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

By Soo M. Sutherland

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Approved: Victor M. Catano, Ph.D.
Supervisor

Approved: Arla L. Day, Ph.D.
Committee Member

Approved: Lucie Kocum, Ph.D.
Committee Member

Approved: Stephen Perrott, Ph.D.
External Examiner

Date: July 25, 2012
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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.
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; Tuples & 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, Chamorro-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
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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 superordinate 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, merits 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.

![General Factor of Personality](image)

*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

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<tr>
<th>Hogan Personality Inventory Scale</th>
<th>Associated Personality Factor</th>
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<tr>
<td>Prudence</td>
<td>Conscientiousness</td>
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<td>Likeability</td>
<td>Agreeableness</td>
</tr>
<tr>
<td>Adjustment</td>
<td>Emotional Stability</td>
</tr>
<tr>
<td>Sociability</td>
<td>Extraversion</td>
</tr>
<tr>
<td>Ambition</td>
<td>Extraversion</td>
</tr>
<tr>
<td>Intellectance</td>
<td>Openness to Experience</td>
</tr>
<tr>
<td>School Success</td>
<td>Openness to Experience</td>
</tr>
</tbody>
</table>

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**

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

**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, α = .90; Extraversion; α = .82; Openness to experience, α = .86; Agreeableness, α = .91; and Conscientiousness, α = .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 ($\alpha = .88$). 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 ($\alpha = .83$), Dedication ($\alpha = .86$), and Absorption ($\alpha = .87$). 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.
TSD VALIDITY AND STRUCTURE

(α = .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*

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>SRMR</th>
<th>RMSEA</th>
<th>CFI</th>
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<tbody>
<tr>
<td>Five factor model</td>
<td>231.99</td>
<td>109</td>
<td>0.08</td>
<td>0.08</td>
<td>.92</td>
</tr>
<tr>
<td>One factor Superordinate (outcome B)</td>
<td>31.35</td>
<td>5</td>
<td>0.06</td>
<td>0.16</td>
<td>0.56</td>
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<tr>
<td>Two factor model (outcome A)</td>
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</table>

*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*

<table>
<thead>
<tr>
<th>Parcel</th>
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<th>E</th>
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<td></td>
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<td>Angry-Hostility</td>
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<td>Depression</td>
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<td>Ideas</td>
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<td>Gregariousness</td>
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<tr>
<td>Excitement Seeking</td>
<td></td>
<td>.67</td>
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<tr>
<td>Positive</td>
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<td>.52</td>
<td></td>
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</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Hogan Personality Inventory Scale</th>
<th>Associated Personality Factor</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prudence</td>
<td>Conscientiousness</td>
<td>.25, $p &lt; .01$</td>
</tr>
<tr>
<td>Likeability</td>
<td>Agreeableness</td>
<td>.49, $p &lt; .01$</td>
</tr>
<tr>
<td>Adjustment</td>
<td>Emotional Stability</td>
<td>.55, $p &lt; .01$</td>
</tr>
<tr>
<td>Sociability</td>
<td>Extraversion</td>
<td>.53, $p &lt; .01$</td>
</tr>
<tr>
<td>Ambition</td>
<td>Extraversion</td>
<td>.50, $p &lt; .01$</td>
</tr>
<tr>
<td>Intellectance</td>
<td>Openness to Experience</td>
<td>.45, $p &lt; .01$</td>
</tr>
<tr>
<td>School Success</td>
<td>Openness to Experience</td>
<td>.14, ns</td>
</tr>
</tbody>
</table>
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 (Intelectance 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*

<table>
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<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
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</thead>
<tbody>
<tr>
<td>1. TSD_ES</td>
<td></td>
<td>.32*</td>
<td></td>
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<td>2. TSD_E</td>
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<td>4. TSD_A</td>
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<td>5. TSD_C</td>
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<td>.08</td>
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<td>6. HPL_ADJ</td>
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<td>7. HPL_AMB</td>
<td>.48*</td>
<td>.50</td>
<td>.08</td>
<td>.21</td>
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<td>8. HPL_SOC</td>
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<td>.31</td>
<td>.03</td>
<td>.48*</td>
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<td>.38*</td>
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<td>.38*</td>
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<td>12. HPL_REL</td>
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<td>.23*</td>
<td>.35*</td>
<td>.30*</td>
<td>.08</td>
<td>.15</td>
<td>.02</td>
<td>.00</td>
<td>.21*</td>
<td>.13</td>
<td>.10</td>
<td>.15*</td>
<td>.87*</td>
<td>.48*</td>
<td>.48*</td>
<td></td>
</tr>
<tr>
<td>17. GHQ</td>
<td>.62*</td>
<td>.22</td>
<td>.06</td>
<td>.09</td>
<td>.01</td>
<td>.43*</td>
<td>.39*</td>
<td>.17</td>
<td>.27</td>
<td>.11</td>
<td>.18</td>
<td>.16</td>
<td>.14</td>
<td>.17</td>
<td>.26*</td>
<td>.20*</td>
<td>.15*</td>
</tr>
<tr>
<td>GPA</td>
<td>.09</td>
<td>.01</td>
<td>.09</td>
<td>.03</td>
<td>.03</td>
<td>.06</td>
<td>.09</td>
<td>.11</td>
<td>.01</td>
<td>.03</td>
<td>.21</td>
<td>.10</td>
<td>.17</td>
<td>.14</td>
<td>.16*</td>
<td>.12</td>
<td>.02</td>
</tr>
</tbody>
</table>

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

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

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

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

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
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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.
References


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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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