristic ( $M = 50.43$ ,  $SEM = 2.30$ ) as compared to low scorers on the Self-directed factor ( $M = 60.46$ ,  $SEM = 2.88$ ). Figure 1 summarizes the significant differences between high and low scores on the Self-Directed Career Factor across the measures described.

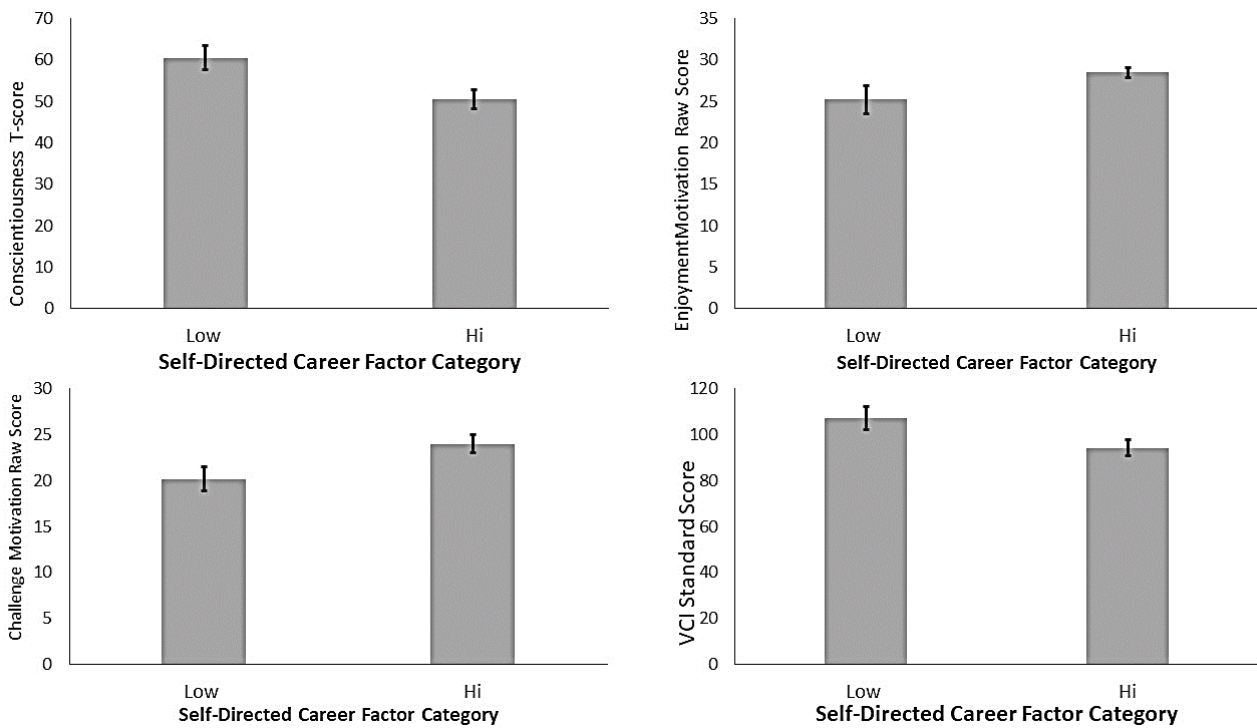


Figure 1: Results comparing individuals scoring in the top and lower 16% of the distribution of scores on the Self-Directed Career factor across measures of Conscientiousness (top left) Enjoyment (top right), Challenge motivation (bottom left), Verbal Comprehension Index scores (bottom right). Error bars represent SEM. There were  $n = 5$  cases in the LOW category and  $n = 8$  cases in the HI category.

Results indicated significant differences on Working Memory Index [ $F(1,12) = 7.53, p = .019, \Omega^2\text{-est} = 0.41$ ] between high and low scores on the Management (Factor 2) Career Factor. The differences on Working Memory Index were being driven by higher scores ( $M=100.29, SEM = 3.64$ ) for individual's low on the Management Career Factor as compared to significantly lower scores ( $M= 79.33, SEM= 7.11$ ) scoring high on this factor. Figure 2 visually represents the differences on Working Memory Index scores between high and low scorers on the General Management Career Factor.

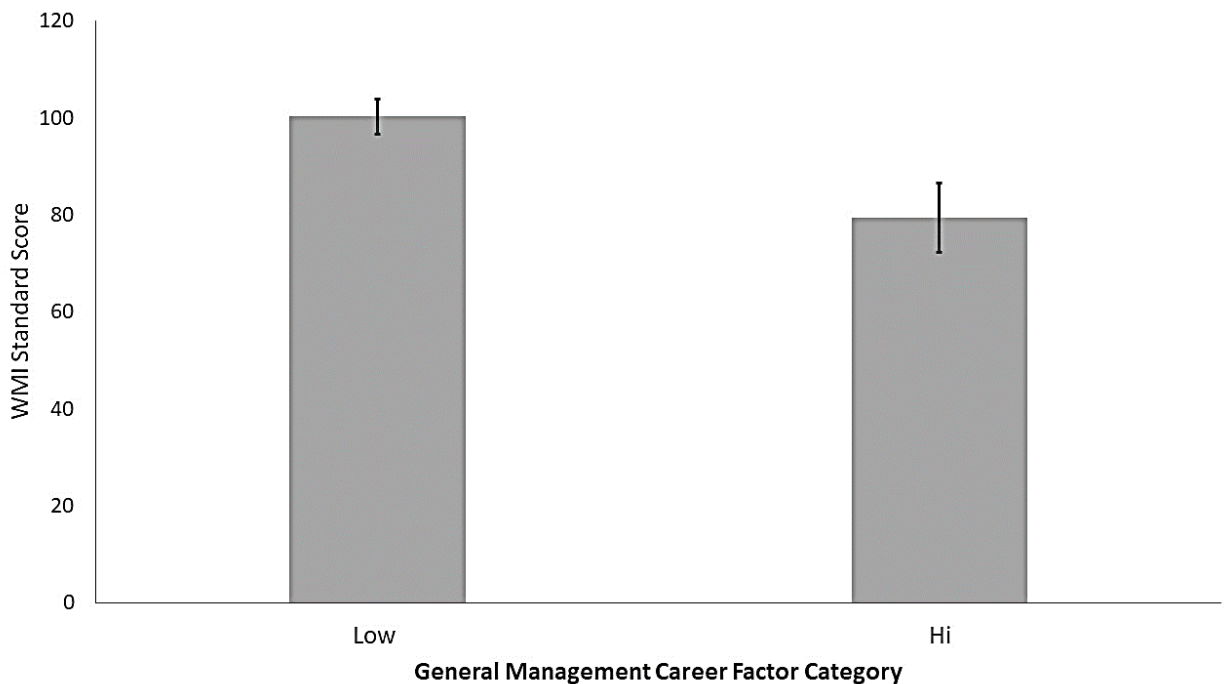


Figure 2: Differences in performance on Working Memory Index standard scores between the upper and lower 16% of the distribution of scores in the General Management career factor. Errors bars represent SEM. There were  $n = 7$  individuals who formed the LOW category and  $n = 6$  cases representing the HI category.

Results identified significant differences on Enjoyment motivation [ $F(1,12) = 7.14, p = .020, \Omega^2\text{-est} = 0.37$ ] and Openness to Experience [ $F(1,12) = 5.91, p = .032, \Omega^2\text{-est} = 0.33$ ] between

high and low scorers on the Skillful-Dedication (Factor 3) Career Factor. Those scoring high on the Skillful-Dedication Career Factor scored significantly higher ( $M = 28.33$ ,  $SEM = 0.72$ ) on Enjoyment motivation as compared to those scoring low on Skillful-Dedication ( $M=24.63$ ,  $SEM = 1.07$ ). Those scoring high on Skillful-Dedication, scored significantly higher ( $M = 60.48$ ,  $SEM = 3.36$ ) on Openness to Experience as compared to those falling within the low category ( $M = 46.80$ ,  $SEM = 4.15$ ). Figure 3 shows the differences between high and low scores on the Skillful-Dedication Career Factor on Enjoyment motivation and Openness to Experience.

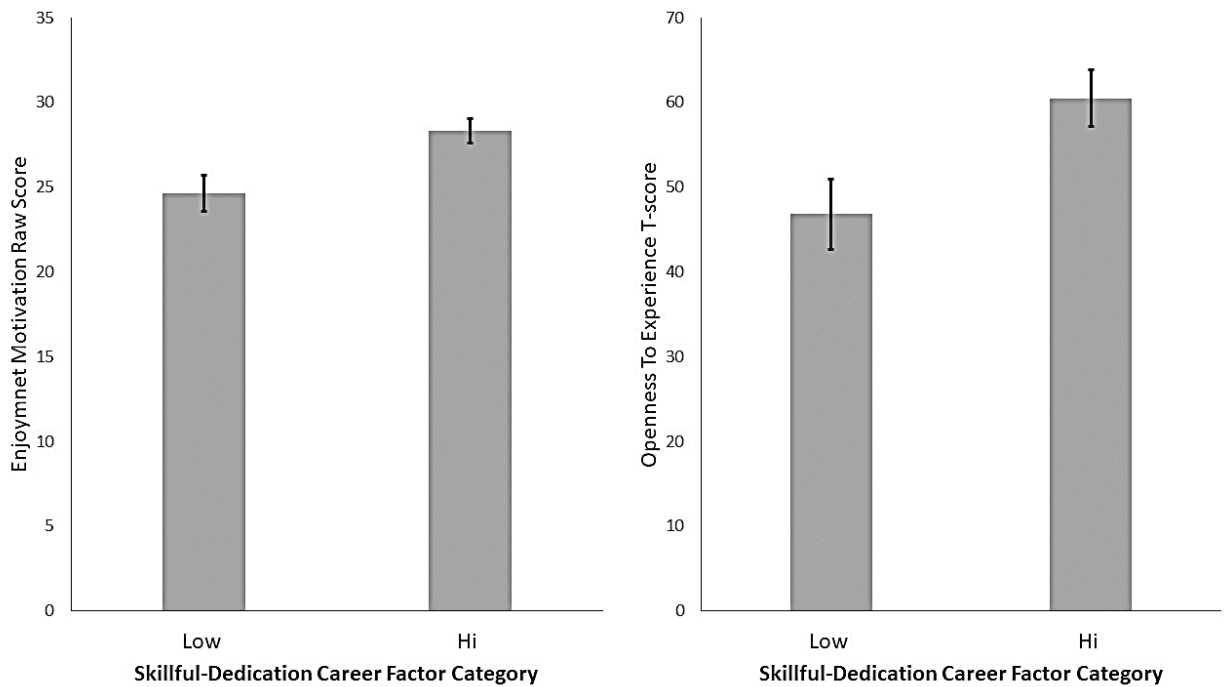


Figure 3: Differences in Enjoyment motivation raw scores (left) and Openness to Experience personality trait T-scores (right) between the upper and lower 16% of scores on the Skillful-Dedication Career factor. Error bras represent SEM. There were  $n = 8$  cases comprising the LOW category and  $n = 6$  cases comprising the HI category.

Results from one-way ANOVA comparing performance-based measures, personality characteristics, and sources of motivation between high and low scorers on the Conservative

(Factor 4) Career Factor revealed significant differences between groups on WCST learning-to-learn standard scores [ $F(1,7) = 6.40, p = .045, \Omega^2\text{-est} = 0.52$ ]. The differences observed were being driven by significantly lowered scores ( $M = -0.12, SEM = 0.13$ ) for those scoring high on the Conservative career factors as compared higher scores ( $M = 0.49, SEM = 0.13$ ) for those scoring low on this career factor. Results are summarized in Figure 4.

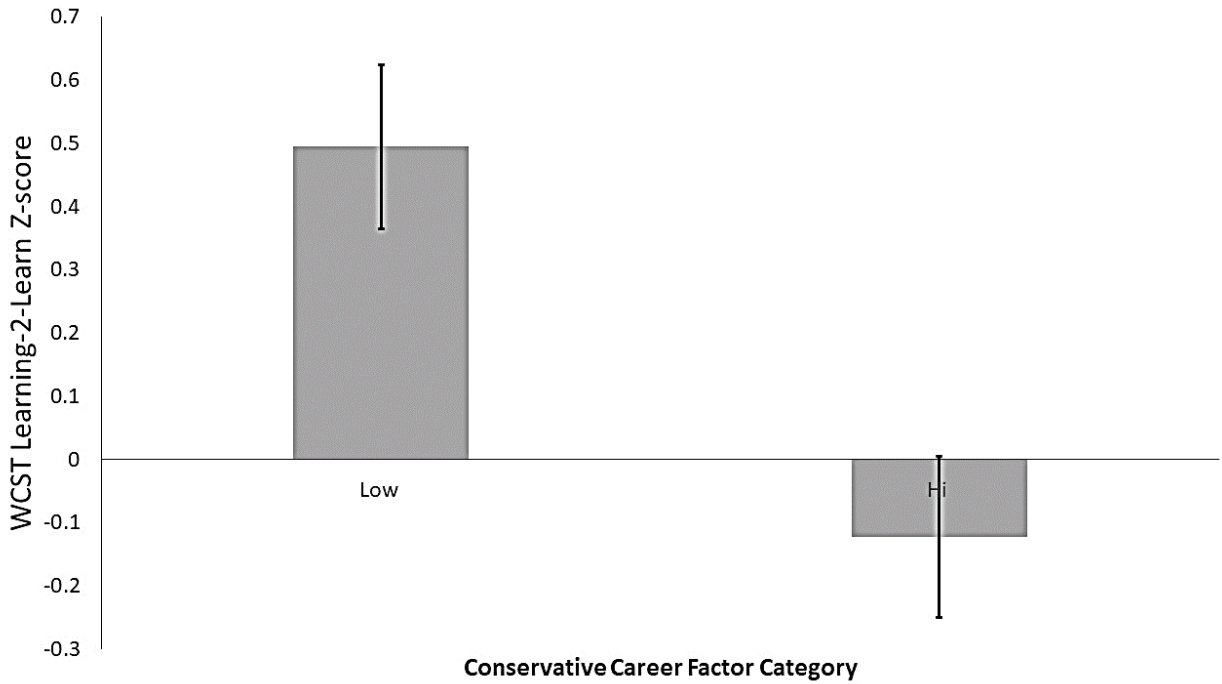


Figure 4: Differences in Wisconsin Card Sorting Task (WCST) learning-to-learn standardized scores between the upper and lower 16% of scores on the Conservative Career factor. Error bars represent SEMs. There were  $n = 6$  cases making up the LOW category and  $n = 2$  cases comprising the HI category. It should be noted, learning-to-learn scores could not be computed for some cases due to overall performance in the WCST. Results are likely to change in light of additional evidence.

To review, results of ANOVAs showed an overlap of findings between differences among the highest and lowest scores on each of the 4 career factors and those identified from regression

analyses. However, there were some distinct variables that were identified from ANOVAs that were not shown to be significant predictors from regression analyses. It is possible these variables were removed from linear regression analyses as a result of the statistical properties inherent to the stepwise feature of regression.

### 3.5 Multicollinearity Results for Multiple linear regression analyses to predict each of the 8 career values

Results inferred no concerns pertaining to dependency among predictors for the Technical-Functional career value as no statistically significant predictors were identified. There were two predictors for the Managerial Competence career value and these predictors were not correlated with any other variable at or above 0.90. Tolerance values ranged from 0.158 - 0.256 and VIF ranged from 4.247 - 4.517. The condition index statistic for the predictors of the Managerial Competence career value did not exceed 30. The Autonomy/Independence career factor was predicted by 2 variables. Evaluation of the zero-order correlations indicated Internal Motivation was highly correlated with Challenge motivation (0.931). Tolerance values for the 2 predictors of the Autonomy/Independence career values had tolerance and VIF values of 0.962 and 1.040 respectively. The condition index statistic did not exceed 30 for the predictors of the Autonomy/Independence career value. The Security/Stability career value was predicted by 1 variable; it was not correlated with any other variable at or above a value of 0.90. The Entrepreneurial Creativity career value was predicted by 1 variable; it was correlated with its z-transformed counterpart with  $r = 0.951$ . The Service/Dedication to a Cause career value was predicted by 3 variables. Evaluation of the zero-order correlations indicated Internal Motivation was highly correlated with Challenge motivation (0.931). Tolerance values of the predictor variables ranged from 0.800 - 0.915 while VIF values ranged from 1.093 - 1.250. Condition index values for predictors of the Service/Dedication to a Cause career value did not exceed 30. Two



variables were identified for the Pure Challenge career value. Challenge motivation was highly correlated with Internal Motivation (0.931) however the second predictor, trials to complete the first category of the Wisconsin Card Sorting Task standardized score, was not correlated with any variable at or above a value of 0.90. Tolerance and VIF for the two predictors of the Pure Challenge career value were 0.986 and 1.015 respectively, and condition index scores did not exceed a value of 30. Lastly, the Lifestyle career value was predicted by a single variable; the predictor of Lifestyle was not correlated with any other variable at or above a value of 0.90.

### 3.5 Multiple linear regression analyses to predict each of the 8 career values

To continue with the in-depth investigation of our sample, we aimed to complete stepwise linear regression to predict the 8 different career values from our collection of performance-based measures, personality traits, and sources of motivation. To this end, 8 stepwise linear regressions were conducted using each career value score as the dependent variable and performance-based measures, personality characteristics, and sources of motivation as independent variables.

No significant predictors were identified for the Technical-Functional career value. Results identified Working Memory Index ( $t = -2.84, p = .008$ ) and Extraversion ( $t = 2.162, p = .040$ ) as significant predictors of the Managerial Competence career value [ $F(2, 29) = 5.98, p = .007, R^2\text{-adj} = .256; SEE = 4.25$ ]. The unstandardized predictive equation for General Managerial Competence is expressed as:

$$\text{Managerial competence} = (-.185 \times \text{WMI}) + (0.134 \times \text{Extraversion}) + 22.657$$

Results inferred Internal Motivation ( $t = 5.170$ ,  $p = 1.9 \cdot 10^{-5}$ ) and Agreeableness ( $t = -2.157$ ,  $p = .040$ ) were significant predictors for the Autonomy/Independence career value [ $F(2, 29) = 14.05$ ,  $p = 6.6 \cdot 10^{-5}$ ,  $R^2\text{-adj} = 0.47$ ;  $SEE = 3.67$ ]. The unstandardized predictive equation for Autonomy/Independence is expressed as:

$$\text{Autonomy/Independence} = (0.668 \times \text{Internal Motivation}) + (-0.108 \times \text{Agreeableness}) - 6.176$$

Results suggested only Openness to Experience ( $t = -2.331$ ,  $p = .022$ ) was a significant predictor of the Security/Stability career value [ $F(1, 29) = 5.43$ ,  $p = .027$ ,  $R^2\text{-adj} = 0.133$ ;  $SEE = 4.89$ ]. The unstandardized predictive equation for Security/Stability is expressed as:

$$\text{Security/Stability} = (-0.197 \times \text{Openness to Experience}) + 31.173$$

Results identified WCST learning-to-learn raw scores ( $t = -3.45$ ,  $p = .002$ ) as the only significant predictor for the Entrepreneurial Creativity career value [ $F(1, 29) = 11.915$ ,  $p = .002$ ,  $R^2\text{-adj} = 0.273$ ;  $SEE = 4.79$ ]. The unstandardized predictive equation for Entrepreneurial Creativity is expressed as:

$$\text{Entrepreneurial Creativity} = (-1.103 \times \text{WCST Learning-to-learn raw score}) + 13.33$$

Results suggested Internal motivation ( $t = 2.212$ ,  $p = .036$ ), Conscientiousness ( $t = -3.51$ ,  $p = .002$ ), and Openness to Experience ( $t = -2.957$ ,  $p = .007$ ) were significant predictors of the

Service/Dedication to a Cause career value [F (3, 29) = 9.916, p = 1.56 · 10<sup>-4</sup>, R<sup>2</sup>-adj = 0.480; SEE = 2.75]. The unstandardized predictive equation for Service/Dedication to a Cause is expressed as:

$$\text{Service/Dedication to a Cause} = (0.227 \times \text{Internal Motivation}) + (-.004 \times \text{Conscientiousness}) + (0.157 \times \text{Openness to Experience}) + 4.918$$

Results revealed Challenge Motivation (t = 5.03, p = 2.8 · 10<sup>-4</sup>) and WCST trials to complete first category standard score (t = -2.58, p = .015) were significant predictors of the Pure Challenge career value [F (2, 29) = 14.615, p = 5.0 · 10<sup>-5</sup>, R<sup>2</sup>-adj = 0.484; SEE = 3.16]. The unstandardized predictive equation for the Pure Challenge career value is expressed as:

$$\text{Pure Challenge} = (0.780 \times \text{Challenge motivation}) + (-7.394 \times \text{WCST trials to complete first category standard score}) + 3.411$$

Results inferred Working Memory Index (t = 2.457, p = .020) was the only significant predictor of the Lifestyle career value [F (1, 29) = 6.06, p = .020, R<sup>2</sup>-adj = 0.148; SEE = 4.86]. The unstandardized predictive equation for the Lifestyle career value is expressed as:

$$\text{Lifestyle} = (0.183 \times \text{WMI}) + 4.843$$

In summary, apart from the Technical/Functional Competence career anchor (value), the scores (level of endorsement) for 7 out of the 8 career values could be predicted by performance-based measures, personality characteristics, and sources of motivation. No concerns regarding dependency between predictors were identified through diagnostics of multicollinearity. Effect sizes observed for predictions from our sample data ranged from 13.3 - 48.4 %.

### 3.6 One-way analyses differentiating between upper and lower 16% of the normal curve for each of the 8 career values

Again, the nature of the data analyzed through methods of regression may be occluded by the statistical procedures associated with stepwise methods. In order to verify any other possible differences, especially between upper and lower scorers, for a given career value, one-way ANOVAs were completed. Furthermore, investigation of the data using ANOVAs would serve to validate findings from stepwise regression. Scores for the 8 career values were standardized using z-transformations. Resultant z-scores were recoded into low ( $z\text{-score} \leq -1$ ) and high ( $z\text{-score} \geq +1$ ) nominal groups. Recall, cut-offs for low and high classifications were selected as the distribution of scores, according to a Gaussian distribution, represent the lower and upper 16% of scores respectively.

Serial (8) one-way ANOVAS were conducted to ascertain differences between high and low scores for each of the 8 career values on performance-based measures, personality characteristics, and sources of motivation.

Results examining differences on performance-based measures, personality characteristics, and sources of motivation between high and low scorers on the Technical/Functional career values

demonstrated differences on Openness to Experience [F (1, 9) = 10128, p = .013,  $\Omega^2$ -est = 0.56]. The differences observed were being driven by lower scores on Openness to experience (M = 41.83, SEM = 2.50) for low scorers on Technical/Functional competence as compared to high scorers on this career value (M= 59.53, SEM = 4.97). Results are summarized in Figure 5.

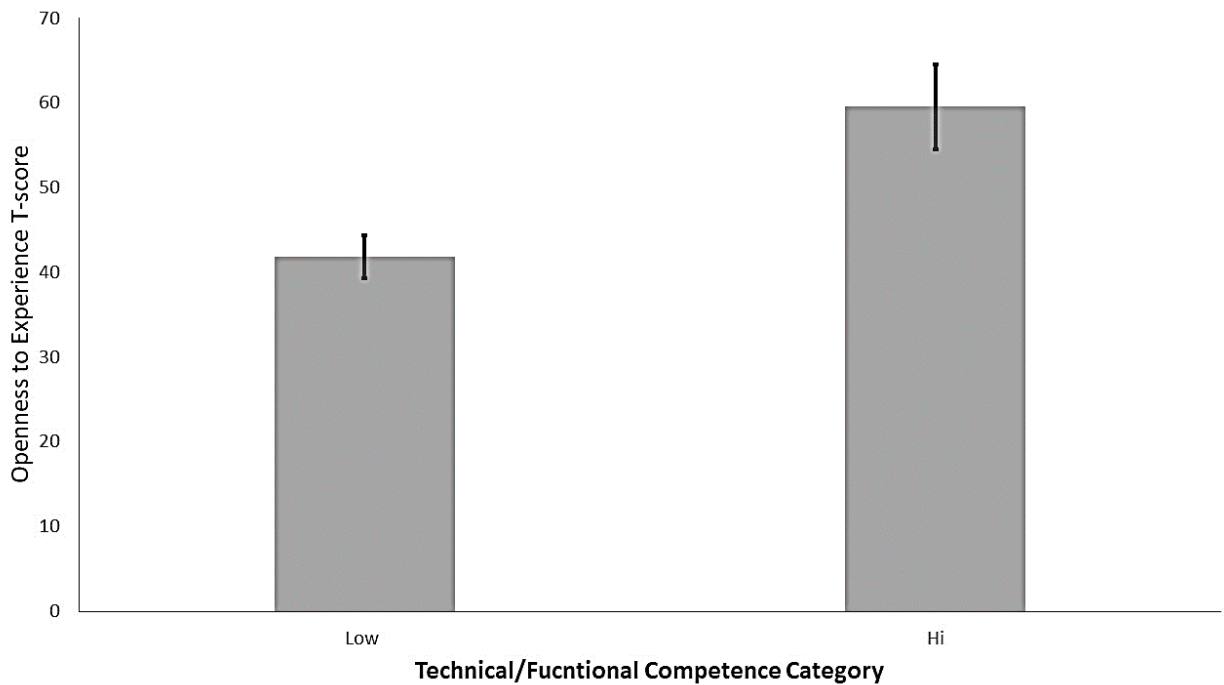


Figure 5: Differences on Openness to Experience personality trait T-scores between the upper and lower 16% of scores on the Technical/Functional career value. Error bars represent SEMs. There was an equal representation of cases (n = 5) in both the LOW and HI categories.

There were no significant differences between high and low scorers on the Managerial Competence career value on any performance-based measure, personality characteristics, and sources of motivation.

Results indicated significant differences on Challenge Motivation [ $F(1, 14) = 12.58, p = .004, \Omega^2\text{-est} = 0.49$ ] between high and low scorers on the Autonomy/Independence career value. Differences observed were being driven by higher scores on Challenge motivation ( $M = 24.75, SEM = 0.861$ ) for high scorers on Autonomy/Independence as compared to low scorers ( $M = 19.86, SEM = 1.10$ ). Results are depicted in Figure 6.

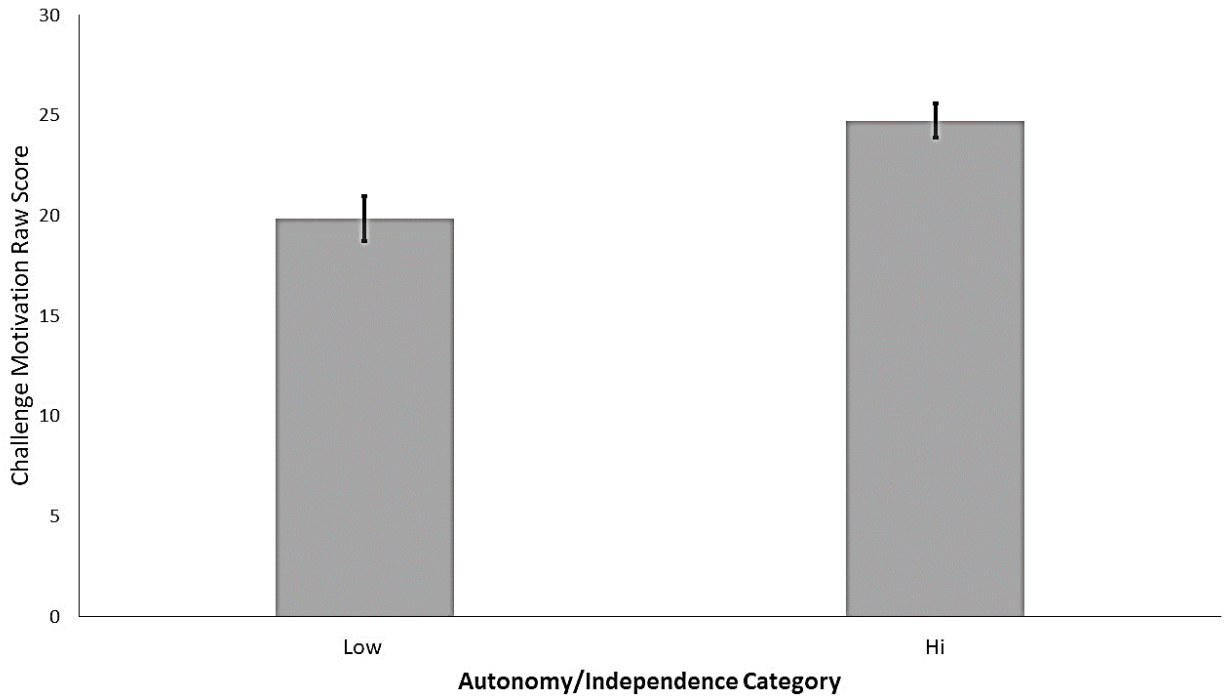


Figure 6: Differences in self-reported challenge motivation raw scores between the upper and lower 16% of scores on the Autonomy/Independence career value. Error bars represent SEMs. There were  $n = 7$  cases comprising the LOW category and  $n = 8$  cases which made up the HI category.

Results inferred significant differences on WCST learning-to-learn standard score [ $F(1, 11) = 5.41, p = .042, \Omega^2\text{-est} = 0.35$ ] and Openness to Experience [ $F(1, 14) = 5.047, p = .043, \Omega^2\text{-est} = 0.28$ ] between high and low scorers on the Security/Stability career value. The differences on WCST learning-to-learn standard score was significantly higher ( $M = 0.50, SEM = 0.095$ ) for

low scorers on Security/Stability as compared to high scorers on this career value ( $M = 0.097$ ,  $SEM = 0.16$ ). Differences obtained on Openness to Experience were being driven by higher scores ( $M = 63.43$ ,  $SEM = 3.46$ ) for low scorers on Security/Stability as compared to high scorers ( $M = 52.64$ ,  $SEM = 2.69$ ) on this career value. Results are graphically represented in Figure 7.

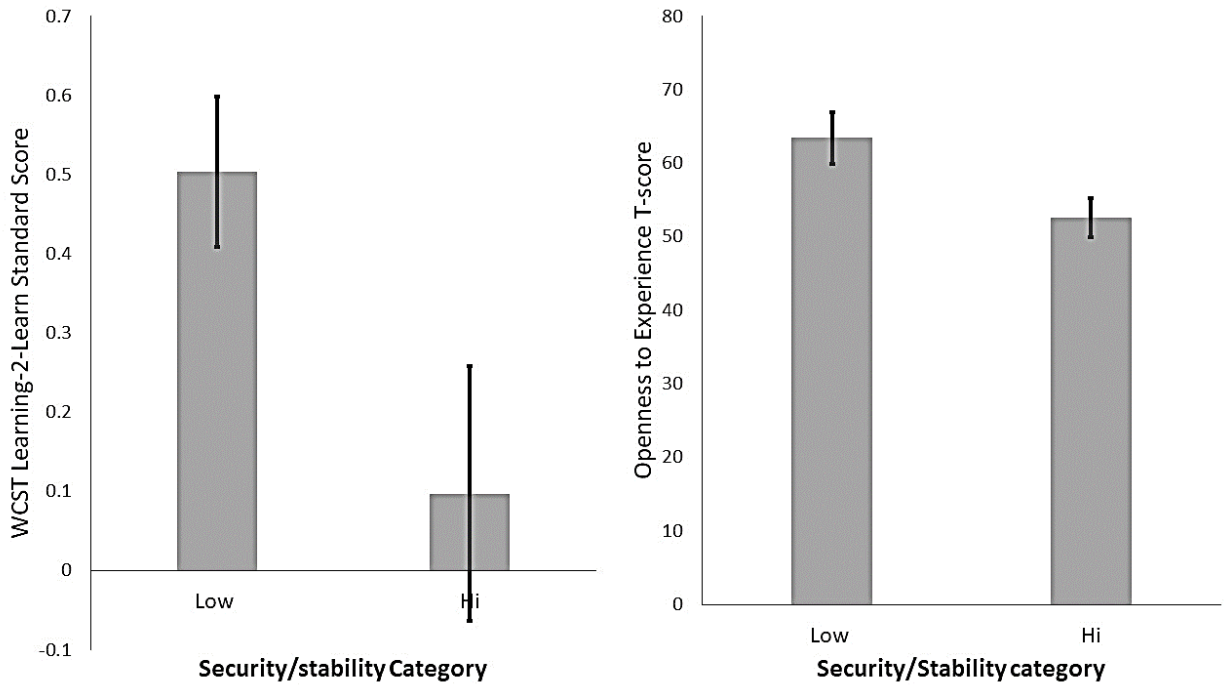


Figure 7: Differences on Wisconsin Card Sorting Task (WCST) learning-to-learn standardized scores (left) and Openness to Experience personality trait T-scores (right) between the upper and lower 16% of scores on the Security/Stability career value. Error bars represent SEMs. There was  $n = 9$  and  $n = 6$  cases in the LOW and HI categories for personality measures, respectively. There were  $n = 8$  cases in the LOW category for measures of WCST learning-to-learn and  $n = 4$  cases in the HI category on WCST learning-to-learn. Differences in sample size are due to computational limitations of the secondary scales on the WCST.

Results suggested significant differences on Verbal Comprehension [ $F(1, 15) = 4.72, p = .047, \Omega^2\text{-est} = 0.25$ ] and Enjoyment motivation [ $F(1, 15) = 4.67, p = .048, \Omega^2\text{-est} = 0.25$ ] between high and low scorers on the Entrepreneurial Creativity career value. Differences on Verbal Comprehension index were being driven by high scores ( $M = 103.6, SEM = 3.75$ ) for low scorers of Entrepreneurial Creativity as compared to high scorers ( $M = 93.63, SEM = 2.67$ ) on the Entrepreneurial Creativity factor. The opposite trend was observed for the differences on Enjoyment motivation where high scores ( $M = 28.63, SEM = 0.57$ ) were associated with higher scores on Entrepreneurial creativity as compared to low scores ( $M = 25.6, SEM = 1.27$ ) on this career value. Results are shown in Figure 8.

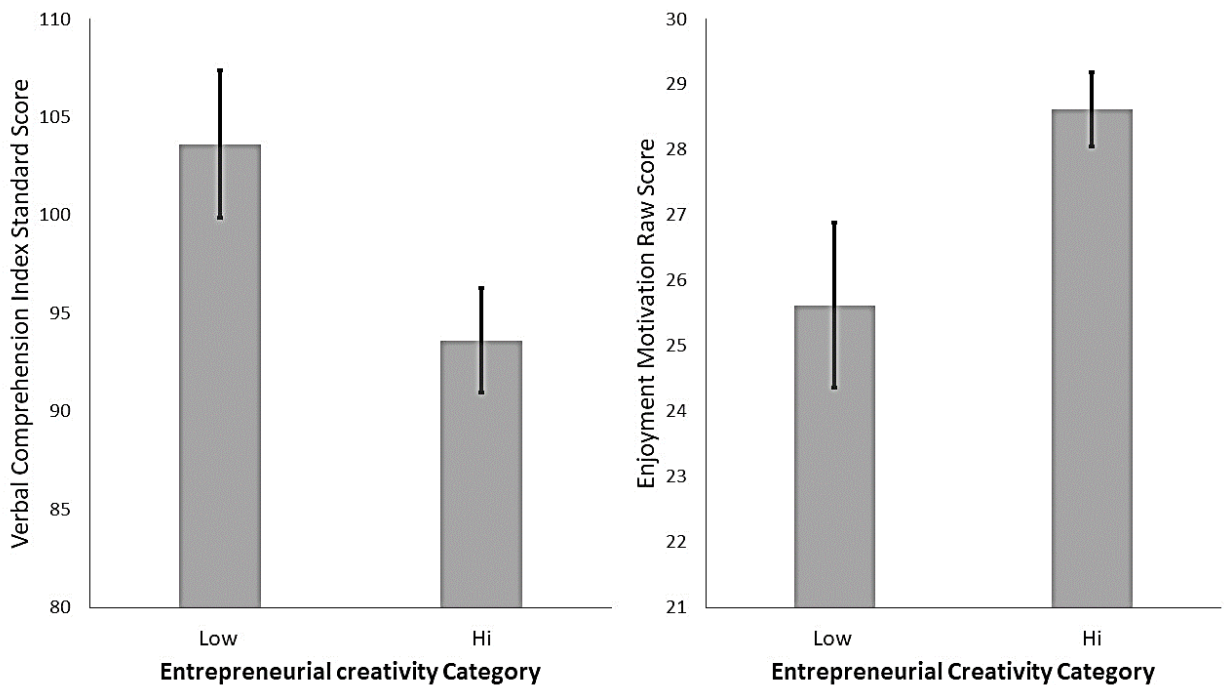


Figure 8: Differences on Verbal Comprehension Index standard scores (left) and self-reported enjoyment motivation (right) between the upper and lower 16% of scores on the Entrepreneurial creativity career value. Error bars represent SEMs. There was an equal representation of cases ( $n = 8$ ) in both the LOW and HI categories.



Results indicated Internal motivation [ $F(1, 12) = 7.150, p = .022, \Omega^2\text{-est} = 0.39$ ], Enjoyment motivation [ $F(1, 12) = 6.00, p = .032, \Omega^2\text{-est} = 0.35$ ], and Challenge Motivation [ $F(1, 12) = 6.471, p = .027, \Omega^2\text{-est} = 0.37$ ] as significantly different between high and low scorers on the Service/Dedication to a Cause career value. Differences obtained on Internal motivation were being driven by significantly higher scores ( $M = 48.14, SEM = 1.668$ ) for high scorers on Service/Dedication to a cause as compared to low scorers ( $M = 40.50, SEM = 2.41$ ). A similar pattern was noted for Enjoyment motivation and Challenge motivation. High scorers on Service/Dedication to a cause had higher scores on Enjoyment motivation ( $M = 28.43, SEM = 0.72$ ) as compared to low scorers on this career value ( $M = 24.83, SEM = 1.35$ ). Scores on Challenge motivation were significantly higher ( $M = 23.57, SEM = 1.152$ ) for those scoring high on Service/Dedication to a cause as compared to those scoring low ( $M = 19.17, SEM = 1.30$ ) on this career value. Results can be seen in Figure 9.

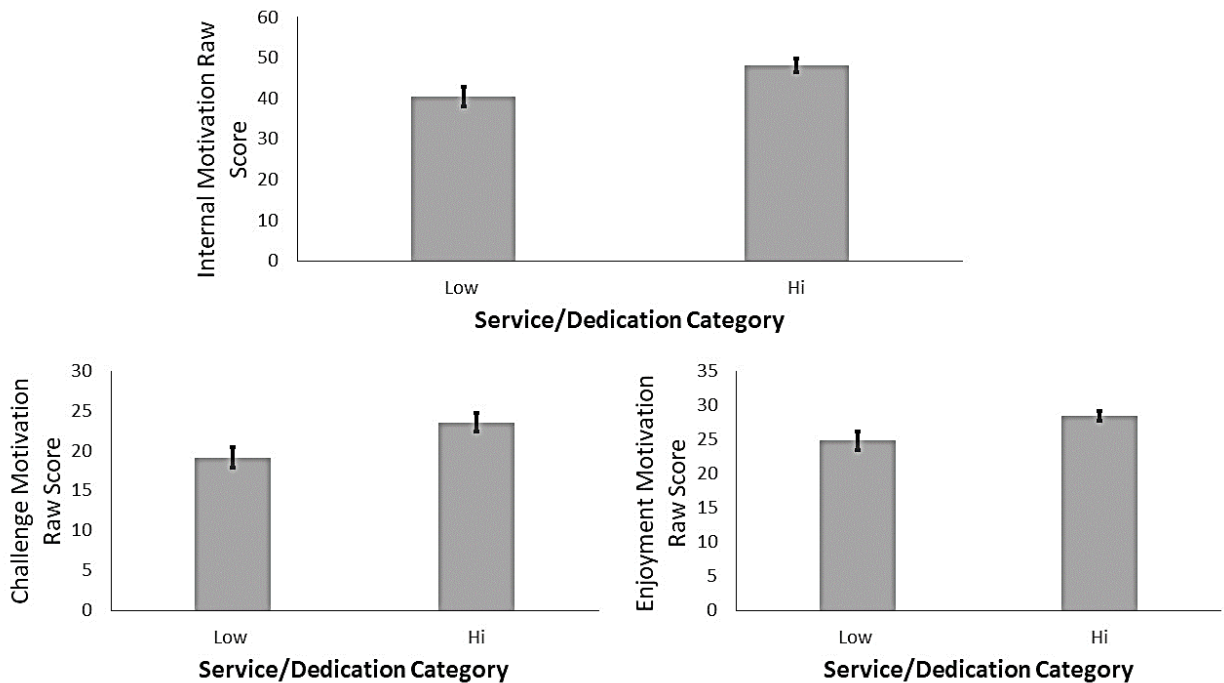


Figure 9: Differences in self-reported internal motivation (top), challenge motivation (bottom left), and enjoyment (bottom right) between the upper and lower 16% of scores on the Service/Dedication to a Cause career value. Errors bars represent SEMs. There were  $n = 6$  cases which made up the LOW category and  $n = 7$  cases which composed the HI category.

Results revealed significant differences on Internal Motivation [ $F(1,10) = 11.688, p = .008, \Omega^2\text{-est} = 0.56$ ], External Motivation [ $F(1,10) = 5.63, p = .042, \Omega^2\text{-est} = 0.38$ ], Challenge Motivation [ $F(1,10) = 13.56, p = .005, \Omega^2\text{-est} = 0.60$ ], and Outward Items [ $F(1,10) = 8.46, p = .017, \Omega^2\text{-est} = 0.48$ ] between high and low scorers for the Pure Challenge career values. Differences observed on Internal motivation were being driven by significantly higher scores ( $M = 50.00, SEM = 1.39$ ) for those who scored high on Pure Challenge as compared to those in low Pure Challenge ( $M = 40.00, SEM = 2.76$ ) category. Differences in External motivation were being driven by significantly higher scores ( $M = 39.80, SEM = 0.800$ ) for individuals scoring low on Pure Challenge as compared to those in the high category ( $M = 33.67, SEM = 1.56$ ) of Pure Challenge. Differences on challenge motivation were being driven by significantly higher scores ( $M = 25.17, SEM = 1.11$ ) for high scorers of Pure Challenge as compared to low scorers ( $M = 18.60, SEM = 1.44$ ) on this career value. Finally, differences obtained on Outward Items were being driven by higher scores ( $M = 24.20, SEM = 1.46$ ) for low scorers on Pure Challenge as compared to high scorers ( $M = 18.52, SEM = 1.31$ ) on this career value. Results are summarized in Figure 10.

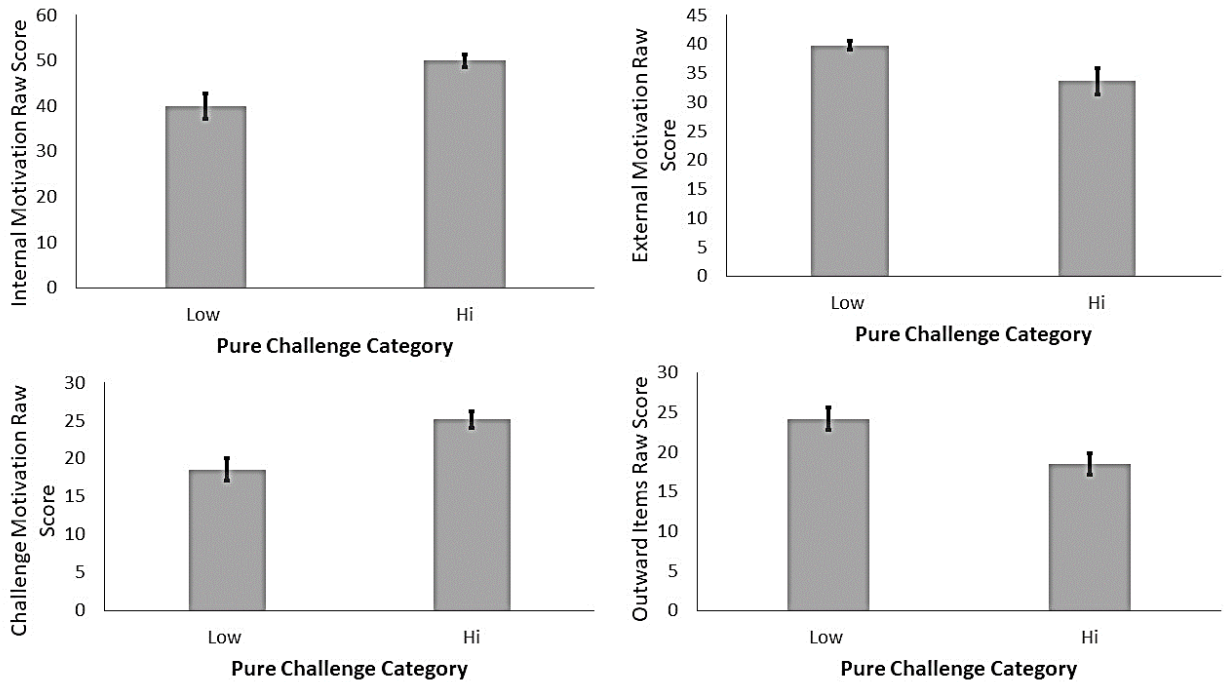


Figure 10: Differences in self-reported internal motivation (top left), external motivation (top right), challenge (bottom left), and outward items (bottom right) between the upper and lower 16% of scores on the Pure Challenge career value. Error bars represent SEMs. There were  $n = 5$  cases and  $n = 6$  cases in the LOW and HI categories respectively.

Lastly, results inferred significant differences between Working Memory Index scores between high and low scorers on the Lifestyle career value [ $F(1, 11) = 6.25, p = .031, \Omega^2\text{-est} = 0.38$ ]. The differences obtained were being driven by higher scores on Working Memory Index ( $M = 102.67, SEM = 2.46$ ) for those scoring high on Lifestyle as compared to those scoring low on this career value ( $M = 86.17, SEM = 6.12$ ). A visual representation of the results is presented in Figure 11.

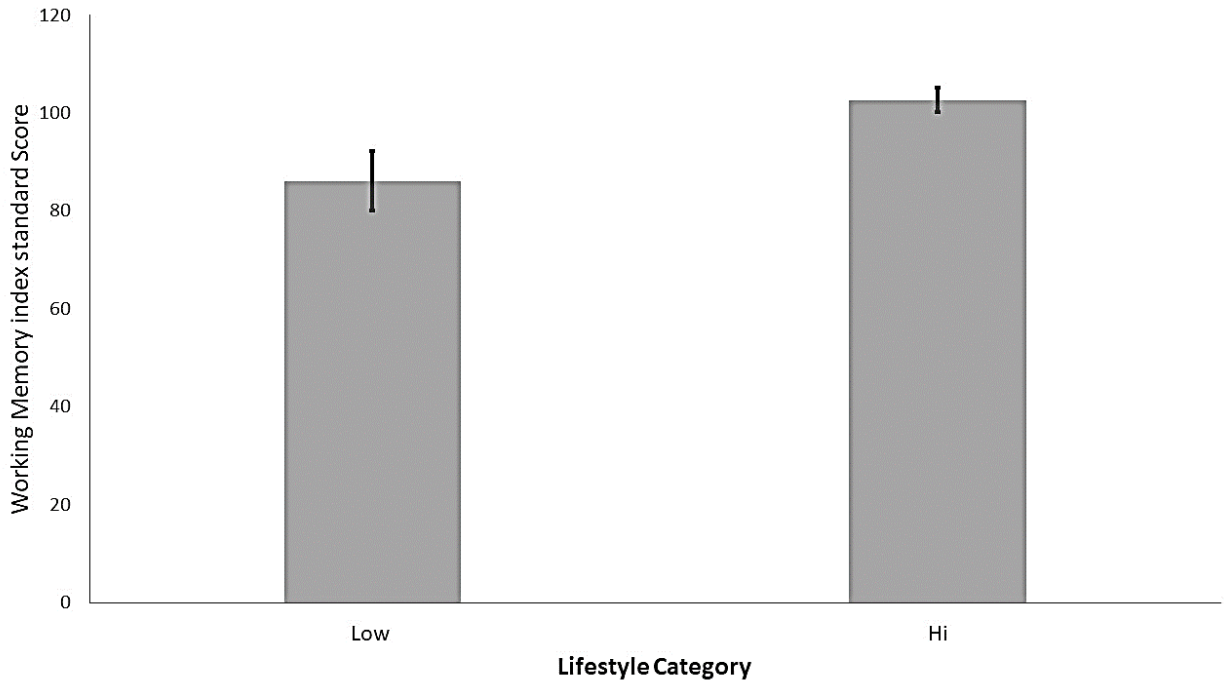


Figure 11: Differences on Working Memory Index standard scores between the upper and lower 16% of respondents on the Lifestyle career value. Errors bars represent SEMs. There was an equal representation of cases ( $n = 6$ ) for both the LOW and HI categories.

To summarize, the results of one-way ANOVAs showed some overlap between stepwise findings that support the validity of our results. In addition, the analyses using one-way ANOVAs indicated higher and lower scorers (i.e., the upper and lower 16%) differed on unique variables that were occluded in stepwise analyses.

## 4 Discussion

### 4.1 Self-Directed Career Factor

Based on the sample of individuals who participated in this project, 4 factors were identified which accommodated approximately 80% of the common sources of variance. The first factor, designated the Self-Directed Career Factor, consisted of high loadings for

Autonomy/Independence, Entrepreneurial Creativity, and Pure Challenge. According to Schein's model these individuals would value having the freedom to work at their own discretion, create products and/or services that are entirely the result of their own ideas and efforts, and overcome challenges or obstacles that stretches their abilities.

Stepwise regression analysis identified several predictors associated with the Self-Directed Career Factor including high Internal Motivation score, low Verbal Comprehension Index scores, a high number of perseverative responses on the Wisconsin Card-Sorting Task (WCST), and low Agreeableness. Internal Motivation reflects the degree to which someone endorses their preference for initiating, maintaining, and terminating future-oriented goal-directed behaviour as related to subjective intrapsychic sources of reinforcement. In this instance, internal motivation consists of two sub-scales: Enjoyment and Challenge. Results suggest people are motivated toward goals because they are identified as subjectively and intra-psychically rewarding. In addition to Internal Motivation, Challenge Motivation, an embedded measure of Internal Motivation, represents a continued pursuit towards mastery through overcoming obstacles. Challenge allows us to push our abilities to a new level of mastery as a consequence of flexing or stretching our abilities.

The Verbal Comprehension Index (VCI) score is a composite score assessing word knowledge and verbal concept formation (Wechsler, 2011). For better or worse VCI is rooted in, or is at least reflective of, predominantly left hemispheric processes as verbal-linguistic processes are typically lateralized (McGettigan et al., 2012; Kreitewolf, Friederici, & von Kriegstein, 2014; Riès, Dronkers, & Knight, 2016). Lower scores on VCI are associated with poorer performance on word knowledge and verbal concept formation and are suggestive of higher scores on the Self-Directed Career Factor. An explanation in favour of the aforementioned indirect relationship may be that language constrains imaginative processes associated with creativity. Creativity is highly

associated with intuitive, emotional, holistic (parallel processing), and imagery-based aspects that are predominantly mediated by the right hemisphere (Flaherty, 2005; Heilman, Nadeau, & Beversdorf, 2003; Carafoli, 2016). Although the outlined research accommodated a performance-based measure favouring right hemispheric characteristics (visuospatial association and pattern recognition) this measure was not identified as a contributor to the Self-Directed Career Factor; alternative explanations are suggested. For instance, it might be that left hemispheric language-associated features are inhibitory to right hemispheric processes (Abraham, 2014; Jung et al., 2010). Thus, an overall reduction in left hemispheric language proficiency would disinhibit inhibitory processes resulting in relatively stronger right hemispheric processing.

Another factor determined to play a predictive role in the Self-Directed Career Factor score was a greater number of perseverative responses to WCST items. Typically, more perseverative responses would suggest the individual continues to apply the same sorting principle to WCST content regardless of receiving corrective feedback. Clinically, a greater number of perseverative responses have been shown to be associated with frontal lobe dysfunction secondary to acquired brain injury, specifically localized to the dorsolateral region of the prefrontal cortices (Demakis, 2003; Lombardi et al., 1999; Nagahama, Okina, Suzuki, and Matsuda, 2005; Anderson, Damasio, Jones, and Tranel, 1991). However, these participants were assumed to be neurologically normal and no history of closed head injury or other possible sources that can accommodate frontal lobe dysfunction were investigated. Narratively, the observed tendency to perseverate on problem-solving strategies without adopting a new strategy under changing conditions may reflect motivational or other factors. For instance, participants' perseverance may be affiliated with challenge, motivating them to maintain a particular behavioural response in order to overcome a difficult problem. If true, one would be expected to observe a direct relationship between

perseverative responses and internal motivation, specifically challenge motivation. Some evidence is supported in the valence (direction) of the unstandardized coefficients defining the predictive equation.

From a neurobiological perspective, the results observed regarding motivation and WCST perseverative responses may be viewed as a competition between top-down and bottom-up processes. Motivation, operationalized as an anticipation of a reward, directs behaviour pursuant to the reward and is mediated by the mesolimbic dopamine pathway. Structural and functional neuroanatomical connections exist between the limbic system and the areas more prominently associated with executive function (e.g., dorsolateral prefrontal cortex) (Rosenbloom, Schmahmann, and Price, 2012; Koenigs & Grafman, 2009; Parent & Carpenter, 1996). Bottom-up processes driven by the limbic system can influence, reduce the efficiency of the executive functions as evidenced by research examining behaviours associated with substance use issues and impulsivity (Cardinal, Winstanley, Robbins, & Everitt, 2004; Rosenbloom, Schmahmann, and Price, 2012; Leclerc, Regenbogen, Hamilton, & Habel, 2018). The desire (motivation) to overcome challenges and be rewarded effectively renders the executive functions less efficient and may explain the observed results.

The last variable identified as a predictor of the Self-Directed Career Factor was the personality characteristic Agreeableness. In essence, higher scores on Agreeableness were associated with lower scores on the Self-Directed Career Factor. Alternatively, lower Agreeableness was related to higher scores on the Self-Directed Career Factor score. Characteristic of individuals low in Agreeableness is a tendency or inclination toward competitiveness, antagonism, and skepticism regarding the intentions of others (McCrae and Costa, 2010). It would follow, these individuals may compete with others or themselves and would be congruent with the

value of Pure Challenge and being motivated to overcome challenges. Suspiciousness associated with intentions of others, another trait characteristic of low Agreeableness, may encourage Self-Directed individuals to avoid others or otherwise present as guarded. Avoidance, suspiciousness, and guardedness would serve as helpful strategies in deterring others from poaching ideas. Effective defenses against inferred or perceived maliciousness would protect the integrity of the value of Entrepreneurial Creativity; the desire to create a product or service that is entirely the result of the efforts of the individual who created them.

Determining differences between high and low scores on a given factor would be revealing. In this vein, one-way ANOVAs were conducted on the upper and lower 16% of scores within each of the identified career factors. When examining the Self-Directed Career Factor, high scorers were significantly different from low scorers on VCI, WCST learning-to-learn, Challenge motivation, Enjoyment motivation, and Conscientiousness. We have discussed possible explanations related to scores on VCI and Internal motivation, the latter of which Challenge and Enjoyment motivation belong. What is distinct between high and low scorers, at least as we have yet to discuss, are lower performance on learning-to-learn and lower scores on Conscientiousness for the highest (top 16% of participants) on the Self-Directed Career Factor.

According to the manual, WCST learning-to-learn is defined as the change in proficiency moving between sorting principles throughout the entire WCST (Kongs, Thompson, Iverson, and Heaton, 2000). Individuals scoring in the top 16% of scores in the Self-Directed Career Factor became less proficient in identifying and applying sorting principles to different categories throughout the task. These individuals learn; however, they require a greater number of trials to do so. Taken together with the overall increase in perseverative responses, the observed patterns of difference are reasonable and expected.



Conscientiousness can be conceptualized as an inference of self-control and planning and organizing behaviour to work to a particular goal (McCrae and Costa, 2010). In addition, Conscientiousness may be related to the control of impulses, management of desires, and ability to defend against temptation (McCrae and Costa, 2010). High scorers on the Self-Directed Career Factor score significantly lower on Conscientiousness as compared to low scorers on the Self-Directed Career Factor. The results do not necessarily indicate these persons lack self-control, self-discipline, or are disorganized in the manner in which they plan and organize their behaviour. It is likely, as suggested previously, these individuals are more impulsive or strive to achieve their desire to pursue enjoyable tasks or overcome challenges. Narratively, enhanced impulsivity and reduced capacity to manage desires or defend against temptation would be congruent with the neurobiological framework previously outlined.

In addition to an overview of the larger picture, we investigated predictors associated with each of the individual career values that loaded on the Self-Directed Career Factor. Regarding the Autonomy/Independence career value, both Internal Motivation and Agreeableness were identified as predictors. The direction of the association of the predictors were not different from those significant predictors identified from the results examining the Self-Directed Career Factor in its entirety. That is to say, Agreeableness was negatively associated with Autonomy/Independence, while Internal motivation was positively associated with Autonomy/Independence.

With respect to the Entrepreneurial Creativity career value, WCST learning-to-learn was identified as the only significant predictor of this career value. Again, the direction of the association identified was congruent with that observed when examining differences between high and low scorers on the Self-Directed Career Factor. One additional interpretation, elicited by the

aforementioned result, may be that a lack of proficiency completing a task translates to greater exploration of available and alternative options that are equally justifiable to be applied to solving the problem. If creativity is conceptualized as a novel application of a defined or developed strategy, then a reduction in proficiency may be a reflection of applying many different or alternative strategies to a given problem. Creative exploration, as marked by a reduction in proficiency on WCST performance, can accommodate some of the observed differences discussed.

The Pure Challenge career value was predicted by Challenge motivation and the number of trials necessary to complete the first category on the WCST. It was refreshing to identify challenge motivation as being positively related to, and predictive of, Pure Challenge, suggesting they share a conceptual framework or have some degree of concurrent validity; they measure the same construct. Interestingly, the number of trials to complete the first category on the WCST was negatively associated with, and predictive of, Pure Challenge. According to the manual, the number of trials to complete the first category on the WCST provides insight to the initial conceptualization of sorting principles prior to shifting set and adopting another problem-solving strategy (Kongs, Thompson, Iverson, and Heaton, 2000). Research has identified trials to complete the first category on the WCST assesses cognitive flexibility (Miles, Howlett, Berryman, Nedeljkovic, Moseley, & Phillipou, 2021) and has been shown to be significantly different (e.g., more trial required) in individuals who routinely make loose associations (Evertt, Lavoie, Gagnon, & Gosselin, 2001). The latter findings may be relevant and revealing of our results.

Research typically identifies frontal lobe dysfunction and abnormal temporal lobe structure and function as the most neurobiologically relevant features of individuals who routinely make loose associations (Ford, Mathalon, Whitfield, Faustman, & Roth, 2002; Gallinat et al., 2002; Cobia, Smith, Wang, & Csernansky, 2012). The relationship between frontal and temporal

structures (namely limbic regions) have been discussed previously and, again, provides evidence that, for our participants, there is a greater influence of limbic and paralimbic networks (e.g., orientation to rewards; reward prediction) on decision-making on individuals high on Self-Directed Career and who highly value Pure Challenge. Conceptually, loose associations can be viewed as poorly defined categories or underdeveloped concepts. Poorly defined conceptual categories, to which new information is compared, may require more comparison and reevaluation of available information to reify the cognitive category. A greater need for accurately updated cognitive models (e.g., evidence gained from hypothesis testing to formulate the bounds of the conceptual category) would translate to a greater number of trials required in order to grasp the requirements of the task. The approach outlined, that of loose associations reified through hypothesis testing to generate an accurate conceptual category, may allow for the opportunity for creative interpretations of the available information and may be linked to, and supportive or reinforcing of, the value of Entrepreneurial Creativity within the Self-Directed Career Factor.

#### 4.2 General Management Career Factor

An examination of the results suggested Managerial Competence positively loaded on the General Management Career Factor, whereas Service/Dedication to a cause and Lifestyle loaded negatively. According to Schein's model, Managerial Competence is a value rooted in utilizing interpersonal skills to coordinate and integrate the efforts of others and delegating tasks. Service/Dedication to a cause reflects a tendency to care for or help others and the community. Lastly, Lifestyle is a value described as balancing or maintaining equilibrium between various domains of life including, but not limited to, personal, professional, leisure, and family concerns. Individuals scoring high on the General Management Career Factor highly value using

interpersonal skills to coordinate others, they place low priority on balancing life and giving of their time to assist or care for others and the world.

Only one variable was identified as a significant predictor for the General Management Career Factor: Working Memory Index scores. Working memory was negatively associated with the General Management Career Factor score. In fact, when comparing differences on WMI between the upper and lower 16% of individuals, those scoring low on the General Management Career Factor scored significantly higher on working memory. Working memory, in this context, is defined as the ability to collect and retain information, complete mental operations or manipulations on said information, and retrieve that newly modified information to complete a task. In a role whose characteristic manner of working is to coordinate and integrate the efforts of others, the reliance on information retention, performance of mental operations, and integration of the newly synthesized information may not be necessarily helpful. It is more likely, the emphasis would be placed more on interpersonal skills, assertive communication, and charisma as a means of creating cohesion amongst others. In this regard, results demonstrated both WMI and Extraversion were significant predictors of the Managerial Competence career value. Extraversion, as suggested by the interpretation outlined, was positively associated with Managerial Competence. Costa, McCrae, and Holland (1984) showed Extraversion is a strong determinant of interest in enterprising occupations whose prime directive is to work with and effectively manage others. As a characteristic, Extraversion is associated with enhanced assertiveness, being active and talkative, cheerful, enthusiastic, and energized in social interactions (McCrae and Costa, 2010). It is likely, positive dispositions of those scoring high on Managerial Competence (and by extension Extraversion) energize others and create the cohesion necessary to effectively direct groups to work toward a common goal.

Examining Service/Dedication to a cause and Lifestyle which, recall, loaded negatively on the General Management Career Factor, suggested each had unique variables that predicted their level of endorsement (e.g., subjective value). Working Memory was the only variable shown to be a significant predictor, and was positively associated with, Lifestyle. The results suggest an antithetical relationship between Managerial Competence and Lifestyle. One interpretation may be that those individuals who value Lifestyle are more preoccupied with actively problem-solving and considering options to best balance all domains of their respective lives day-to-day. Some evidence supporting this idea comes from research that shows working memory is a subset of executive functions (Titz & Karbach, 2014; Carpenter, Just, & Reichle, 2000). Individuals scoring high on the General Management Career Factor may be less concerned with trivial aspects of balancing the various domains of their lives favouring to work with people in the moment and encouraging others to work connectedly toward a common goal.

Lastly, the final component loading on the General Management Career Factor, Service/Dedication to a Cause, was shown to be predicted by Internal Motivation, Conscientiousness, and Openness to Experience. Internal motivation, consisting of both Enjoyment and Challenge subscales, is low for individuals scoring high on the General Management Career Factor. Suggesting these individuals are less motivated to initiate, maintain, or terminate goal-directed behaviour for reasons that are personally relevant, intrapsychic, and subjective. These findings do not eliminate other possible sources of motivation, however. In their tripartite theory of motivation, McClelland (2005) discussed individuals are motivated by affiliation, achievement, and power-control. Under McClelland's framework, persons high on the General Management Career Factor are likely to score higher on both affiliation motivation (being surrounded by others; socializing) and power-control (influencing and directing the behaviours of

others) as compared to achievement and internal motivation. It may be either the General Management Career Factor, the Managerial Competence value, or both would show this convergence. Similarly, Service/Dedication to a cause would be posited to be negatively associated with power-control motivation and may be either positively or negatively associated with affiliation motivation. The relationship between these career values, General Management Career Factor and affiliation motivation and power-control is worth investigating in the future.

Two personality characteristics, Conscientiousness and Openness to Experience, were shown to be predictors of Service/Dedication to a Cause with the former being negatively associated with Service/Dedication to a cause and the latter being positively associated with Service/Dedication to a Cause. It is suggested, individuals scoring high on the General Management Career Factor score higher on Conscientiousness and lower on Openness to Experience. As previously discussed, high Conscientiousness infers more discipline and a more well-developed ability to regulate impulses. The approach to people, and business, may be highly organized, carefully considered, and detail oriented.

Openness to Experience, when high, is characteristic of an appreciation and acceptance of a wide range of interests, hobbies, and values. It is typically associated with explorative curiosity. While low scores on Openness to Experience are characteristics of individuals rooted in tradition, accepting a narrower and conservative perspective, and those who are generally set in a particular way of doing things. It is the latter series of descriptors which would be best used to describe individuals high on the General Management Career Factor.

### 4.3 Skillful-Dedication Career Factor

The Skillful-Dedication Career Factor (factor 3) was shown to involve two loading variables: Technical/Functional Competence and Service/Dedication to a Cause. According to Schein's model, Technical/Functional Competence describes valuing the need to develop and master a particular set of skills or developing an understanding of technical concepts to a very high level of expertise. Service/Dedication to a Cause, as a review, is rooted in helping, giving time in the service of others. When examining predictors of Skillful-Dedication, it was shown Openness to Experience was positively associated with this career factor while Conscientiousness was negatively associated with Skillful-Dedication; both were determined to be significant predictors of Skillful-Dedication.

Openness to Experience, which is high for high scorers on the Skillful-Dedication Career Factor, represents a broad range of interests, subjects, and hobbies; an aesthetic appreciation for art and nature; and a high degree of non-judgment coupled with an acceptance for non-traditional means of doing things (McCrae and Costa, 2010). Non-judgment, empathy, and genuineness, the cornerstones of counselling outlined by Rogers, would be characteristic of these persons. Conscientiousness, as previously noted, typically involves aspects of self-discipline and appropriate management of temptation. Persons scoring high on the Skillful-Dedication Career Factor score lower on Conscientiousness, suggesting an inclination for impulsive behaviours (likely contributing to the desire to try new things) and reduced rigidity in thinking and planning.

When comparing the highest and lowest scores on the Skillful-Dedication Career Factor, Openness to Experience and Enjoyment Motivation were shown to be significantly different between the upper and lower 16% of scores. Openness to Experience and its interpretation relevant to the Skillful-Dedication Career Factor has been outlined. Although characteristic of the Skillful-

Dedication Career Factor, those scoring highest in this dimension demonstrate typical patterns of thinking, feeling, behaving, and relating that is more characteristic (more readily observed and consistent across a variety of situation) of the highest scorers on the Skillful-Dedication Career Factor.

Enjoyment Motivation, which differentiates and characterizes individuals scoring highest on the Skillful-Dedication Career Factor, suggests individual scoring within the top 16% of scores on this Career factor are motivated to initiate, maintain, and terminate actions pursuant to their goals provided they are subjectively rewarding, producing positive affective experiences. One interpretation is that those individuals find exploring and learning about different values, interests, or hobbies, as exciting, rewarding, and result in producing feelings of contentment.

A careful examination of predictive variables associated with Technical/Functional Competence indicated no variables could predict scores related to this, standalone, career value. One interpretation is that our sample of individual participants is homogenous in their endorsement and perceived value of Technical/Functional Competence as related to their current or future careers. Further evaluation of differences between the upper and lower 16% of individual scores on Technical/Functional Competence revealed Openness to Experience as the only variable which was significantly different between them. The possibility that Openness to Experience is a redundant feature embedded within Skillful-Dedication is evident.

Comparatively, the Service/Dedication to a Cause career value, as previously discussed, was positively associated with, and predicted by, Internal Motivation and Openness to Experience and negatively associated with, and predicted by, Conscientiousness. These variables, and their



relevant interpretations associated with the Skillful-Dedication Career Factor have already been addressed.

#### 4.4 Conservative Career Factor

The Conservative Career Factor (factor 4) was defined by the combination of Security/Stability and Lifestyle values; both of which loaded positively on the Conservative Career Factor. According to Schein's model, Security/Stability evaluates the degree to which a respondent values job security, financial certainty, and predictable working environments. Lifestyle is the value an individual ascribes to balancing the domains of life including family, leisure, work, and personal interests. The loading coefficients observed in the Conservative Career Factor is diametrically opposed to the loading coefficients for the General Management Career Factor.

Results investigating possible sources that contribute to the prediction of scores on the Conservative Career Factors identified a single variable: WCST learning-to-learn score. The relationship between WCST learning-to-learn and the Conservative Career Factor was negative. Individuals scoring lower on WCST learning-to-learn scored higher on the Conservative Career Factor. Recall, learning-to-learn measures proficiency conceptualizing problem-solving strategies across categories on the WCST. In essence, individuals scoring high, as results inferring differences between the upper and lower 16% of the sample, score lower on the WCST learning-to-learn. Narratively, persons high on the Conservative Career Factor are less proficient, require more trials, and commit a greater number of errors, over the course of the task. It may be that individuals high on the Conservative Career Factor prefer the certainty of over-learned and familiar tasks, skills, and procedures. They know what to do in unchanging circumstances and they do it well. Introducing uncertainty into routines, that is exemplified by changing the sorting principle

and learning to adopt new problem-solving strategies, is met with tentative and hesitant exploration.

When addressing the independent career values that loaded on the Conservative Career Factors, Lifestyle was positively predicted by and associated with the Working Memory Index. One explanation, described previously, is that individuals high on WMI, which measures ability to retain information in the mind's eye, perform manipulations and integrative processes on said information, and using the integrated information to solve problems, are constantly trying to balance and manage the various domains of life. They may be updating appointments, strategizing ways to work with family schedules most effectively, and plan means to engage in leisure activities for example.

Comparatively, Security/Stability was predicted by, and negatively associated with, Openness to Experience. According to McCrae and Costa (2010) persons low in Openness to Experience are characteristically conventional in their behaviours and maintain conservative outlooks. They are less affected by negative and positive emotions and are more comfortable with familiar situations compared to novel ones. The conservatism characteristic of those who value Security/Stability more highly may contribute, at least in part, to the observed differences in WCST learning-to-learn.

#### 4.5 Integration

From our results it was determined that scores (level of endorsement) of a given career value could be predicted by one or more variables assessing performance (e.g., global intellectual function and executive function), personality, and motivation. Furthermore, comparisons between the highest and lowest scorers of a given career value showed significant differences on only those

variables shown to predict scores (level of endorsement) for that particular career value. The identified relationships may infer that values related to career strongly resonate with specific mental abilities.

What does it mean that career values are tied to specific mental abilities? One interpretation that may possibly account for the observed relationship may be rooted in selection pressures and adaptation. In evolutionary biology, environmental factors impact the ability of organisms to effectively adapt. Provided a variation in phenotype results in an advantage that improves survival, that trait will be selected and represented in subsequent generations. With respect to career orientation, it may be that identified strengths, consciously or unconsciously recognized, in the form of specific mental abilities have an influence regarding future career selection. Under this framework, people would be fitted, over several failed attempts and learning, to a give work environment that compliments their individual strengths. If true, then people who are employed in positions that are congruent with their strengths should be more successful (financially; improved task efficiency with low work demand) and satisfied with their career.

One approach to evaluating the relationship between career values and specific mental abilities as a selective determinant for employment type would be to select a given job type and assess the distribution of scores of the specific mental abilities and career values of all those employed in that position. Say for instance the job position is in service; it would be expected that, based on our findings and on previous research, service/dedication to a cause and pure challenge would be identified as the most frequently occurring (highest scores) values among service workers. If our hypothesis is accurate, service workers in general, would likely score higher (on

average) on internal motivation, Openness to Experience, and challenge motivation and would score lower (on average) on Conscientiousness and WCST trials to complete the first category as compared to non-service workers.

Another prediction, provided our model is accurate, that emerges from our framework would be rooted in job performance and satisfaction. Among service workers, our framework would posit that the best performing service members (as assessed by customer reviews, tip percentage, sales, etc.) would be those scoring the highest on the specific mental abilities defining service workers (e.g., internal motivation, openness to experience, etc.). A similar trend is predicted for job satisfaction (e.g., higher job satisfaction associated with higher scores on specific mental abilities associated with service/dedication to a cause career value).

Also worthy of discussion, is that our framework of selective determinants for employment type would predict low performance and likelihood of career change. First, low performance in a given job would be the inverse of highest performers. Second, the likelihood of job change (termination or transfer) would be maximized if the values determined by the individual are not congruent with the job demands and work environment. Incongruence of career values and concomitant specific mental abilities and job type/environment may result in frustrative aggression, low work performance, and low job satisfaction ultimately creating intrapsychic conflict. It is possible the resultant intrapsychic conflict may encourage greater stress and increase the number of days the employee reports taking sick leave.

In addition, it is possible, provided our framework is accurate, that predictions can be made regarding individuals who have undergone circumscribed brain damage (e.g., lesion, head injury). If an employed individual undergoes resective surgery for a brain tumor or sustains a brain injury and the resulting lesion impacts specific mental abilities associated with the individual's career value, it is likely that individual will no longer be able to complete the duties and responsibilities of their job, or they may not be satisfied in their current position. The artificial incongruence, generated as a consequence of brain trauma, may encourage the person to transfer positions or outright terminate their employment. This can become very troublesome especially in cases where insight to psychological function is limited, or when the individual retains their values however their specific mental abilities that assisted them complete their job-related tasks are compromised. Under these circumstances, individuals would advocate to retain their position despite a reduction in their overall performance.

## 5 Conclusion:

The data suggests a complex interplay between performance-based skills, personality characteristics, and sources of motivation that contribute to the importance placed on individual values related to a person's career. Despite identifying 4 factors (Self-Directed, General Management, Skillful-Dedication, and Conservative) not all the variance observed could be accommodated. Similar findings were noted for predictive equations for the factors identified and Schein's 8 career values. The lack of absolute classification or inability to precisely predict scores suggest that values are shared amongst individuals (to varying degrees), and they are subject to the errors accommodated by individual differences.

## 6 Limitations:

No scientific investigation, even one that is well-planned and thoroughly organized, is without limitations. The most notable limitation to this research was its sample size. The data rendered is still useful and revealing for the individuals represented in the population sampled. However, we were unable to evaluate some of the aims outlined in this dissertation. Primarily, we were unable, at this time, to comment on profile convergence between outcome groups (e.g., specific career domains) and students.

In addition to sample size and inability to complete outlined objectives, test selection also posed as a limitation. Test selection was based on the theoretical framework presented in the introduction. For each domain examined, multiple tests exist to effectively evaluate the construct of cognition, personality, motivation, executive function, and career values. Furthermore, tests used in this study were selected to capture a range of performance-based measures within a circumscribed period of time. It may be prudent, in the future, to select a greater number of tests to evaluate the domains listed that are more time efficient than the battery presented here.

Furthermore, there is the issue of the low ecological validity and generalizability which is part due to issues pertaining to sample size. Moreover, low ecological validity and generalizability is constrained by the statistical analysis used. Stepwise linear regression was used as a consequence of the low sample size to variable ratio; however, this technique is notorious for producing results that do not replicate well across studies or other samples. To accommodate these particular limitations several replication studies and large sample populations are required.

The last limitation inherent in this research is that of generalizability. Part of the lack of generalizability to the population is the sample size evaluated. In addition, the vast majority of

cases included in this sample were post-secondary students attending a Northern Ontario post-secondary institution. In order to overcome the issue of generalizability we would require further evaluation of a representative sample of students enrolled in secondary school courses, vocational training programs, and college certifications. In a similar sense, it would be prudent to evaluate individuals across a variety of employment domains.

#### 7 Future Directions:

One consideration for future derivatives of this work, and one informed by the findings, is to fully evaluate the role of individual differences in career value and choice. To this end, future researchers may want to limit their selection (sample population) to a single employment domain (e.g., nurses/nursing students). Narrowing in on one domain, or a shared work environment/work role, would limit the contribution of extraneous sources of variance. Provided the environment/role of the group under investigation is homogenous, any effects determined would be more strongly influenced by individual differences.

Another point to consider is conducting a longitudinal study assessing the interaction of changing parameter. For instance, one may wish to evaluate concomitant changes in personality structure as is related to career value and overall job satisfaction. If Schein's model evaluates what an individual values in a career, that is the priority and importance placed on a career that is intrapsychically subjective, then priorities would shift according to the significance of events the individual experiences. Significant life events have been shown to be related to changes in personality profiles over time (Bleidorn, 2019). Subjective measures of success, sense of reward and fulfillment, and overall job satisfaction may be related to incongruent personality-career value interactions and may be predictive of job change, a worthy pursuit.

A key finding presented in the results were subjective reports of motivation were predictive of career factors and independent career values. Discussion points outline possible explanations for the observed. Future renditions of this research may wish to substitute the Work Preference Inventory, assessing only internal and external sources of motivation, for a psychometric tool which incorporates McClelland's (2005) tripartite theory of motivation. The results of future studies, provided these considerations are taken into account, would add enormously to the interplay of individual differences on career value and choice.

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