Trait Self-Descriptive Personality Inventory: The Search for Validity

and Structure

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Table of Contents

Appendices

List of Tables

List of Figures

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Abstract

There has been a resurgence of interest in research with respect to personality as a selection measure for organizations. The Trait Self Descriptive Personality Inventory (TSD), a recent implementation as a selection measure for the CF, has demonstrated conformity to the predominant Five-Factor model, as well as moderate association with organizational outcome variables such as Reliability and Student Engagement. However, there were moderate to weak correlations between the commensurate factors of the TSD and the Hogan Personality Inventory, suggesting poor equivalence between inventories. Finally, an evaluation of the presence of superordinate and aggregate factors beyond the Big Five personality structure revealed no substantive higher order factor structure was apparent. Additional research directions are discussed.

25 Jul 2012

Trait Self-Descriptive Personality Inventory: The Search for Validity and Structure

In an increasingly industrialized world, sizeable resources are invested to finding the best and brightest workers. For any organization, selecting the worker who will perform the best in a particular job is crucial; as such, employers of all professions and sectors seek the best selection methods that will enable them to select the most capable and effective employees. Although a variety of criteria such as cognitive ability and person-job fit have remained a mainstay in selection decisions, of increasing interest are dispositional factors such as personality that may suggest desirable employee traits. For example, personality, especially the predominant Big Five model, and its measurement has also garnered interest among the business and research community alike, given the potential to predict an array of behaviours ranging from job performance (Barrick & Mount, 1991) and employee engagement to counterproductive work behaviours (CWB; Catano & Prosser, 2006). The Canadian Forces (CF) is one large organization that has implemented selection procedures involving personality with the use of the Trait Self Descriptive Personality Inventory (TSD; Noonan, L.E., personal communication, February 16, 2011). However, despite the proliferation of use, the factor structure of personality remains in questions for some researchers. Although there is general acceptance that the personality domain follows a five factor structure (Barrick, Mount & Judge, 2001), significant empirical evidence points to a more complex hierarchy of meta-traits that may further explain organizational outcomes. As such, the two goals of my research are to examine the

construct validity of the TSD and subsequently, through the use of the TSD scales, to investigate the potential multidimensional factor structure.

The CF constantly strives towards effective and legally defensible selection of the best candidates. Such candidates are required to be proficient at both being a soldier and a tradesperson and, as such, are required to possess a wide breadth of knowledge, skills, abilities, and other characteristics. Cognitive ability is firmly established as a bone fide job requirement for screening and selection. However, non-cognitive criteria such as personality have been recent additions to the CF selection system (Kuschnereit, 2008) which currently employs a multi-step screening and selection process for its members. Current CF selection doctrine requires that all applicants have cognitive ability assessed with the Canadian Forces Aptitude Test (CFAT) and person-job fit by means of structured interview questions (SIQ) to determine the overall suitability of candidates. However, the use of a standardized personality measurement as part of the selection process, specifically the TSD, was just implemented in 2012 (L.E. Noonan, personal communication, February 16, 2011).

Personality Testing as a Factor Level Predictor

The resurgence of research interest with respect to personality as a selection measure for organizations began in the 1990s. Prior to that, there was no clear conceptual framework to infer consistent and meaningful relationships between personality constructs and organizational outcomes (Barrick, Mount, & Judge, 2001; Hogan & Roberts, 2001). As indicated above, the most widely accepted personality

framework is the Five Factor model (Big Five; Tupes & Christal, 1992) comprised of

Extraversion, Conscientiousness, Openness to Experience, Emotional Stability, and

Agreeableness (Barrick & Mount, 1991). In Industrial-Organizational (I-O)

psychology, substantial research efforts have concentrated in examining these factors

in terms of their utility as predictors of job performance (Barrick & Mount, 1991;

Barrick et al, 2001; Salgado, 1997; Salgado, 2003; Salgado, Viswesvaran, & Ones,

2003). The validity of these Big Five personality constructs and measures in

predicting job performance has amassed over a decade of support from meta-analytic

reviews (see Hough & Oswald, 2008). Conscientiousness has usually emerged as the

strongest predictor of job performance at a generalizable level, but the other factors

have also proven to be successful predictors in specific occupations (Barrick &

Mount, & Judge, 2001).

The link between personality and academic performance has also received

considerable attention (Chamorro-Premuzic & Furnham, 2003; Farsides &

Woodfield, 2003; Goff & Ackerman, 1992; Rothstein, Paunonen, Rush, & King,

1994). Conscientiousness tends to be significantly correlated with undergraduate

GPA (Goff & Ackerman, 1992; Wolfe & Johnson, 1995). In a longitudinal analysis

of student exam and final year project marks, Chamarro-Premuzic and Furnham

(2003) not only demonstrated that both Neuroticism and Conscientiousness were

significant correlates of academic success, but that Extraversion was also positively

associated with final year project marks. This latter finding may be attributed to the

requirement of interpersonal interaction during the conduct of the project. By

contrast, Farsides and Woodfield (2003) found that Openness to Experience and

Agreeableness were the only two consistent indicators of undergraduate success. The

collection of research suggests that, similar to job performance, certain personality

traits predict academic success in certain course types and criteria of success but not

in others, and further suggests that personality-performance link may be generalized

to academic performance as well.

The TSD is the instrument that is used to assess personality in the CF.

Originally developed by Christal and his colleagues (see Christal, Barucky, Driskill,

& Collis, 1997) for the American Armed Forces as the Air Force Self-Descriptive

Inventory (AFSDI), the questionnaire has been adapted for research and potential

implementation within the CF (O'Keefe, 1998). The most recent large-scale study

the use of the TSD with CF recruits was conducted by Boyes in 2005 who examined

the psychometric properties of three versions of the scale and their association with

job performance and counterproductive behaviours. The abbreviated, factor-level

versions of the TSD were proposed for use within the CF selection system for the

purposes of faster administration times and model parsimony (Boyes, 2006; O'Keefe

2004). Using a sample of both officer candidates and non-commissioned members,

Boyes (2006) concluded that a 75-item TSD was the most parsimonious model to

provide adequate content representation. It is this iteration of the TSD that has been

used in research post-2005 for validation and use as a selection measure.

Beyond the Big Five: Creating Higher Order Constructs

The collection of research in support of the five-factor personality model as a predictor of performance to date is substantial, but more recent investigation of the five factor taxonomy have raised new questions. The research in the preceding paragraphs mentioned associations between criterion variables and single personality factors; however, empirical studies have examined additional assertions that the factors may not act in isolation of one another (DeYoung, 2009; Digman, 1997; Musek, 2007). There is a general appeal in developing higher order multidimensional constructs due to the bandwidth-fidelity trade-off and increased parsimony, but the validity of the higher-order constructs often do not receive the same scrutiny as that of standalone unitary constructs (Johnson, Rosen & Chang, 2011). With respect to personality, Digman (1997) marked the earliest research into the possibility of higher order factors, and subsequent research proliferated in support of either two or one single personality factors above the Big Five taxonomy (DeYoung, 2002; Musek, 2007). Ones (1993) also independently examined the possibility of a higher order personality construct in defining the construct of integrity, specifically a meta-trait involving Conscientiousness, Agreeableness, and Emotional Stability. However, none of the aforementioned research has addressed the specific direction of the relation between the multidimensional construct and its dimensions. Examination of the internal structure of a higher order construct is crucial. If the internal structure lacks validity, then any observed relations it has with the correlate and the criterion variables are moot (Johnson, Rosen, & Chang, 2011). The degree of specificity

concerning higher order factors is important to establish prior to any examination of

higher order factors, and has not been systematically addressed to this level of

scrutiny. Indeed, in the search for higher order factors, directionality of causality has

been ignored in organizational research in general (Johnson, Rosen, & Chang, 2011),

and my research was aimed to investigate the possibility of higher order factors in the

TSD by examining the multidimensional constructs as either superordinate or

aggregate in nature.

The Big Five as Superordinate Constructs.

Multidimensional constructs may be distinguished in two different ways via

the direction of the relationship between the construct and its dimensions (Edwards,

2001), each with conceptual and statistical differences. If the relationships flow from

the construct to its dimensions, the construct may be termed *superordinate* because it

represents a general concept manifested by specific dimensions. This is analogous to

reflective measures, where observed variables represent manifest indicators of an

underlying construct (Diamantopoulos & Siguaw, 2006). A superordinate construct

is the primary cause of its indicators, and as such, the effects indicators should

demonstrate high intercorrelations (Johnson, Rosen, & Chang, 2011). In addressing

the validity of this type of higher order variable, as the loadings between the

indicators and superordinate construct increase, the intercorrelations should also

increase, which would result in a higher internal consistency reliability (Edwards,

2001). For the specifics of personality, the observed systematic intercorrelations

between factors has been the crux of the rationale for advocating the presence of

higher order factors, suggesting either two latent factors (as argued by Digman, 1997

and DeYoung, 2002) or one latent General Factor of Personality (GFP; as advocated

by Musek, 2007).

The Big Five personality factors have previously been considered to be

orthogonal, yet inconsistencies in many personality studies exist that have prompted

some researchers to re-examine the factor structure. For example, many studies have

shown that the factors are not orthogonal (Block, 1995; Boyes, 2006; Digman, 1997;

Goldberg, 1992). Another criticism of the Five Factor model is that the model is

purely descriptive with no regard to the causality of the presence of such factors

(McAdams, 1992), and that the degree of "orthogonality" depends on the

characteristics of the sample (Block, 1995). Thus, Digman (1997) proposed a

hierarchical personality model after an examination of factor analyzed correlation

matrices among the Big Five and proposed that Agreeableness, Conscientiousness,

and Neuroticism are facets of a broader construct, labelled Alpha, and Extraversion

and Openness represent facets of the broader construct, labelled Beta (Figure 1).
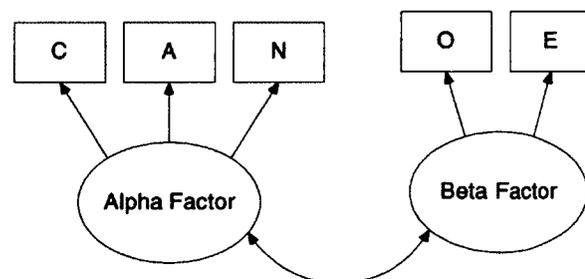
Figure 1. A conceptual model of two higher order factors from C =

Conscientiousness; A = Agreeableness; N = Neuroticism; O = Openness to

Experience; E = Extraversion. N represents the reverse coding of Emotional Stability.

In further exploring the implications of these higher order factors, Digman (1997) suggested that Alpha represents a socialisation factor that is associated with impulse restraint, conscience, the management of aggression and hostility, and neurotic defence. Subsequent studies have suggested that the socialization factor may be analogous to Integrity, given that socially desirable behaviour includes adherence to societal norms (DeYoung, Peterson, & Higgins, 2002). The second factor, Beta, is considered a possible construct related to personal growth. The joint contribution of Extraversion and Openness to Experience to a Beta factor may thus represent a construct consisting of positive affective states, openness to a variety of novel and imaginative experiences, and social and interpersonal involvement. Digman also theorized that Beta entails active and enthusiastic participation in life activities. From these descriptions alone, the factor Alpha would suggest an association with managing counter-productive behaviours or conforming to societal norms, while the Beta factor may be attributed to experiential engagement (Digman, 1997).

The existence of Digman's superordinate variables is also supported through an examination of biological mechanisms. DeYoung, Peterson, and Higgins (2005) asserted that serotonergic functioning was responsible for the sources of variance for the composite variable of Agreeableness, Conscientiousness, and Emotional stability (Alpha factor), while dopaminergic functioning was attributed to Extraversion and Openness to experience (Beta factor). In neurobiological terms, the dopaminergic

pathways are associated with restraint, while the serotonergic pathways are linked to

approach. Although there is belief that the five personality factors are orthogonal and

represent the highest variable order (Barrick & Mount, 1991), the support that

common neurological functions are primary driving forces behind the factors suggests

that such correlations between factors represent actual personality meta traits beyond

the Big Five (DeYoung et al, 2005).

Digman's proposal of the hierarchical nature of personality prompted

divergent streams of research to investigate the relationships of behavior and the

aggregate variables in efforts to develop a more comprehensive perspective on the

individual differences. DeYoung et al (2002) replicated Digman's factor order

solution, as well as demonstrating that the Alpha and Beta Factors (referred to as

Stability and Plasticity, respectively) both predicted Conformity. In other words,

individuals who were more "stable" (as represented by the shared variance of

Emotional Stability, Agreeableness, and Conscientiousness) were likely to be more

conforming, whereas people who were more "plastic", as indicated by variance

common to Extraversion and Openness, were likely to be less conforming (DeYoung

et al, 2001). More specifically, Socialization, Goodness of Personality, Stability, and

Self-Control is consistent with Digman's (1997) overarching definition of social

desirability in the context of following society's rules and conforming to social

norms.

With respect to the Beta factor, there is limited research or theoretical

background (Olsen, 2005). The terms of Personal growth, Plasticity, Engagement,

and Social Competence is consistent with Digman's (1997) idea of experiential

personal growth. Individuals high in Extraversion are characterized by interactional

behaviours, such as "I enjoy attending parties" (NEO PI, Costa & McRae, 1992). By

contrast, Openness to Experience include items that represent cognitive aspects rather

than focussing on behaviour, such as "I am full of ideas" (NEO PI, Costa & McRae,

1992). The analysis at the single factor level demonstrates that Extraversion is linked

to leadership and sales performance (Barrick & Mount, 1991). Barrick et al (1991)

also denoted that Extraversion and Openness to Experience were both valid predictors

of training proficiency across a wide array of occupations. However, other studies

have failed to support a consistent personality-performance link concerning the

factors of Extraversion and Openness to Experience together (Barrick & Mount,

1993; Barrick, Mount, & Stewart, 1998). One may argue that the Beta Factor has

adaptive value, which in turn may prove beneficial to a given organization. As such,

there may be psychological benefits to Engagement during major life challenges.

Individuals high in levels of Extraversion and Openness showed increased self-

esteem when faced with a significant life transition (Kling, Ryff, Love, & Essex,

2003). Furthermore, in a more extreme example, Extraversion and Openness are also

empirically associated with benefiting from difficult and traumatic life events in the

form of positive outcomes such as perceiving greater personal strength and pursuing

new interests and possibilities in one's life (Tedeschi & Calhoun, 1996). Events such

as beginning post-secondary education or a new job is argued to represent significant

life transitions, and the ability to predict psychological well-being and personal

strength from dispositional personality variables may provide a valuable link in determining other positive organizational outcomes.

Olsen (2005) theorized Engagement as a representation of the composite of Extraversion and Openness to Experience. However, this construct has multiple meanings in different domains of psychology. Educational psychologists define engagement in the context of school involvement, to be a multidimensional construct that encompasses 3 aspects: behavioural, emotional, and cognitive engagement. Behavioral engagement draws on the idea of participation; it includes involvement in academic and social or extracurricular activities and is considered crucial for achieving positive academic outcomes and preventing dropping out. Emotional engagement is meant to encompass positive and negative reactions to teachers, classmates, academics, and school and is presumed to create an affiliation to an institution and influence willingness to do the work. Finally, cognitive engagement draws on the idea of investment; it incorporates thoughtfulness and willingness to exert the effort necessary to comprehend complex ideas and master difficult skills. Taken together, the concept of Engagement reflects a multi-faceted embracing experience of an academic endeavour.

Compared to the preceding educational approach, the construct of engagement has slightly different connotations in industrial-organizational psychology. Originally coined to represent an "antipode" of burnout (Maslach & Leiter, 1997), engagement is characterized by the degree of energy, involvement, and efficacy with work activities (Schaufeli, Salanova, Gonzalez-Roma & Bakker, 2002). Subsequent

research has supported the view that elements of Engagement (Efficacy and Vigor) are positively related to academic performance (Schaufeli et al, 2002).

The examination of these superordinate variables within I-O psychology is even further limited. Olson (2005), in his review and integration of the Alpha and Beta super variable research, suggested that the Alpha Factor (termed Self-Control) may be linked to job performance measures, while the Beta Factor (named Engagement) is more associated with benefitting from life challenges and sensation-seeking. There is little research examining Digman's Beta factor as a predictor of organizational behavior, given previous links in leadership to Extraversion and Openness to Experience (Barrick & Mount, 1991; Salgado 1997).

Further to the idea of super ordinate factors to the Big Five, yet another stream of recent research argues further that one General Factor of Personality (GFP) occupies the apex of the hierarchical structure of personality (Musek, 2007; van der Linden, te Nijenhuis & Bakker, 2010). This is similar to the debate concerning whether intelligence consists of a general factor "g" or is a multi-faceted construct. Similar to researchers (e.g., DeYoung, 2001) who propose a 2-factor higher order structure, many proponents of one general superordinate factor (Rushton et al, 2009; Musek, 2007, Van der Linden et al, 2010) also argue that the presence of intercorrelations between all of the factors, originally considered orthogonal, merited further examination of one single meta-trait. An illustration is depicted in Figure 2. Musek (2007) originally was influenced by the research of DeYoung et al. (2003) that demonstrated that Alpha and Beta higher order factors were positively correlated, and

further reasoned that one factor may be at the apex of the personality taxonomy. In his pivotal study towards one personality factor, Musek (2007) found a general factor of personality using different personality measures using a variety of different factor analytic techniques. Musek (2007) argued that this factor represented an integration of positive aspects of personality facets. Musek (2007) hypothesized that one superordinate factor unified positive aspects of stability (conformity) and plasticity (non-conformity). Through both exploratory and confirmatory factor analyses, Musek (2007) demonstrated within 3 samples the presence of a GFP, explaining 60% of the source variance. He further proposed that the one superordinate factor may reflect a psycho-biological disposition that affects emotionality, well-being and self-esteem.
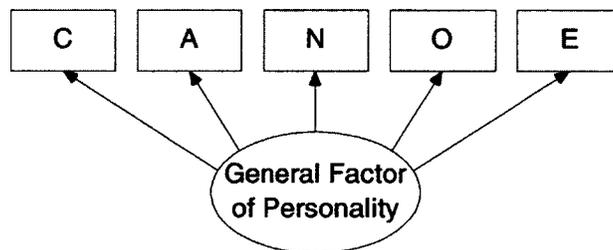
Figure 2. A conceptual model of a one factor solution.

Following Musek's (2007) work, Rushton and Irwing (2008) also demonstrated the presence of a GFP through a re-examination of samples used in research conducted by Digman (1997) and Mount, Barron, Scullen and Rounds (2005). After testing several models, the best fit was one with a single general factor at the apex of a hierarchy. Hull and Beaujean (2011) also conducted a comparison of measurement models that included a five-factor model, two-factor model, and a one-

factor model, and concluded that the data gathered from a sample of Jamaican

adolescents demonstrated the best fit for a single personality superfactor. A criterion-

related study conducted by Van der Linden et al. (2010), including a meta-analysis on

the intercorrelations among Big Five personality factors, further demonstrated a link

between GFP and supervisor-rated job performance from a sample of 144 workers in

various industrial agencies.

Additional support for a GFP in other domains of psychology also exists in

behavioural genetic studies. Veselka, Shermer, Petrides, and Vernon (2009)

examined the role of a GFP in association with mental toughness and trait emotional

intelligence within a monozygotic and same-sex dizygotic twins sample.

Additionally, Rushton, Bons, and Hur (2008) demonstrated that a single factor

explained 37% of the source variance when associated with social responsibility and

self-reported delinquency.

The growing research literature supporting a single factor of personality also

raises the issue of the psychological meaning of this factor. Musek (2007) argued that

the GFP may be a blend of all the positively valued aspects of personality. For

example, in the CF, ideal applicants tend to be high in Conscientiousness,

Agreeableness, Openness to Experience, Extraversion, and Emotional Stability.

Despite the growing volumes of research arguing the presence of such higher

order variables, these theories also have their detractors that provide alternative

explanation to the degree of obliqueness that is observed between factors. For

example, de Vries (2011) reanalyzed Van der Linden et al's (2010) dataset, and

argued that a model with GFP was impossible without setting an error variance to zero, and that a better model fit was identified with a five-factor model. A re-examination of the intercorrelations of personality factors in Hull and Beaujean (2011) and Erdle, Gosling and Potter (2009) show extremely modest associations between factors, thus casting doubt on both the meaningfulness of the published results and the substantive nature of the GFP. Two competing theories explaining the presence of higher-order factors may shed light on the phenomenon of intercorrelations. Biesanz and West (2004) conducted a multi-trait multi-method study to examine the convergent and divergent validity of Big Five factors. Their results demonstrated that there was no evidence of intercorrelation across the different types of informants (self, peer, and parent), suggesting that the degree of orthogonality relies on the source of data. The Halo-Alpha Beta (HAB) model (Anusic, Schimmack, Pinkus, & Lockwood, 2009) is an extended argument in favour of bias built into questionnaires. The authors used Thorndike's (1920) general evaluative bias model and Digman's original 1997 data to identify the presence of the consistent correlations that make up Alpha and Beta.

The alternative explanation provided by Ashton, Lee, Goldberg, and de Vries (2009) asserted that the presence of blended variables in different personality inventories explained the correlations between factors observed in previous literature. This explanation examined personality inventories at the facet level. Ashton et al, (2009) compared the higher order model of three samples with a blended variable model, and subsequently demonstrated a better fit with the latter model. Given the

differing interpretations of the correlated factor, the presence of a latent factor

requires further research.

The Big Five as Aggregate Constructs

In contrast to the five-factors as superordinate variables, an *aggregate*

construct represents a variable where the relationship flows from the dimensions to

the construct, thus combining specific dimensions into a general concept (Edwards,

2001). This is analogous to formative indicators in scale construction

(Diamantopoulos & Siguaw, 2006) and represents the sum of the shared and unique

variance in their indicators. Thus, as opposed to superordinate constructs, high

intercorrelations between the indicators are not necessary (Edwards, 2001). The

integrity research conducted by Ones (1993) suggesting a compound trait that

includes Conscientiousness, Agreeableness, and Emotional Stability would represent

an aggregate construct under this analytical framework.

This integrity research primarily led by Ones examined the possibility of a

composite variable of Conscientiousness, Agreeableness, and Emotional Stability as a

predictor of Integrity. The concept of shared underlying personality constructs

between different integrity tests was observed in various studies (Hogan &

Brinkmeyer, 1997; Wanek, Sackett, and Ones, 2003). Wanek et al. (2003) conducted

an item-level analysis with seven commonly used integrity instruments, developing

thematic clusters of personality items and then correlated these clusters with the

scores on the seven integrity tests, followed by examining the factor structure for

higher-order dimensionality. The study confirmed that strong relationships exist

between integrity and Conscientiousness, Emotional Stability and Agreeableness.

Linking integrity to the big five personality variables, Ones (1993) also found the

highest correlations with Conscientiousness, Agreeableness, and Emotional Stability,

respectively, suggesting that integrity represents a higher order aggregate factor.

Although it was not hypothesized in Boyes' (2005) research, a modest correlation of

the HEXACO's Honesty-Humility factor was reported with the Conscientiousness,

Emotional Stability, and Agreeableness factors of the TSD, supporting the

personality-driven representation of Integrity. Overall, in examining integrity

research, there appears to be convergence of empirical findings that integrity tests

have a common personality core that seems to be modeled after the Alpha factor

found within the Five Factor Model framework (Digman, 1997; Olsen, 2005; Ones,

1993; Wanek, 1997). This finding deserves further investigation.

The presence of a GFP as an aggregate variable is limited in the literature,

given that most of the focus for its development was based on intercorrelations

between personality factors. However, the study by van der Linden, te Nijenhuis,

Cremers, & van de Ven (2011) involving 6 datasets from the Netherlands armed

forces explored the idea of using an aggregate value to predict various organizational

outcomes. Using six personality questionnaires, GFP scores were computed from

two personality inventories by creating composites from the z-scores; the values of

the underlying factors were highly correlated with each other, suggesting that they

were measuring the same construct. Moreover, the GFP was related to military

training attrition, suggesting predictive capability as a compound aggregate of

organizational outcomes.

Defining the Theoretical Construct Definitions.

As outlined in the previous paragraphs, independent lines of research have

connected Conscientiousness, Emotional Stability and Agreeableness, whether as a

superordinate variable of Stability or as an aggregate (compound trait) of Integrity.

However, as stated in Johnson, Rosen and Chang (2011), the nature of the relations

between the higher order factor and the lower level indicators must be established and

firmly rooted in sound theory. The research in the construct of integrity uses a

criterion-focused approach where items of a given instrument are retained on the

basis of predictive relationships with the criterion, for the purposes of higher

criterion-related validity than the basic indicator traits. By contrast, the Stability,

Plasticity, and GFP research predominantly assesses the fit of various first order and

second order CFA models as evidence of a substantive factor. With respect to a

composite of Extraversion and Openness to Experience, there is a possibility that

engagement may represent a combination of these two factors.

Similarly, the GFP may be a composite variable. Little research has examined

the creation of a composite variable specifically with all of the five factors (van der

Linden, te Nijenhuis, Cremers, & van de Ven, 2011); however the model's potential

for a substantive aggregate should be explored and subsequently assessed in the

context of previous GPF literature.

The presence of superordinate factors does not contradict a five-factor model. Digman (1997) asserted that the demonstration of two higher order factors challenges the view that the Big Five represent the basic level of personality taxonomy, but this does not invalidate the Big Five as distinct sources of trait variation. Specific behaviours seem more likely to be predicted by specific traits, whereas linear combinations of the Big Five may prove useful in the prediction of lifestyles and longer-term outcomes (Blackburn, Logan, Stanley, Renwick, & Donnelly, 2004). Thus, in an organizational setting, such composite variables may be useful in predicting long-term retention, organizational citizenship behaviours, or career progression.

Current Study

The current study presents a dual purpose both in validation and investigation with respect to the five-factor taxonomy of personality. Given that the TSD will be used as part of the assessment tools for selection of CF members, both the establishment of construct validity and preliminary examination of the factors as possible multidimensional constructs would further add to the utility of this instrument for future use in the CF.

The validation aspect focused on the employment of multiple analyses in assessing the construct validity of the TSD, as outlined in the hypotheses below. Firstly, the factor structure of the TSD will be assessed using CFA to test that the TSD conforms to the five-factor model.

H1: The Factors as measured by the TSD will conform to a five-factor

solution.

The TSD will also be compared to a commercial personality questionnaire, the

Hogan Personality Inventory (HPI; Hogan & Hogan, 1995), as noted in H2 below.

Table 1 illustrates the links between the HPI scales and the five-factor model.

Table 1

Linking the HPI to the Five Factor Model

Hogan Personality Inventory Scale	Associated Personality Factor
Prudence	Conscientiousness
Likeability	Agreeableness
Adjustment	Emotional Stability
Sociability	Extraversion
Ambition	Extraversion
Intellectance	Openness to Experience
School Success	Openness to Experience

It is expected that there will be a higher correlations between respective factors

(convergent validity) than correlations among the non-respective factors (divergent

validity).

H2: The five factors of the TSD will demonstrate higher correlations between

the respective HPI dimensions than with the non-respective HPI scales.

The investigative element of the current study examines the taxonomy of the

five-factor model as measured by the TSD. Given these unanswered questions and

remaining areas of ambiguity, further investigation is required to reconcile conflicting

lines of research prior to justifying further empirical study on higher-order personality

factors.

This study addresses the following research question:

Research Question 1: *What is the nature of the higher order factors that exist within the Big Five as measured by the TSD?*

The response to this research question reflects the types of multidimensional constructs that have been demonstrated in the aforementioned literature on higher order constructs. Table 1 illustrates an overview of the analyses conducted. If the data conformed to two superordinate variables as described by Digman (1997), then Conscientiousness, Emotional Stability, and Agreeableness should be intercorrelated and an Alpha factor should emerge as a latent construct. Within the same outcome, Extraversion and Openness to Experience should correlate, and confirm the existence of the Beta Factor. These possible outcomes are represented by outcome A in Table 1. Outcome B would result if the data fit a one-factor solution, thus establishing a GFP. Outcomes C and D were related to the aggregate variable solutions. Based on the Ones' (1993) and Waneck et al's (2003) research concerning integrity as a composite personality variable, the examination of the Alpha* factor as a potential predictor of Integrity and the Beta* factor to Engagement would be supported by strong correlations linking the composites to the criterion variables. In addition, a GFP* aggregate model should be related to psychological well-being as positive organizational outcomes (outcome D).

Table 2

Higher Order Factor Research Question Overview

Outcome	Details	Label	Method	Criterion variable
A	2 superordinate factors	Alpha	CFA	N/A
		Beta	CFA	N/A
B	1 superordinate factor	GFP	CFA	N/A
C	2 aggregate factors	Alpha*	Correlation of Composite	Reliability
		Beta*		Engagement
D	1 aggregate factor	GFP*	Correlation of Composite	GPA Psychological Well-Being

Note. The summary of tests assessing the level of multidimensionality of the five

factors and possible outcomes.

Method

Participants

A total of 246 students registered for the study through the Saint Mary's

University experiment management system (SONA) system. However, data for 46

students could not be used due to their failure to complete more than 50% of total

questionnaire items, and their data were subsequently excluded from the analysis.

The final sample size used in the analysis was 200.

The final sample consisted of 109 women (61.5%) and 68 men (38.5%).

Seventy-six percent of the participants were within the age of 17-22; 23–29 at 14.5%;

and 30–39 at 4.3%; and 40 plus at 5.2%. Ninety-five percent of the sample attended

on a full-time basis, while five percent were part-time students. The participants' year

of study was as follows: 21.2% in first year; 26.6% in second year; 20.3% in third

year; 22.6% in fourth year; and 9.0% in other.

Procedure

Students signed up for one of four data collection sessions from January 2009

until January 2010. For each administration, students were instructed to navigate to a

Survey Monkey link that contained four of the five measures. Upon completion of

the questionnaires on the Survey Monkey link, the participants were then directed to

the Hogan Personality Inventory website to complete the final questionnaire. A

general consent form served as the first page of the questionnaire. Prior to completing

the questionnaires, participants were provided with the information/consent sheet,

which indicated that participation was voluntary. Completion of the survey was taken

as an indication of their consent. Participants were free to withdraw participation at

any time while filling out the questionnaire. Participants received bonus points

applied to coursework for their involvement in the study, whether or not they

completed the study.

Measures

The complete scales used in the study are provided in the Appendices, with

the exception of the HPI and TSD due to copyright protection.

Personality. Two personality inventories were used in the study: the Trait

Self-Descriptive Personality inventory (TSD) and the Hogan Personality Inventory

(HPI). The TSD PI is a 75-item questionnaire, comprising both adjectives and

statements related to personality factors based on the five-factor model. The

respondent uses a 7-point Likert type scale to respond to each item (i.e. 1 =

"extremely uncharacteristic of me" to 7 = "extremely characteristic of me". The

original full version of the TSD originally was developed by Christal (1988), but it

was abbreviated to its current form for use in the CF (Darr & Kemp, 2009).

Cronbach's alpha coefficients, measures of internal reliability, were acceptable for

each subscale: Neuroticism, $\alpha = .90$; Extraversion; $\alpha = .82$; Openness to experience,

$\alpha = .86$; Agreeableness, $\alpha = .91$; and Conscientiousness, $\alpha = .81$.

The Hogan Personality Inventory (HPI- R. Hogan & Hogan, 1995) is a 206

item inventory based on the five factor model, and assesses personality dimensions

through seven primary scales (as outlined in Table 2): Prudence; Likeability;

Adjustment; Sociability; Ambition; Intellectance; and School Success. The HPI was

developed specifically to predict real-world outcomes such as job performance and

assesses the Five Factor Model in occupational life within a normal population. The

respondent is required to answer each question as either true or false. Each scale

consists of five to seven conceptual subthemes referred to as Homologous Item

Composites (HIC; Zonderman, 1980). The concept of HIC is similar to subordinate

facets that make up a given factor. The internal consistency of the scales ranges from

.71 (Likeability) to .89 (Adjustment; Hogan manual, 1996). Cronbach's alpha was not

computed due to the unavailability of individual scores for this sample due to the test

publisher's restrictions.

Reliability. The Reliability scale is generated from the HPI as one of six

occupational scales designed to assess broad dimensions of organizational

effectiveness and employment success in specific jobs. The scale consists of 18 items

that come from four HIC originating from Adjustment, Likeability, and Prudence

scales. Sample items include "I rarely do things on impulse" and "When I was in

school, I rarely gave the teachers any trouble". The test publisher reports the internal

consistency reliability for this scale is .75 and the test-retest reliability over a four-

week period is .83 (Hogan & Hogan, 1995). The Reliability scale scores were

calculated by the test publisher.

Engagement. Schaufeli et al's (2002) 17-item student version scale was used

to assess degree of engagement (α = .88). Students were asked to rate their level of

agreement on 17 statements related to their studies on a 5-point Likert-type scale.

Sample items include: "To me, my studies are challenging" and "Time flies when I

am studying". This is a multidimensional scale that measures Vigour (α = .83),

Dedication (α = .86), and Absorption (α = .87). Higher scores on the scale reflect

higher levels of engagement as measured by the respective dimensions. The

subscales were combined for an overall mean Engagement score.

Psychological Well-Being. For the purposes of the measurement of

psychological Well-Being, the abbreviated version of the General Health

Questionnaire (GHQ-12, Golderberg & Williams, 1988) was used. This measure asks

whether participants have recently experienced events such as "loss of sleep due to

worry" or "the ability to concentrate on whatever they are doing". Ratings on some

items were recoded so that high scores indicated more positive psychological well-

being, and the mean rating across all twelve items was used as the overall scale score

($\alpha = .78$). Responses were rated on a 4-point scale ranging from not at all (1) to much

more than usual (4). This measure is a reliable and valid measure of psychological

well-being for use in occupational studies (Banks, Clegg, Jackson, Kemp, Stafford, &

Wall, 1980).

Academic Performance. The criterion variable in this study was the student

end-of-term grade point average (GPA). These results were requested from the

Office of the Registrar after being granted permission from the student to obtain this

data.

Results

Prior to the assessment of the research questions and hypotheses, the data

were examined for outliers, data entry errors, non-random missing data, and

violations of assumptions including non-linearity, non-normality, multicollinearity,

and heteroskedasticity. Frequencies and descriptive statistics were run using SPSS

16.0 for Windows. No outliers or any other serious violations of assumptions were

identified. Missing data were treated using mean substitution at the item level.

Construct Validity of TSD

A Confirmatory Factor Analysis (CFA) was conducted using AMOS 16.0 to

determine whether the TSD conformed to a five-factor model. Given that previous

TSD research (O'Keefe, 2003; Boyes, 2005) found 5 factors consistent with the FFM,

the analysis was conducted to confirm the construct validity. Parcels were created

using the NEO-PI facet lexicon to group similar items to reduce the number of

parameters to estimate at the item level. The purpose of this parceling approach is to

produce item parcels with similar contributions (Little, Cunningham, Shahar, &

Widaman, 2002).

When presenting the results of a CFA, Hu and Bentler (1998) recommended

the use of a minimum of two fit indices, of which one should be the standardized root

mean square residual (SRMR) as this index is the most sensitive to misspecification

error. Tabachnick and Fidell (2001) indicated that the comparative fit index (CFI) and

the root mean square error of approximation (RMSEA) are the most commonly

reported fit indices. In terms of cut-off criteria, Hu and Bentler (1998; 1999)

suggested that values *close* to .95 for ML-based CFI, .08 for SRMR, and .06 for

RMSEA are indicative of good model fit.

Examination of the goodness-of-fit indices as illustrated in Table 3 provided

conflicting evidence of model fit to the data. For the five-factor model, the SRMR

and RMSEA suggest marginal fit for the FFM, but the CFI indicates a good fit for the

established theoretical model of personality. As such, the demonstration of fit

provides support for H1.

The factor loadings as outlined in Table 4 also suggest that the parcels

sufficiently reflect the factor consistent with previous personality facet research. As

such, the five-factor model of the TSD was accepted and further analysis involving

the TSD was carried out at the factor level.

Table 3

The Goodness of Fit for Factor Models

Model	χ^2	*df*	SRMR	RMSEA	CFI
Five factor model	231.99	109	0.08	.08	.92
One factor Superordinate (outcome B)	31.35	5	0.06	0.16	0.56
Two factor model (outcome A)	Not conducted				

Note. SRMR - Standardized Root Mean Square residual, RMSEA - Root Mean

Square Error of Approximation, CFI - Comparative Fit Index.

Table 4

Standardized Factor Loadings for the Confirmatory Factor Model of the TSD by Parcel

Parcel	Factor				
	C	A	N	O	E
Order	.62				
Deliberation	.57				
Competency	.60				
Tender-mindedness		.61			
Altruism		.63			
Compliance		.58			
Anxiety			.66		
Angry-Hostility			.45		
Vulnerability			.70		
Depression			.46		
Reflection				.55	
Aesthetics				.56	
Ideas				.64	
Gregariousness					.65
Excitement Seeking					.67
Positive					.52

Convergent and Divergent Validity of the TSD Five Factors

An overview of all of the zero-order correlations conducted for the study is

summarized in Table 6. The construct validity of the TSD was examined in terms of

the correlations with their respective factor or factors on the HPI. Each of the five

factors represented in the TSD was expected to highly correlate with its associated

dimension on the HPI as per Table 2. Table 5 shows that the factors were moderately

correlated with their corresponding factor. Conscientiousness and the associated

Prudence scale demonstrated a moderate positive correlation at $r = .25, p < .01$.

Adjustment was moderately correlated with Emotional Stability at $r = .55, p < .01$.

Sociability and Ambition, each derived from Surgency, were moderately positively

correlated with Extraversion at $r = .53$ and $r = .50$, respectively $(p < .01)$. Likeability

is positively correlated with Agreeableness at $r = .49, p < .01$. With respect to the

TSD Openness factor, only the Intellectance scale demonstrated a correlation at $r =$

$.45, p < .01$.

Table 5

Correlations between Equivalent Factors of the HPI and TSD

Hogan Personality Inventory Scale	Associated Personality Factor	Correlation
Prudence	Conscientiousness	$.25, p < .01$
Likeability	Agreeableness	$.49, p < .01$
Adjustment	Emotional Stability	$.55, p < .01$
Sociability	Extraversion	$.53, p < .01$
Ambition	Extraversion	$.50, p < .01$
Intellectance	Openness to Experience	$.45, p < .01$
School Success	Openness to Experience	$.14, ns$

Non-respective TSD and HPI factors were also correlated, thus raising

question about discriminant validity. Emotional Stability was associated not only with

Adjustment, but also with the scales representing Openness (Intellectance at $r = .21$

and School Success at $r = .22, p < .05$) and Extraversion (Sociability at $r = .28$ and

Ambition at $r = .50, p < .01$). Extraversion was associated with Prudence ($r = -.16, p$

$< .05$) and Likeability ($r = .30, p < .01$).

The correlation values were also examined to determine whether there was a

higher degree convergent validity than divergent validity between the TSD and HPI

scales. Given that the HPI standard error values were unavailable, the comparison

could not be derived quantitatively. However, upon researcher examination of the

values, the pattern of the correlations overall demonstrated that convergent validity

was higher than the values observed for divergent validity. An exception was noted

with Ambition, where equally high correlations were observed between Extraversion

and Emotional Stability ($r = .50$ and $r = .48$, respectively).

As part of the examination of the TSD's level of criterion-related validity,

bivariate correlations were examined between the personality factors and the criterion

variables. An examination of zero-order correlations from Table 6 between the

criterion variables and personality factors illustrated mixed results. Engagement was

positively associated with TSD Openness ($r = .32, p < .01$), Agreeableness ($r = .23, p$

$< .01$), and Conscientiousness ($r = .38, p < .01$).

Table 6

Intercorrelations among Personality and Criterion Variables

	1	2	3	4	5	7	8	9	10	11	12	13	14	15	15a	15b	15c	16	17
1. TSD_ES	-																		
2. TSD_E	.32*	-																	
3. TSD_O	-.12	-.11	-																
4. TSD_A	.04	.18	.23	-															
5. TSD_C	.04	.08	-.01	.41*	-														
7. HPI_ADJ	.55*	.15	.06	.23	.13	-													
8. HPI_AMB	.48*	.50	.05	.08	.21	.41*	-												
9. HPI_SOC	.28	.53	.02	.13	-.03	.09	.40	-											
10. HPI_LIK	.21	.31	-.03	.48*	.12	.38*	.25	.37	-										
11. HPI_PRU	.06	-.16	-.10	.06	.25	.26	.07	-.28	.11	-									
12. HPI_INT	.21	.06	.45	.10	-.08	.04	.22	.34	.04	-.16	-								
13. HPI_SS	.22	.05	.13	-.03	.12	.15	.31	.03	-.09	.09	.17	-							
14. HPI_REL	.09	-.11	-.08	.05	.08	.44*	.01	-.31	.10	.60	-.32	.03	-						
15. ENGAGE	-.05	.02	.32*	.23	.38*	.18	.16	-.04	.05	.24	.06	.13	.11	-					
15a. VIGOR	.21	.10	.31*	.15	.37*	.24	.28	.00	.03	.31*	.10	.15	-.11	.91*	-				
15b. DEDI	-.01	.16	.33*	.01	.34*	.17	.23	.05	.10	.26*	.04	.06	.13	.81*	.67*	-			
15c. ABSORP	.35*	-.06	.23*	.35*	.30*	.08	.15	.02	.00	.21*	.13	.10	.15*	.87*	.48*	.48*	-		
16. GHQ	.62*	.22	.06	.09	.01	.43*	.39*	.17	.27	.11	.18	.16	.14	.17	.26*	.20*	.15*	-	
17. GPA	-.09	.01	.09	.03	.03	-.03	.06	.09	-.11	.01	.03	.21	-.10	.17	.14	.16*	.12	-.02	-
M	3.78	4.26	4.48	5.59	5.13	4.56	4.42	5.67	5.35	2.94	4.59	47.72	27.10	3.23	3.22	3.70	2.87	2.67	2.94
SD	1.13	.60	0.91	.70	.88	1.00	1.18	.69	.74	1.15	1.08	26.65	22.16	.71	.79	.74	.91	.46	.72

Note: Items in Bold indicate significant associations to p < .05, and items in bold with an asterisk represent signification associations to $p < .01$.

The terms VIGOR, DEDI, and ABSORP represent subscales of engagement referred to as Vigor, Dedication, and Absorption, respectively.

The Reliability Scale, derived from a composite of the Adjustment,

Likeability, and Prudence scales, correlated with these ($r = .46, .15,$ and $.60$

respectively). However, no significant correlation was identified between Reliability

and the TSD factors. GPA was not associated with any of the TSD personality

variables; however, it was positively associated with the School Success Scale ($r =$

$.21; p < .01$), as well as Engagement ($r = .17, p < .05$).

Presence of Higher Order Factors

As Superordinate Factors. Further analyses were carried out to determine

the presence of higher order factors. The basis of superordinate factors rested on the

argument that intercorrelations exist between factors that comprise the Alpha

(correlations between Conscientiousness, Agreeableness, and Emotional Stability)

and Beta (correlations between Extraversion and Openness to experience)

superordinate factors. The TSD Extraversion and Emotional Stability scales were

positively associated at $r = .32, p < .01$. TSD Agreeableness exhibited multiple inter-

scale correlations with Conscientiousness ($r = .42, p < .01$), Openness ($r = .23, p <$

$.01$), and Extraversion ($r = .18, p < .05$).

Based on the lack of expected correlations between requisite indicator factors

for Alpha and Beta, a CFA for a two-factor model representing these superordinate

factors was not conducted, as illustrated in Table 5. As such, there is no evidence of a

two-factor superordinate model.

Due to some intercorrelations observed between the personality factors, the

one factor model was tested (see Table 3 for fit indices). The results are subsequently

shown to be an extremely poor fit for all of the fit indices (RMSEA = .16; CFI = .56).

As such, the data did not show a GFP as a latent trait.

As Aggregate Factors. In the investigation of aggregate factors, the bivariate

correlations between the criterion variables and composite aggregates were observed,

as illustrated in Table 7. The composites were created by combining scale scores for

Alpha* as a mean value of Conscientiousness, Agreeableness, and Emotional

Stability whereas Beta* was created from a linear combination of Extraversion and

Openness to Experience. The GFP* as denoted in Table 7 is an average of all five

scale scores.

Table 7

Intercorrelations between Hypothesized Personality Aggregates and Criterion

Variables

Composite Factor	M	SD	GPA	Engagement	Reliability	Well Being
Alpha*	5.34	.66	.04	**.37***	<u>.13</u>	.13
Beta*	4.37	.66	.07	**.28***	-.14	**.20***
General Personality Factor*	4.86	.50	.07	**.43***	<u>.00</u>	**.22***

Note: Underlined values represent hypothesized associations with the composite

factor.

Items in bold indicate significant associations to $p < .05$, and items in bold and with

an asterisk indicate associations significant at $p < .01$.

Correlations were observed between Psychological Well-Being and Beta* and

GFP* (.20 and .22 respectively). None of the personality measures were associated

with GPA. Moderate to high correlations were observed for Engagement, with the

highest correlation associated with the GFP* at $r = .43$. For Reliability as the

criterion variable, the only significant correlation was with the Beta* factor $(r = -.14)$.

With the correlations observed, some mixed evidence is demonstrated for the

presence of a GFP* and the Beta* factor. Given the absence of significant correlation

with Reliability, there was no evidence of an Alpha* aggregate factor.

Discussion

The purpose of the research was twofold. Given that the TSD will be used for

selection in the CF, the first consideration was to confirm its construct validity and its

adherence to the five-factor taxonomy. Previous TSD research has supported a five-

factor solution (Boyes, 2006), and the current research further supports those

findings. The second goal of the research was to investigate the presence of higher

order factors in the hierarchy of the five-factor model. There is considerable appeal

in the concept of higher order factors or multi-dimensional constructs for reasons of

bandwidth-fidelity tradeoff and parsimony (Ones & Viswesvaran, 1991). Thus, in an

organizational setting, if the final desired end-state is to predict broadly defined work

attitudes and behaviours, then higher order constructs as operationalized by one

instrument would demonstrate higher utility (Johnson, Rosen, & Chang, 2011).

Construct Validity of TSD at the Five-Factor Level.

The results overall are fairly consistent with previous TSD literature (Boyes,

2006; Darr, 2009) in confirming that the TSD conforms to the five factor model. One

difference with previous research is that the current study used a student, rather than

military, sample. Based on conformity of the five-factor model, this construct validity

replication in a civilian population somewhat extends the generalizability of the TSD

beyond military recruits and suggests it is a viable five-factor model of personality to

use with civilians not yet accepted into the CF. The CFA demonstrated a relatively

strong five-factor model with consistently high loadings clearly affiliated to each of

the hypothesized components. Concerning the construct validity of the TSD with

relation to a monotrait-monomethod approach in comparison to the HPI, the results

show that most of the HPI scales and TSD measures moderately correlate with its

equivalent scale, with the exception of School Success and Conscientiousness

demonstrating a very low correlation. High correlations between such scales suggest

that results from one construct measure would generalize to another of the same

construct, indicating a degree of convergent validity. However, only the TSD factors

relating to Emotional Stability and Extraversion demonstrated commensurability with

its corresponding scale. The modest correlations observed between scales purported

to represent Conscientiousness, Openness to Experience, and Agreeableness further

suggests limited generalizability. Finally, the low correlations between School

Success and Openness in the factor comparisons between the TSD and HPI further

indicate that both are distinct constructs, thus threatening overall content validity.

An examination of the HICs comprising the HPI scales and the actual TSD

items revealed notable differences in the construct definition between the two

personality inventories. Table 8 summarizes the HICs affiliated with each HPI scale,

and are linked with the relevant TSD scale; this linkage potentially explains the

pattern of correlations between the two personality measures. The Conscientiousness

factor demonstrated the weakest correlation with Prudence. Examining the HICs and cross comparing with the TSD items, Prudence is comprised of 7 HICs: Moralistic; Mastery; Virtuous; Not Autonomous; Not Spontaneous; Impulse Control; and Avoids Trouble. By contrast, the TSD Conscientiousness scale assesses competence, level of orderliness and achievement striving with items such as "organized", "I try to set a schedule for accomplishing tasks and stick to it", and "I always try to do more than what is expected of me". Items such as the latter that assesses achievement striving likely explains the correlation observed with the HPI Ambition Scale, which in turn is a purported derivation of Extraversion.

The two scales of Intellectance and School Success are purported to stem from Openness to Experience. An examination of the constituent HICs reveals that aspects such as Curiosity, Culture, and Intellectual Games assess similar attributes to the TSD Openness Factor. However, School Success is a measure of perceived Math and Reading Ability, as well as whether or not a respondent has a good memory and, as such, is argued not to measure Openness to Experience but rather cognitive ability, thus explaining the lack of correlation observed between the two measures. Other validation research concerning the Big Five personality questionnaires have also reported lower correlations between Openness and School Success (Johnson, 2000).

Table 8 (continued on next page)

HPI/HIC Comparison with TSD (adapted from Hogan & Hogan, 1995, Chapter 2, p. 14)

	HPI Scale and HIC Definition with Sample Item			Theorized Corresponding TSD Scale
Scale	HIC	Definition	Sample Item	
Adjustment	Empathy	Emotional identification with others	**I would rather not criticize people, even when they need it.**	Agreeableness
	Not Anxious	Absence of anxiety	I am seldom anxious or tense.	Emotional stability
	No Guilt	Absence of regret	I rarely feel guilty about some of the things I have done.	Emotional stability
	Calmness	Lack of emotionality	I keep calm in a crisis.	Emotional stability
	Even Tempered	Not moody or irritable	I rarely lose my temper.	Emotional stability
	No Somatic Complaints	Lack of health concerns	I almost always feel good.	GHQ
	Trusting	Not paranoid or suspicious	People really care about one another.	Agreeableness
	Good Attachment	Good relations with one's parents	No matter what happened, I felt my parents loved me.	N/A
Ambition	Competitive	Being competitive, and persistent	I am an ambitious person.	Conscientiousness
	Self Confidence	Confidence in one's self	I am a very self confident person.	Extraversion/ Emotional stability
	No Depression	Feelings of contentment	I am a happy person.	Emotional stability
	Leadership	Capacity for leadership	In a group, I like to take charge of things.	Extraversion/ Conscientiousness
	Identity	Satisfaction with one's life tasks	I know what I want to be.	N/A
	No Social Anxiety	Social self confidence	I don't mind talking in front of a group of people.	Extraversion/ Emotional stability
Sociability	Likes parties	Enjoys parties	I would go to a party every night if I could.	Extraversion
	Likes Crowds	Finds large crowds exciting	Being part of a large crowd is exciting.	Extraversion
	Experience Seeking	Preference for variety and challenges	I like a lot of variety in my life.	Openness to experience
	Exhibitionistic	Exhibitionistic tendencies	I like to be the centre of attention.	Extraversion
	Entertaining	Being witty and entertaining	I am often the life of the party.	Extraversion
Likeability	Easy to Live With	Tolerant and easy going nature	I work well with other people.	Agreeableness/ Extraversion
	Sensitive	Tends to be kind and considerate	I always try to see the other person's point of view.	Agreeableness
	Caring	Interpersonal sensitivity	I am sensitive to other people's moods.	Agreeableness
	Likes People	Enjoys social interaction	I enjoy just being with other people.	Agreeableness/ Extraversion
	No Hostility	Lack of hostility	**I would rather not criticize other people, even when they need it.**	Agreeableness/ Emotional stability
Prudence	Moralistic	Adhering strictly to conventional values	I always practice what I preach.	N/A
	Mastery	Being hard working	I do my job as well as I possibly can.	Conscientiousness
	Virtuous	Being perfectionistic	I strive for perfection in everything I do.	Conscientiousness
	Not Autonomous	Concern about others'	Other people's opinions of	N/A

		opinion on one's self	me are important.	
	Not Spontaneous	Preference for predictability	I always know what I will do tomorrow.	Conscientiousness
	Impulse Control	Lack of impulsivity	I rarely do things on impulse.	N/A
	Avoids Trouble	Professed probity	When I was in school, I rarely gave the teachers any trouble.	N/A
Intellectance	Science	Interest in science	I am interested in science.	Openness to experience
	Curiosity	Curiosity about the world	I have taken things apart just to see how they work.	Openness to experience
	Thrill Seeking	Enjoyment of adventure and excitement	I would like to be a race car driver.	Openness to experience
	Intellectual Games	Enjoys intellectual games	I enjoy solving riddles.	Openness to experience
	Generates Ideas	Ideational Fluency	I am a quick witted person.	Openness to experience
	Culture	Interest in culture	I like classical music.	Openness to experience
School Success	Good memory	Having a good memory	I have a large vocabulary.	N/A
	Education	Being a good student	As a child, school was easy for me.	N/A
	Math Ability	Being good with numbers	I can multiply large numbers quickly.	N/A
	Reading	Enjoys reading	I would rather read than watch TV.	N/A

Correlations between HPI Scales and non-corresponding TSD factors deserve further scrutiny, given that they represent the mono-method, multi-trait divergent validity. In a further examination of the HICs, TSD Emotional Stability correlated with HPI scales of Sociability, Ambition, Likeability, Intellectance, Prudence (negative), and School Success. Each of these HPI scales contains HICs that may be linked to differing facets of Emotional Stability. Ambition contains the No Social Anxiety and No Depression HICs, and the Likeability scale has the No Hostility HIC.

An additional scale showing cross-correlation includes the HPI Adjustment scale and the TSD scale of Agreeableness. The HICs of the Adjustment scale, purported to be a measure of Emotional Stability, include Empathy; Not Anxious; No Guilt; Calmness; Even Tempered; No Somatic Complaints; Trusting; and Good Attachment. Four of the seven HICs are related to Emotional Stability. However, the

inclusion of Empathy with a sample item of "I would rather not criticize people, even

when they need it" and Trusting are argued to map more strongly to the construct

Agreeableness, thus providing a possible explanation of the positive and moderate

correlation with the TSD Agreeableness scale.

Based on the preceding examples, the conceptualization of the constructs

depending on the inventory developer may blur the definition of each construct.

Block (1995) indicated that many Big Five inventories each assess a slightly different

conception of each of the Big Five traits. Such inventory-specific differences in the

conceptions of the Big Five traits can attenuate or augment the strength of

relationships between traits. The HPI's development was based on the Five-Factor

Model, however, the results presented here indicate divergence from the definitions

outlined in other personality inventories. Hogan and Hogan (1996) approached scale

construction from a socio-analytical perspective, and their scale development evolved

from the clustering of HICs from various Factor Analyses, with an occupational

outcome focus. As such, some researchers (Pace & Brannick, 2010; Salgado, 1997)

argue that the HPI would not generalize to other Big-Five inventories. In fact, it has

even been argued that the current HPI version no longer reflects the Five Factor

Model (Salgado, 2003). Given that Boyes (2006) compared the TSD with the

HEXACO and the NEO FFI with positive validation of structure with lends further

credence that the TSD is a closer representation of the Five Factor model. Future

TSD research that includes convergent validation with other personality inventories

should use purer measures of the Big Five such as the NEO PI.

Absence of Superordinate Factors

There was overall lack of support for the hypotheses related to the presence of superordinate factors. In research arguing the presence of higher order factors (DeYoung, 2001; Musek, 2007), the resultant structural models indicate that Alpha/Beta or the GFP taxonomies are superordinate constructs, meaning that causality flows from the higher order constructs to its indicators. The CFA testing for the presence of two superordinate factors was not conducted due to lack of intercorrelation between the factors of Conscientiousness, Emotional stability and Agreeableness as the Alpha Factor, and the Extraversion and Openness to experience as the Beta Factor. The analysis also revealed a poor fit for the one-factor superordinate GFP. As outlined in Johnson, Rosen, and Chang (2011), indicators that contribute to a superordinate construct should share a high degree of overlap and be conceptually interchangeable, resulting in higher internal consistency as the degree of intercorrelations increase, which would ultimately provide statistical support to the presence of superordinate models.

The absence of correlations between purported factors comprising Alpha and Beta introduce further skepticism that superordinate factors are substantive constructs, at least for the TSD. The arguments of artifactual correlation posited by Anusic et al (2009), Ashton et al. (2009), and Biesanz and West (2004) are further supported by the results reported here. Block's (1995) assertion that the Big Five factors' degree of orthogonality is sample dependent contributes to the explanation of variations in the intercorrelations. Block noted based in several studies that the Five

Factors were reasonably orthogonal when a homogeneous sample was used, but when data from a more heterogeneous group was used, the consequent factor structure "lost" its orthogonality. He attributed this phenomenon to the use of psychologically different subject samples.

Overall, these findings support the idea that the previous studies demonstrating superordinate factors may be an artifact, and thus their emergence in previous studies could be explained alternatively by common method variance. The shared systematic error variance among the factors due to the similarity in measurement methods can inflate observed relationships among the variables. The sources of common method variance in previous studies (DeYoung, 2007; Rushton et al, 2011) include use of similar response formats in self-report questionnaires and socially desirable responding (Podsakoff, 2003), which could have led to the erroneous conclusion of indicators for superordinate constructs. Future research should include a re-analysis of the other previous studies data controlling for common method variance, such as use of different response formats or measuring the constructs at different times (Johnson, Rosen & Chang, 2011) or a multi method design similar to Biesanz and West's (2004) in assessing personality with self, parent and peer.

The current analysis failed to show support for superordinate factors overall with respect to the TSD, thus providing evidence that the five factors represent the highest level of theoretical taxonomy. The research on the existence of higher factors has largely made the supposition that Alpha/Beta or GFP are latent traits, with the

justification of their search based on the intercorrelations observed between factors

(DeYoung et al, 2009; Digman, 1997; Musek, 2007; Rushton & Erdle, 2009). Some

correlations between personality factors were observed, however, according to

Johnson, Rosen and Chang, (2011), this is not sufficient grounds to assume a latent

trait, even with the studies demonstrating a fit for a one or two factor solution.

Limited Presence of Aggregate Factors

The hypotheses addressing the presence of aggregate factors primarily stems

from the personality-based integrity research literature, asserting that integrity is

comprised of underlying personality constructs of Conscientiousness, Agreeableness,

and Emotional stability. Unlike the superordinate factors that requires

intercorrelations between the personality constructs (Johnson, Rosen & Chang, 2011),

aggregate constructs differ conceptually where causality flows from the indicators to

the higher order factor. The indicators should be conceptually distinct in order to

include unique contributions to the aggregate construct and, as such, orthogonality

between factors is preferred to minimize redundancy (Diamantopoulos & Siguaw,

2006).

From the correlations of the composite variables, the significance observed

between the criterion variables and the GFP* and the Alpha*/Beta* aggregation

merits further discussion. According to the Hogan and Hogan (1995), the 18-item

scale was developed from the highest correlations to delinquency. However, given

the construct differences previously discussed with the Conscientiousness/Prudence

scales, supported by the low correlation between the different personality scales, it is

quite possible that the Reliability scale is heavily weighted on the Moral and Virtues

HICs not measured in the TSD Conscientiousness Scale. Examining the strength of

correlations between Reliability and its HPI constituents, Prudence is the highest

loading factor, followed by Adjustment and Likeability. Negative correlations were

observed with Sociability and Intellectance, suggesting there is an antagonistic effect.

There is empirical support to the idea that Alpha* and Beta* counterbalance each

other at a behavioural level (DeYoung et al, 2007), but also at a biological level, and

further research should examine this possibility.

Explanations for the lack of correlation between any of the aggregate factors

to GPA may be due to the level of measurement. Similar to Chamarro-Premuzic and

Furnham (2003), there may need to be further distinction between what would lead to

higher GPA for students. Given that students of any faculty such as social science or

engineering may take the psychology courses leading to the involvement of the study,

markers for high GPA may differ within the sample. It may be that GPA is too

general as a criterion.

Concerning the association with Beta aggregate purporting to represent

Engagement, it is interesting that Engagement was associated with all of the

composite variables that were created. However, given previous research and current

observations linking the criterion variables to the one or more of the constituent

personality factors, this may explain an attenuated association.

The analysis involving the creation of equal-weighted composites of the

Alpha, Beta, and GFP with a subsequent bivariate correlation with criterion variables

was conducted to assess the level of association between the aggregates and predictor

variables. The moderate correlations with Engagement and Psychological Well-

Being with the composites is likely attributable to correlations observed by the

constituent factors. The most interesting finding was the absence of correlation

between Alpha and Reliability, given that the Reliability scale itself is a composite of

Adjustment, Likeability, and Prudence (Hogan & Hogan, 1995). In other words, the

Reliability scale also had the same composition as the constructed TSD Alpha

aggregate. This adds further doubt to the substantive nature of higher order factors.

Due to the limitations of the use of data, it is not possible to examine the weightings

of the scale composition. Specifically, Engagement, especially in an academic

setting, has been linked to Conscientiousness (Schaufeli et al, 2002) which may

contribute to the correlation observed with Alpha* and GFP*. Therefore, the

significant correlations observed that provide support to the hypotheses are

considered unsubstantive.

The decision to assess presence of aggregate factors by correlating composites

with empirically supported organizational outcomes has been used as a methodology

in the literature (van der Linden, te Nijenhuis & Bakker, 2010; van der Linden, te

Nijenhuis, Cremers, & van de Ven, 2011). However, according to Diamantopoulos

and Siguaw (2006), the most appropriate analysis to test for evidence of aggregate

constructs is using a MIMIC model and/or structural linkage with the criterion

variables of interest. Johnson, Rosen, and Chang (2011) further recommend

additional tests such as a usefulness analysis and to calculate an adequacy coefficient

to determine the proportion of variance extracted from the aggregate construct in question. Exploratory attempts to conduct an SEM in this current study were concluded to be premature, given that despite the general acceptance that integrity represents an aggregate of Conscientiousness, Agreeableness, and Emotional Stability, it is possible that there are other inclusion criteria that should be considered as part of the aggregate that may lead to better fit. The composite created from the TSD Alpha* factors did not correlate with the Reliability scale, suggesting that would have been a poor fit to a model. More specifically, further research and theoretical debate is required to determine what these aggregate constructs represent. There are admitted challenges to furthering such theory. Because indicators of aggregate constructs are ideally heterogenous, the factor loadings and by extension, the meaning of the overall construct, are not easily interpreted (Edwards, 2011). The variation of the definition and operationalization of integrity (Catano & Prosser, 2006) provides evidence of the challenge of interpretability. This idea is supported by Berry, Sackett and Wiemann (2007), as they argue that these three personality variables do not account for all of the variance in integrity. Marcus, Lee and Ashton argue that integrity may reflect Honesty-Humility, a sixth dimension in the HEXACO, is not adequately captured by the Five Factor Model. Similar to the superordinate factor research, further empirical analysis should focus on establishing the theoretical underpinnings of such aggregation prior to a re-analysis of Alpha/Beta or GFP as aggregate variables.

General Discussion

The observed correlations did not follow the expected pattern shown previous research concerning higher order factors (Digman, 1997; DeYoung et al, 2002; DeYoung et al, 2008; Hirsh et al, 2007); however, other streams of research have theorized different superfactors. Clark and Watson (1999) have asserted that the construct of Disinhibition versus Constraint is a complex combination of Agreeableness and Conscientiousness. Eysenck (1992, 1994) has argued that Agreeableness and Conscientiousness are facets of the broader construct of Psychoticism. An examination of the Psychoticism scale in the EPQ (Eysenck, Eysenck, & Barrett, 1985) shows a collection of items that are argued to be facets of conscientiousness and agreeableness, such as "Do you enjoy cooperating with others?", "Does it worry you if you know there are mistakes in your work?", and Do you try not to be rude to other people?". Eysenck's PEN Theory is also biologically based, and shows some overlap with DeYoung's findings. According to Eysenck (1994), Extraversion is based on cortical arousal, and can be measured by physiological responses such as sweating, or measuring brain waves. Dopamine responsivity, which makes people highly sensitive to reward, may be the factor responsible for both positive affect and social interest. However, Psychoticism appeared to be based on testosterone levels. More research into understanding the intricate neurotransmitter pathways and its effect on personality is warranted.

Concerning the correlation between Emotional Stability and Extraversion, there is no research that has linked both as a meta-trait. Even Eysenck's PEN theory

(1985) asserts that both Extraversion and Neuroticism (reverse of Emotional Stability) are considered distinct constructs. However, there are volumes of research that have noted that Extraversion and Neuroticism often covary together (Steel, Schmidt, & Shultz, 2008; Vitterso, 2001).

Taking together all of the findings in this research, it is clearly apparent that generalizing across different personality instruments must be done with extreme caution. There are many five-factor model personality inventories available to researchers, both commercially and academically. However, convergent validity does not always exist between instruments. Block (1995) asserted that there are two phenomena that explain the results above. The "jangle fallacy", referring to constructs in psychology that carries different labels, and the "jingle fallacy" two distinct constructs that have the same name cause additional confusion and "waste scientific time". These assertions are further supported by Pace and Brannick (2010), who demonstrated that personality scales with the same construct name were often only moderately correlated. Other constructs used within this study that falls under the same issue are Engagement and Integrity. Concerning Engagement, in industrial psychology circles, this construct is the reverse of burnout (Schaufeli et al, 2002) and the original scale was derived for use in occupational settings, and a students' version evolved based on this research. However, in educational psychology, the term Engagement has a slightly different meaning. Bauer and Liang (2003) define student engagement as the quality of effort put forth in academic activities. Lack of a clear and universal definition of Engagement further contributes to confusion and error.

With respect to Integrity, Catano and Prosser (2006) outlined in their literature review

an overview of the different instruments used in assessing integrity. There are even

two broad categories of tests, overt and covert (personality-based), thus implicating

further divergence of equivalence in the definition of Integrity. If the theoretical

understanding of constructs as measured across studies does not have the same

empirical meaning, then there will be lack of empirical meaning of the relations

between variables.

The differences observed between the HPI and TSD support the consistent

assertion that results are dependent on the questionnaire used in a given study (de

Vries, 2011; Block, 1995). More specifically, differences in the lower order structure

would in turn contribute to the mixed results found across empirical studies of higher

order structure (Block, 1995; Ashton, Lee, Goldberg, & de Vries, 2009). Digman's

(1997) pivotal work in defining meta traits has led to a substantial volume of

research, but even its proponents have conceded inconsistencies in the findings

(Musek, 2007; DeYoung et al, 2006; DeYoung et al, 2007). Such conclusions mean

that extreme caution must be taken in generalizing one set of results to other

personality inventories.

Overall, the practical implications of the TSD in an applied setting are mixed.

The continued integrity of the five-factor structure through a factor analysis

demonstrates its utility in measuring the personality factors. There is less confidence

to proceed with the theory of the presence of meta-traits based on these results.

Nevertheless, there is merit in continuing to examine the five-factor taxonomy. Block

(1995) in his contrarian view towards the five factor model raises very relevant issues

concerning the differences in the big five definition across personality measures;

these criticisms include the lack of theoretical underpinning for five factors, and a

lack of critical examination of how inventories are constructed and theory is evolved

from subjective analysis (Tabachnick & Fiddell, 2007).

Limitations

Given that the personality instruments used were not theoretically equivalent,

the unexpected pattern of correlations prevented some of the analyses that were

proposed. In addition, the Reliability measure was not optimal, given that it is a

composite of the HPI factors. Future studies should include more established

Integrity measures. Further adding to the lack of external validity is the presence of

common method variance. All of the questionnaires were self-report through an

electronic medium provided to the participant in one session. The only variable that

was not self-report was academic performance, which was not correlated with any

other variable, suggesting influence of method artifacts or bias on the observed

correlations. In order to truly gauge the structural taxonomy of the five-factor model,

a multitrait-multimethod approach would be preferable (Campbell & Fiske, 1959;

Anusic et al, 2009).

The use of university undergraduate students that self-selected their

participation in the study is another limitation in the study that narrows the scope of

external generalizability of the results. Despite earlier assertions that the five-factor

model fit achieved by this sample suggests generalizability to a military applicant

population, differences are conceded with the demographics of the sample

demonstrating a much higher female component compared to a predominantly larger

male military applicant population that would normally be administered the TSD.

These differences suggest that students are not the most appropriate sample to make

inferences and recommendations to the CF based on the results obtained from the

study. If a replication of this study occurs in the future, researchers should obtain a

military sample.

Future Research Directions

The appeal of Digman's (1997) original work lies in the attempt to find a

unifying theory of personality through the identification of higher order traits. He

asserted that the elements of alpha and beta created links to the classical models of

personality. Given the more recent study of personality at the neurobiological and

genetic level, researchers are discovering further pieces to the personality puzzle. As

such, future research should focus on linking neurobiological and genetic personality

studies to current cognitive and personality-based research. Only through

multidisciplinary study will meaningful findings converge to forward the science of

personality.

With the recent implementation of the TSD within the CF for recruiting and

selection purposes, research efforts should also use CF members as a sample to

examine additional organizational outcomes. Although Boyes (2006) investigated the

personality-performance link with CF recruits, other criterion variables such as

psychological well-being or attrition should be pursued. The lack of an assessment

for integrity in the CF selection system adds further advocacy to continue examining

the TSD for potential higher-order factors that may serve as measurement for

integrity. However, as previously stated, the theoretical aspects must be soundly

established prior to further research.

Conclusion

The aim of this research was to examine further the potential of higher order

personality factors as predictors of job performance. However, based on the reported

here, the search for a substantive multidimensional construct appears to be premature.

Despite the appeal of developing a parsimonious personality measure for the CF,

current factor level analysis is sufficient in assessing personnel for organizational

outcomes.

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Appendix A

INFORMED CONSENT FORM

The purpose of an informed consent is to ensure that you understand the purpose of the study and the nature of your involvement. The informed consent is to provide sufficient information such that you have the opportunity to determine whether you wish to participate in the study.

Study Title: Integrity and Engagement as Meta Traits of the Big Five Personality Factors

Study Personnel: Soo Sutherland (Principal Investigator, Phone: (705) 252-7806)
Dr. Victor Catano (Faculty Investigator, Phone: (902) 420-5845)

Purpose and Task Requirements: The purpose of this study is to assess how your personality impacts on your well-being, level of school engagement, and grade point average (GPA). We are asking you to fill out a number of questionnaires that will take approximately 50 minutes to complete regarding your personality characteristics (such as how you would describe what you are like), your level of involvement at school, and well-being. In addition, we will ask you for permission to access your GPA. Only the principal investigator will have access to this information. Once the information is obtained and combined with the other information, personal identifiers (your student number) will be stripped from the final dataset. The information following the study will be kept confidential. You will be given 2 experimental credits for participating in this study, regardless of how much of the content is completed.

Potential Risk and Discomfort: There are no physical risks in this study. There may be some discomfort when thinking about your health or in agreement to disclose your course grades. This information will be used strictly for research purposes, and any identifying information such as your student number will be removed and destroyed once the files containing the personality scores are merged with the GPA scores.

Specific Note on accessing GPA: As noted above, there will be a question asking for your permission to access your transcript marks from the Registrar. Please note that you have the option, as with any part of this study, to omit this information, and still complete the remainder of the study without penalty.

Anonymity/Confidentiality: The data collected in this study will be kept confidential. The questionnaire will be associated with a code, and only this code will identify your questionnaire.

Right to Withdraw: Your participation in this study is entirely voluntary. At any point during the study, you have the right to not complete certain questions or to withdraw with no penalty whatsoever.

This research has been reviewed and approved by the Saint Mary's University Research Ethics Board. If you have any questions or concerns about the study, you may contact Dr. Jim Cameron at ethics@smu.ca, Chair, Research Ethics Board.

I have read the above description of the study concerning integrity and engagement as meta-traits of the five factor personality model. The data collected will be used in research publications and/or for teaching purposes. I understand that I may participate in the study without By clicking "Yes", this indicates that I agree to participate in the study, and this in no way constitutes a waiver of my rights.
*

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