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Applicability of the NEO Personality Inventory-3 in a South African context

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Chapter 1: Literature Review

1.1. Introduction

There are various definitions of personality due to the complex nature of this construct (Weiten, 2001). Even so, there is a common goal amongst those interested in the study of personality; that is to understand the ways in which people generally feel, think, and behave across situations and with different people (Louw & Edwards, 1993). This understanding allows for the prediction and assessment of overt behaviour (Church, 2000). Interestingly, Foxcroft and Roodt (2013) indicated that the use of personality type assessments could be traced as far back as biblical times (see Judges: 7, 1-8). Even to this day, personality and the appropriateness of psychometric tools to measure personality in the South African context is a focal point for research (Laher & Cockcroft, 2013).

This study focused on the trait approach to personality and assessment, particularly the Five Factor Model (FFM). According to Church (2000), the trait approach permeates personality theory and research. Moreover, the contribution of trait theory to the psychometric assessment of personality is immeasurable, in that it provides a structured and methodical approach to the evaluation of personality (Church, 2000). This chapter explores the trait approach to personality, in addition to the FFM, before moving on to a discussion of the NEO Personality Inventories (NEO-PI). The remainder of the chapter explores the concepts of reliability, validity, bias and equivalence in relation to the measurement of personality in a multicultural context.

1.2. Trait Psychology

When taking the trait approach to personality into consideration, trait psychologists concentrate on the structure of personality in terms of intrinsic personal characteristics that influence individual behaviour within a cultural context (Foxcroft & Roodt, 2013; Franklin-Ross, 2009; Laher, 2013). These characteristics are generally referred to as traits; which are regarded as stable, long-lasting variations in the way an individual thinks, feels, and behaves (Allik & McCrae, 2004; Ashton & Lee, 2005; Church, 2000; Foxcroft, 2004; Franklin-Ross, 2009; Laher, 2013).

The trait approach to personality emphasises the cross-cultural applicability of a basic trait model; which has proven to be dominant in cross-cultural personality research and assessment (Church, 2000; Franklin-Ross, 2009; Laher, 2013; McCrae, 2001). The contribution that this approach makes to the understanding and study of personality can be attributed to the way in which the theory emphasises basic traits that give rise to particular behaviours and characteristics in different contexts (McCrae R,

2001). However, there are also significant debates regarding the general application of this Westernised model of personality to non-Western cultures (Church, 2000; Laher, 2013). The point being that it is debatable whether or not a model of personality based on more individualistic conceptualisations of personality structure can be applied to cultures with a more collectivistic approach (Church, 2000; Laher, 2013).

In addition to the overall structure, there is considerable debate regarding the specific number of traits that can comprehensively account for the full range of human personality and behaviour in multicultural contexts (Ashton & Lee, 2005; Church, 2000; Laher, 2013; Paunonen & Jackson, 2000). However, proponents of the widely accepted FFM purport that five broad traits have been continually replicated across cultures (with different personality measures in different languages), and successfully encompasses a comprehensive consideration of the structure of personality (Grucza & Goldberg, 2007; Laher, 2013; McCrae, 2001; McCrae et al., 2005). To follow is a detailed consideration of the FFM.

1.3. The Five Factor Model

Sir Francis Galton is recognised as one of the first scientists to clarify the lexical hypothesis, from which the empirical model of the FFM and factor analysis of personality descriptors and inventories emerged (Franklin-Ross, 2009; Goldberg, 1990; Laher, 2013; Terracciano & McCrae, 2006). Here, the supposition is made that the most fundamental traits or words to describe individual differences are encoded in everyday language because people take note of and talk about commonly displayed behaviours (Grucza & Goldberg, 2007; Goldberg, 1990; Paunonen & Jackson, 2000; Terracciano & McCrae, 2006). This discourse results in the creation of common descriptive words to account for commonalities and differences in the way people are seen to behave (Paunonen & Jackson, 2000).

In accordance with the lexical approach, Allport and Odbert created lists of vast numbers of personality descriptors by employing words in the English dictionary associated with personality (Foxcroft & Roodt, 2013). In the process of grouping these descriptors, many similarities began to emerge and factor analysis was used as a means to reduce the amount of descriptors into broader personality dimensions (Foxcroft & Roodt, 2013; Laher, 2013). Notably, Raymond Cattell factor analysed the lists of personality traits developed by Allport and Odbert into 16 personality factors; leading to the development of the 16 Personality Factor Questionnaire (Ashton & Lee, 2005; Goldberg, 1990; Visser & Du Toit, 2004). This came to be the point of departure for future research spanning two decades; which provided replicated evidence of five clearly defined factors that could be meaningfully

employed to describe the structure of personality (Foxcroft & Roodt, 2013; Franklin-Ross, 2009; Laher, 2013; Paunonen & Jackson, 2000; Terracciano & McCrae, 2006).

The evidenced five factors became known as the Big Five and formed the basis of the FFM (Franklin-Ross, 2009; Paunonen & Jackson, 2000; Terracciano & McCrae, 2006). The FFM is now regarded as the dominant structural model of personality within the trait approach, and is widely accepted in psychology as the standard against which to evaluate other trait models (Ashton & Lee, 2005; Costa, McCrae, & Martin, 2008; Foxcroft & Roodt, 2013; Franklin-Ross, 2009; Paunonen & Jackson, 2000; Weiten, 2001). In turn, the NEO Personality Inventories are regarded as amongst the best operationalisations of the FFM (McCrae, Martin, & Costa, 2005; Laher & Cockcroft, 2013). The five domains of the NEO Personality Inventory – Revised (NEO-PI-R), which are carried over into the NEO Personality Inventory-3 (NEO-PI-3) are briefly introduced below (Foxcroft & Roodt, 2013; Franklin-Ross, 2009; Paunonen, Zeidner, Engvik, Oosterveld, & Maliphant, 2000; Terracciano & McCrae, 2006; Visser & Du Toit, 2004).

1.4. The NEO-PI-R and NEO-PI-3 Domains and Facets

The five domains outlined are Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness[1] (McCrae & Costa, 2010). The first domain, Neuroticism, is marked by a propensity for negative emotionality. The focus in this domain is on whether an individual is generally calm and composed, or tends to perceive reality in a stressful and negative manner (McCrae & Costa, 2010; Dalton & Wilson, 2000; Laher & Cockcroft, 2013; Weiten, 2001). According to the NEO-PI professional manual, those who obtain a higher score on Neuroticism have a tendency to be insecure, easily embarrassed, anxious, as well as prone to stress and irrational ideation (McCrae & Costa, 2010). Conversely, those who obtain a lower score tend to be more emotionally stable (McCrae, Costa, & Martin, 2005; McCrae & Costa, 2010). The six facets that make up this domain are Anxiety, Angry Hostility, Depression, Self-Consciousness, Impulsiveness, and Vulnerability (McCrae & Costa, 2010).

Extraversion is the second domain and concerns a tendency to be more social, positive, and enthusiastic. High scorers are regarded as more sociable, unreserved, friendly, and optimistic (McCrae & Costa, 2010). Low scorers on the other hand tend to be more reserved, quiet, solitary, inhibited, and aloof (McCrae & Costa, 2010). The six facets that make up this domain are Warmth,

[1] See Appendix B for full descriptions of the domains and facets

Gregariousness, Assertiveness, Activity, Excitement-Seeking, and Positive Emotions (McCrae & Costa, 2010; Dalton & Wilson, 2000; Laher & Cockcroft, 2013; Weiten, 2001).

The third domain, Openness to Experience, encompasses behaviour geared towards novelty seeking and curiosity. Individuals who score higher on this domain show a tendency to be more curious, flexible, imaginative, creative, unconventional, variety seeking, and attentive to feelings (McCrae & Costa, 2010). In contrast, people who score low on this domain tend to be more conventional, conservative, and focus on more practical issues (McCrae, Martin, & Costa, 2005; McCrae & Costa, 2010). The six facets that make up this domain are Fantasy, Aesthetics, Feelings, Actions, Ideas, and Values (McCrae & Costa, 2010; Dalton & Wilson, 2000; Laher & Cockcroft, 2013; Weiten, 2001).

The second last domain is Agreeableness; which focuses on how an individual tends to interact with others in terms of warmth, cooperation, compassion, and amicableness. Individuals who obtain higher scores on this domain tend to be more warm, kind, and sympathetic towards others; expecting others to interact with them in the same way (McCrae & Costa, 2010). Individuals who obtain lower scores tend to be more petulant, inflexible, competitive, suspicious, and aggressive towards others (McCrae, Martin, & Costa, 2005; McCrae & Costa, 2010). The six facets encompassed by this domain are Trust, Straightforwardness, Altruism, Compliance, Modesty, and Tender-Mindedness (McCrae & Costa, 2010; Dalton & Wilson, 2000; Laher & Cockcroft, 2013; Weiten, 2001).

Conscientiousness is the final domain and concerns a sense of responsibility, persistence in the face of obstacles, meticulousness, and adherence to rules and processes. Individuals with higher scores tend to be perceived as more reliable, disciplined, diligent, and organised (McCrae & Costa, 2010). Individuals with lower scores on the other hand may be perceived as slothful as well as less achieving, vigorous and disciplined (McCrae, Martin, & Costa, 2005; McCrae & Costa, 2010). The six facets included in this domain are Competence, Order, Dutifulness, Achievement Striving, Self-Discipline, and Deliberation (McCrae & Costa, 2010; Dalton & Wilson, 2000; Laher & Cockcroft, 2013; Weiten, 2001).

Due to the NEO-PI-3 being a fairly new and revised version of the NEO-PIs, there is a need for cross-cultural research on the psychometric properties and applicability of the tool in various contexts. In light of this, certain aspects of reliability, validity, and issues of bias are explored below.

1.5. Reliability

The various types of reliability are briefly outlined below. Broadly, reliability is concerned with the consistency of a measurement (Jooste, 2006). Test-retest reliability is concerned with the stability of measurement over time, as expressed by the coefficient of stability calculated between repeated measurements of the same test takers at different points in time (Jooste, 2006; Cortina, 1993). Equivalent forms reliability is concerned with how similar the scores are on equivalent forms of a test for the same test takers, as determined by calculating the coefficient of equivalence (Jooste, 2006). Inter-rater reliability is concerned with how well the ratings of different observers correspond to each other, as calculated by the coefficient of inter-rater consistency (Jooste, 2006; Cortina, 1993). Finally, the most common way to evaluate the reliability of a measurement instrument is to establish internal consistency, addressing the extent to which the items on a test are related (Davison, Neale, & Kring, 2004; Franklin-Ross, 2009; Jooste, 2006; Laher, 2010; Cortina, 1993). Here, a number of different items on a test are used to provide a complete measurement of a particular construct and there should be a sufficient degree of consistency among these test items (Gravetter & Forzano, 2003; Louw & Edwards, 1993; Salkind, 2009).

This study focused specifically on internal consistency reliability most commonly established by calculating Kuder-Richardson (K-R) and coefficient alpha (CA) reliability coefficients (Jooste, 2006). Unlike the K-R coefficient of equivalence; which can only be applied to dichotomous items, CA is more general and can be applied to any type of response scale (Cortina, 1993). According to Cortina (1993), coefficient alpha is "one of the most important and pervasive statistics in research involving test construction and use" and "takes into account variance attributable to subjects and variance attributable to the interaction between subjects and items" (p. 98). Cronbach-Alpha reliability coefficients are considered in this study to ensure alignment with previous research conducted with other versions of the NEO-PI and allow for the comparison of results due to minimal research having been conducted on the NEO-PI-3 specifically.

The NEO-PI-3 has evidenced high internal consistency reliability coefficients in adult and adolescent samples in both international cross-cultural as well as South African specific studies, yielding alpha coefficients ranging from .61 - .90 (McCrae, Costa, & Martin, 2005; Laher, 2013; Franklin-Ross, 2009). In comparison to the NEO-PI-R, the NEO-PI-3 shows almost equivalent reliability indices at the domain level, with even higher indices at the facet level (McCrae, Costa, & Martin, 2005). At the domain level, Neuroticism yielded an alpha coefficient of .90, Extraversion .85, Openness to experience .86, Agreeableness .88, and Conscientiousness .61 (Quy, 2011). Specifically, internal consistency for the 5

domains range from .85 to .89 for Form S and .84 to .93 for Form R of the NEO-PI-3. In addition, the NEO-PI-3 also showed slightly better internal consistencies than the NEO-PI-R with respondents aged 14 to 20 (McCrae, Costa & Martin, 2005). In a study conducted on 329 South African Grade 11 and 12 learners, the NEO-PI-3 evidenced acceptable Cronbach Alpha coefficients at the domain level (Boshoff, 2014). Here, Neuroticism yielded an alpha coefficient of .75, Extraversion .79, Openness to Experience .69, Agreeableness .61, and Conscientiousness .83. While at the facet level for the university student sample, Activity yielded an alpha coefficient of .36, Fantasy .80, Angry-Hostility .76, Self-Discipline and Deliberation .75, Order .74, Ideas .73, Trust, Depression and Competence .72, Aesthetics, Anxiety and Gregariousness .71, and Modesty and Warmth .70 (Quy, 2011). As evidenced, most facets demonstrated acceptable reliability with alpha coefficients reaching .80. For the adolescent learner sample, Actions, Tender-Mindedness, Values, and Compliance were found to be particularly problematic (Boshoff, 2014).

To follow is an exploration of validity with the same emphasis on comparison of the NEO-PI-3 validity results with previous NEO-PI-R validity results.

1.6. Validity

Validity is oriented towards the precision or truthfulness of a measurement instrument; which in turn relates to how useful that measurement tool is (Gravetter & Forzano, 2003; Louw & Edwards, 1993; Weiten, 2001; Salkind, 2009). The question that establishing validity answers is whether or not the test is actually measuring what it claims to measure (Davison et al., 2004; Foxcroft & Roodt, 2013; Gravetter & Forzano, 2003; Jooste, 2006). As with reliability, there are various types of validity; which will be considered here. Construct validity concerns how well a test measures the theoretical construct or trait that is purports to measure (Davison et al., 2004; Foxcroft & Roodt, 2013; Gravetter & Forzano, 2003; Jooste, 2006). Face validity focuses on the extent to which test-takers see the test as valid for the intended purpose, whereas content validity concerns how representative a sample a test is of all the characteristics of a particular construct (Jooste, 2006). Criterion-related validity aims to show the relationship between test scores and the scores on some type of criterion behaviour (Jooste, 2006). Here, convergent and discriminant validity was demonstrated when the NEO-PI-3 scales were correlated with the Subjective Well-Being Scale (SWB) in a previous study (McCrae, Costa & Martin, 2005).

For this study specifically, construct validity was explored as it is a principal form of validity when examining a trait approach to behaviour (Laher, 2013). In addition, the construct validity of the NEO-

PI-R has been replicated across different cultures, indicating that the tool can be widely generalised and allows for a comparison with the NEO-PI-3 results here (McCrae et al., 2005). As with reliability, the validity of the NEO-PI-3 closely matches that of the NEO-PI-R.

A recent South African study conducted with the NEO-PI-3 on university students has evidenced support for Costa and McCrae's (1992) assertions of construct validity through the factor analysis conducted (Quy, 2011). For the South African context in particular, it appears that there are five factors evident at the domain level, with some evidence of variation at the facet level (Quy, 2011). According to Quy (2011), five factors emerged from the Procrustes and varimax rotation techniques used; with the five factors explaining 59.93% of the shared variance in congruence with the FFM. Quy (2011) reported that 20.47% of the variance was explained by Factor 1, 11.31% by Factor 2, 9.88% by Factor 3, 8.64% by Factor 4, and 6.63% by Factor 5.

A South African study conducted with a sample of adolescents aged 15 to 20 indicated that the NEO-PI-3 shows good construct validity at the domain level, with some variance at the facet level (Boshoff, 2014). Initially, the Extraversion and Openness to Experience facets loaded together, and none of the facets loaded on Factor 5 (Boshoff, 2014). In particular, the construct validity improved when the Compliance facet was removed from the analysis (Boshoff, 2014).

1.7. Multicultural Assessment: Bias and Equivalence in the South African Context

The history of psychometric assessments in South Africa has been tainted by a legacy of preferential treatment of and unequal access to resources for one population group over another (Foxcroft & Roodt, 2013; Jooste, 2006; Laher, 2013). In this context, tests were developed and misused across different groups in order to perpetuate the superiority of one population group over others (Foxcroft & Roodt, 2013). Previously, tests based on Westernised individualistic constructions of behaviour were applied without adaptation to non-Western collectivistic cultures (Foxcroft & Roodt, 2013). However, there has been a distinct move towards recognising that the value of a test depends on the suitability for a particular context or group (Abrahams, 2002; Bedell et al., 1999; Foxcroft, 1997; Foxcroft, Paterson, Le Roux, & Herbst, 2004; Foxcroft & Roodt, 2013; Laher & Cockcroft, 2013; Meiring, Van de Vijver, Rothman, & Barrick, 2005).

In light of the need to ensure that measurement tools yield accurate and consistent results across all groups, thus ensuring fairness in the application of the tool, bias and equivalence are critical considerations when evaluating the applicability of a tool in a multicultural context (Meiring et al.,

2005). Bias can be defined as systematic error in measurement due to the presence of nuisance factors that indicate differences in a construct that are not due to actual differences in a particular trait (Van de Vijver & Rothmann, 2004; Laher & Cockcroft, 2013). There are three types of bias – item, method, and construct bias. Equivalence on the other hand relates to the comparability of scores considering the effect of nuisance factors that cause errors in measurement (Meiring et al., 2005). There are also three hierarchical levels of equivalence - construct, metric, and scalar equivalence (Meiring et al., 2005). To follow is a discussion of these concepts in more detail.

The first type of bias to be considered is item bias or differential item functioning; which can be regarded as a broad term that encompasses anomalies at the item level (Meiring et al., 2005; Laher & Cockcroft, 2013). Item bias occurs when the meaning of and resultant score on an item is different across cultures and not due to actual differences in the trait being measured, but rather due to the inappropriateness of an item for that culture (Meiring et al., 2005; Van de Vijver & Rothmann, 2004; Laher & Cockcroft, 2013). Secondly, method bias relates to all bias that occurs due to the manner in which the study was conducted; in relation to the sample differences that have a significant impact on item responses, differences in the instrument administration procedures, and the systematic distortion of responses to the instrument utilised (Meiring et al., 2005; Laher & Cockcroft, 2013). Finally, construct bias occurs when a construct is measured differently across different groups (Davison et al., 2004; Laher & Cockcroft, 2013; Meiring et al., 2005; Van de Vijver & Rothmann, 2004). Construct bias also occurs when a test does not measure the entirety of how a particular construct manifests for different groups (Davison et al., 2004; Laher & Cockcroft, 2013; Meiring, Van de Vijver, Rothman, & Barrick, 2005; Van de Vijver & Rothmann, 2004). Metric equivalence is the second level of equivalence and requires the same measurement unit (Van de Vijver & Tanzer, 1997). While the third level, scalar equivalence, requires the same interval scales across the groups measured (Van de Vijver & Tanzer, 1997). With regard to the various types of equivalence, the first level is construct or structural equivalence; which provides a measurement of how a construct is measured across various groups (Van de Vijver & Tanzer, 1997; Van de Vijver F. J., 2003). It relates to the generalizability of a construct across various cultures and is required for the other two levels of equivalence to be considered (Meiring D. , 2007).

According to Van de Vijver and Rothman (2004), it is crucial to determine the applicability, appropriateness and equivalence of measurement of constructs in multicultural contexts such as South Africa, to ensure that scores can equally be compared across various groups without bias. In addition, a consideration of construct bias can lead to insight into cross-cultural differences that could

be explored further to explain the causes of differences between groups (Meiring et al., 2005). Previous studies exploring construct bias in personality questionnaires within multicultural or non-Westernised cultures found little evidence of construct equivalence across different groups (Meiring, Van de Vijver, Rothman, & Barrick, 2005; Teferi, 2004; Quy, 2011). As a result, the appropriateness of the use of these measurement instruments was questioned within a multicultural context (Franklin-Ross, 2009; Meiring et al., 2005; Teferi, 2004; Quy, 2011). In light of the challenges discussed, the study focused specifically on an exploration of construct bias.

Along with the increasing emphasis on the rigorous scientific investigation of the appropriateness of a test for a particular context, has come an increase in the positive perception of psychometric testing in South Africa (Foxcroft et al., 2004). The realisation has been that bias may not be eliminated entirely, but the effects of potential sources of bias can potentially be minimised if known (Bedell et al., 1999). In practice, it means that subgroup specific trends can be accounted for when interpreting results (Bedell et al., 1999).

This study focused on the subgroups divided along the lines of gender, race and home language; to follow is a brief outline of the relationship between these subgroups and personality. Due to the recent development of the NEO-PI-3, however, insufficient research was found to explore the relationship between demographic variables and personality as measure by this test. Instead, research based on the NEO-PI-R will be discussed as it provides a better understanding of the interaction of these variables and personality.

1.8. Gender and Personality

Of the demographic variables considered, gender and personality differences appear to be the most widely studied (Goldberg, Sweeney, Merenda, & Hughes, 1998; Borkenau, McCrae, & Terracciano, 2013). Goldberg et al. (1998) reported that, when studying the FFM of personality in general, researchers expected to find larger gender differences on domains such as Extraversion, Emotional Stability, and Agreeableness. Here, it is claimed that men would score higher on Assertiveness and women would score higher on Anxiety, Nurturance, Sympathy, Empathy, and Concern for others (Goldberg et al., 1998).

A South African study conducted by Laher (2010) evidenced systematic differences across gender groups, where females scored higher on Neuroticism and Agreeableness than males (Laher & Cockcroft, 2013). On the other hand; Costa, Terracciano, and McCrae (2001) explored all 30 traits in

26 different cultures with the NEO-PI and found that gender differences are more significant in Western than non-Western cultures. However, across the cultures studied, females obtained higher scores on Neuroticism, and Agreeableness than men (Costa et al., 2001). Differences arose when it was found that American females did not score differently to males on Openness to Experience and Conscientiousness but females in other cultures did (Costa et al., 2001). This study compared male and female participants to determine if any of these differences were apparent when considering the NEO-PI-3.

1.9. Race and Personality

The second demographic variable that is considered in this study is race or population group. Due to the tumultuous history of psychometric assessment in South Africa, and the way in which information was used to ensure the prosperity of one race over another, the exploration of personality differences between the racial groups in our country is necessary when considering the application of a tool in this context (Foxcroft & Roodt, 2013).

When researching the FFM of personality, Goldberg et al. (1998) found only small differences between population groups, with the highest correlations only reaching .20. For the NEO-PI specifically, McCrae (2001) also purports that even though personality traits are influenced by culture, it essentially transcends culture. However, South African studies using the NEO-PI have shown difference in personality between subgroups in the population; where the FFM has been replicated for White participants and lesser so for Black participants (Franklin-Ross, 2009; Allik & McCrae, 2008). Moreover, White participants scored higher on Extraversion and Openness to experience than non-white participants in a study conducted by Laher on the NEO-PI-R (Laher & Cockcroft, 2013).

Interestingly, African and Asian cultures have been shown to score lower on certain domains such as Extraversion and Openness to Experience, but higher on others such as Agreeableness (Allik & McCrae, 2008). Allik and McCrae (2008) purport that the observed differences may be as a result of how traits are expressed differently in collectivistic and individualistic cultures. This study compared the population groups to determine if there were any apparent variations in measurement for these groups.

1.10. Language and Personality

Language is the final demographic variable taken into consideration in this study. Language has a significant influence on test performance (Abrahams, 2002; Foxcroft, 1997; Foxcroft & Roodt, 2013; Franklin-Ross, 2009; Jooste, 2006; Laher, 2013). Language is a particularly important source of bias when the language of a measurement tool is not the first language of the respondent (Foxcroft, 1997; Foxcroft et al., 2004; Foxcroft & Roodt, 2013; Laher, 2013). Moreover, the FFM in particular has been criticised due to the English lexical approach being fundamental in its development (Laher & Cockcroft, 2013).

According to Laher (2011), it is vital to consider language when exploring the cross-cultural applicability of a test; even more so for the South African context where there is a complex interrelationship of history, politics, language and power. Moreover, it should be evidenced that the constructs being measured by a particular test are actually meaningful in the culture, and that the language of the test can transfer the intended meaning successfully in the culture where the test will be utilised (Abrahams, 2002; Bedell et al., 1999; Foxcroft, 2004). However, the results within the South African context have been varied in studies conducted (Foxcroft & Roodt, 2013; Franklin-Ross, 2009; Laher, 2013). For example, the FFM has been supported in Afrikaans and English-speaking groups, but has not been replicated well among African language speaking groups (Foxcroft & Roodt, 2013; Franklin-Ross, 2009; Laher, 2013).

Specifically, Laher found that those with English as a second language generally scored lower on Extraversion and Openness to Experience than those with English as their first language (Laher & Cockcroft, 2013). In addition, Openness to Experience, Agreeableness, and Conscientiousness were found to be particularly problematic among South African participants whose first language was not English (Franklin-Ross, 2009). Interestingly, the model appears to have been more widely replicable across groups when utilizing a sample of English speaking tertiary educated participants (Laher, 2013). It is proposed that university students are exposed to a more individualistic and competitive environment and are regarded as acculturated to more Westernised patterns of behaviour; leading to more individualistic expressions of behaviour (Laher & Cockcroft, 2013).

In light of the importance of language considerations in a multicultural context, this study explores the possible impact of language on the measurement of personality using the FFM.

1.11. Conclusion

This study encompassed an exploration of vital aspects of the reliability, validity and issues of bias of the fairly new NEO-PI-3 in a South African context; taking into account the effects of demographic variables such as gender, race, and language on personality. Since previous research on the FFM in South Africa showed moderate to small differences across the abovementioned groups, and research on the applicability of the NEO-PI-3 in a South African context is sparse, it is hoped that this study can provide insight into the specific concerns regarding personality assessment and the FFM in multicultural contexts in general, in addition to specific contextual information regarding the applicability of this particular tool within South Africa (Laher & Cockcroft, 2013). Chapter 2 goes on to describe the methods utilized in this study to achieve the set objectives in more detail.

Chapter 2: Methods

2.1. Introduction

This study investigated the applicability of the NEO-PI-3 in the South African context by exploring responses to a questionnaire containing the NEO-PI-3 and demographic information. The psychometric characteristics of reliability, validity, and issues of bias were explored in order to determine the utility of the NEO-PI-3 in a general sample of the South African population. To follow is the rationale for embarking on this study, the specific questions answered, and a description of the measurement tool, procedures, research design, ethical considerations, and data analysis utilized in this exploration.

2.2. Research Rationale

There were various aspects taken into consideration when deciding on the approach to this study, the most important of which being the Employment Equity Act of 1998; which states that psychometric instruments must be scientifically shown to be valid, reliable, and unbiased for all groups in South Africa (Office of the President, 1998). The publication of the Employment Equity Act Amendment Bill in October 2012 and acceptance thereof in January 2014 reiterates the importance of utilizing psychometrically sound measuring instruments in this context (Office of the President, 2014). Moreover, there is a stipulation that psychometric instruments must be certified by an authoritative body on Psychometrics in South Africa, such as the Psychometrics Committee of the Health Professions Council of South Africa (HPCSA) (Office of the President, 2014). The most crucial aspects considered during the evaluation process are reliable, valid and unbiased application of measurement instruments within a South African context (Jooste, 2006).

In 2004, Van de Vijver and Rothmann indicated that psychology professionals are responsible for establishing the psychometric properties of measuring instruments. The amendment to the Employment Equity Act also places a responsibility on professionals in the field of psychology to establish and share a solid scientific basis for the application of psychometric instruments in various contexts. Reliability, validity, and bias are the most crucial aspects to be determined before a measuring instrument is utilized (Jooste, 2006). However, it appears as though most personality tools are utilized in the South African context without considering the appropriateness for specific groups (Van de Vijver & Rothmann, 2004).

As indicated by Jooste (2006), the psychometric properties of a measuring instrument are dependent on the group and context for which it was standardized. Therefore, a test's reliability, validity and unbiased application must be re-evaluated for every context in which the test is applied; even more so in multicultural contexts such as South Africa (Jooste, 2006). Specifically, personality tools are utilized to aid decision-making in settings that have long term consequences for individuals and groups, such as educational institutions, employment organisations, and psychological practices (Bedell et al., 1999; Laher, 2013). It is, therefore, vital that the required psychometric properties of a test are adequately demonstrated for the various groups in this country (Bedell et al., 1999). A study conducted in 2004 by Foxcroft et al. revealed that assessment practitioners in the South African context agree that the value of a psychometric instrument is proportionate to the soundness of its psychometric properties. Therefore, the current study aimed to contribute to the growing body of knowledge regarding the cross-cultural applicability of personality measurement instruments in general and in South Africa in particular.

2.3. Research Questions

The main research question is: How applicable is the NEO-PI-3 in the South African context?
This was demonstrated in the following questions:

2.3.1. Reliability

Are the NEO-PI-3 scales reliable in the South African context in terms of internal consistency reliability coefficients?

2.3.2. Validity

Does the NEO-PI-3 factor into a five factor solution?

2.3.3. Bias

Are responses on the NEO-PI-3 domain and facet scales influenced by gender?
Are responses on the NEO-PI-3 domain and facet scales influenced by population group?
Are responses on the NEO-PI-3 domain and facet scales influenced by language?

2.4. Sample

A non-probability convenience sample of 272 South Africans, predominantly from Johannesburg and surrounding areas was utilized for the purposes of this study. There was a two-pronged approach to sampling in this study; both of which were nonprobability, convenience techniques. Each of the 4 researchers involved in the joint project sourced approximately 50 volunteers from the general public to complete the questionnaire. In addition to this, second year Research Design and Analysis (RDA) 2A course students at the University of the Witwatersrand were asked to get 1 volunteer to complete the questionnaire (preferably not a family member or close friend). Students who did this and returned the questionnaire obtained a 1% course credit towards their coursework mark. Permission to do this was obtained from the RDA 2A course coordinator. All researchers used volunteer sampling, i.e. participants who were easy to obtain access to and were willing to respond (Gravetter & Forzano, 2003).

As presented in Table 2.1., 31.3% of the 272 participant sample were male and 66.9% were female. It is evident here that the sample was predominantly female. The sample was represented by White, Black, Indian and Coloured population groups. 40.1% of the participants were Black, 7% Coloured, 23.2% Indian, 27.6% White, and 1.8% Other. The sample was predominantly made up of Black participants, with White as the second highest represented population group. 2.6% participants indicated Afrikaans as their home language, 55.5% English, 1.1% isiNdebele, 4.4% sePedi, 1.1% siSwati, 3.3% seSotho, 1.8% xiTsonga, 5.5% seTswana, 1.5% tshiVenda, 4.4% isiXhosa, 13.2% isiZulu, and 5.1% Other. The majority of this sample indicated English as their first language.

In terms of education level, 39% of participants indicated that they held a tertiary level qualification, followed by 29.4% of the sample indicating a secondary level education. 23.5% of the sample participants were students, followed by 17.6% indicating Other. Of the 129 participants that indicated English as a second language, 19.9% indicated excellent English reading skill, 18% indicated good, and 8.5% indicated satisfactory. Of these participants, 20.6% indicated excellent English comprehension, followed by 16.9% very good, and 8.5% satisfactory. 40.1% of the sample indicated that they are test wise. 8.8% of the participants in the sample indicated that they were very familiar with testing, 15.1% quite familiar, 14% satisfactory familiarity, 2.9% fair familiarity, and 4% somewhat familiar with testing.

Table: 2.1. Uncollapsed sample demographic information

Variable		Frequency	Percentage	Cumulative %
Gender	Male	85	31.3	31.8
	Female	182	66.9	100
	Missing	5	1.8	
Population Group	Black	109	40.1	40.2
	Coloured	19	7	47.2
	Indian	63	23.2	70.5
	White	75	27.6	98.2
	Other	5	1.8	100
	Missing	1	0.3	
Home Language	Afrikaans	7	2.6	2.6
	English	151	55.5	58.3
	isiNdebele	3	1.1	59.4
	sePedi	12	4.4	63.8
	siSwati	3	1.1	64.9
	seSotho	9	3.3	68.3
	xiTsonga	5	1.8	70.1
	seTswana	15	5.5	75.6
	tshiVenda	4	1.5	77.1
	isiXhosa	12	4.4	81.5
	isiZulu	36	13.2	94.8
	Other	14	5.1	100
	Missing	1	.5	
Education	Basic	15	5.5	5.7
	Secondary	80	29.4	35.8
	Post-Secondary	35	12.9	49.1
	Tertiary	106	39	89.1
	Postgraduate	29	10.7	100
	Missing	7	2.5	
Occupation	Student	64	23.5	23.6
	Corporate/Business	29	10.7	34.3
	Production/Operations	30	11	45.4
	Finance/Admin	39	14.3	59.8
	Sales/Marketing	12	4.4	64.2
	Education/Research	15	5.5	69.7
	Life-science/Health	15	5.5	75.3
	Professional	19	7	82.3
	Other	48	17.6	100
	Missing	1	.5	
English Reading Skill	Not so good (1)	1	.4	1.5
	Fairly good (2)	2	.7	3.1
	Satisfactory (3)	23	8.5	20.8
	Very good (4)	49	18	58.5
	Excellent (5)	54	19.9	100
English Comprehension	Not so good (1)	1	.4	.8
	Fairly good (2)	3	1.1	3.1
	Satisfactory (3)	23	8.5	20.9
	Very good (4)	46	16.9	56.6
	Excellent (5)	56	20.6	100
Test Wiseness	No (0)	162	59.6	59.8
	Yes (1)	109	40.1	100
	Missing	1	.3	
Test Familiarity	Somewhat familiar (1)	11	4	9.8
	Fairly familiar (2)	8	2.9	16.3
	Satisfactory (3)	38	14	47.2
	Quite familiar (4)	41	15.1	80.5
	Very familiar (5)	24	8.8	100
	Missing	150	55.2	

Table 2.2 presents the means, standard deviations, skewness coefficients and range of responses related to English reading skill, English comprehension, and test familiarity for the sample. From Table 2.2, it is evident that the majority of the sample indicated at least satisfactory English reading and comprehension skill, as well as satisfactory exposure to testing.

Table: 2.2. English and test sample demographics

Scale	Mean	SD	Minimum	Maximum	Skewness
English Reading Skill	4.23	1.05	.0	5	1.30
English Comprehension	4.18	.90	.0	5	-1.22
Test Familiarity	3.46	1.19	.0	5	-.68

2.5. Instrument

Data was gathered by means of a questionnaire consisting of two sections - a demographics section, and the NEO-PI-3.

2.5.1. Demographics Section

Participants were required to indicate the following demographic information at the beginning of the questionnaire: age, gender, population group, home language, education, English proficiency and test wiseness. This information was used to describe the sample. Gender, population group, and home language were also used for the bias analysis.

2.5.2. NEO-PI-3

The NEO-PI is regarded as one of the most widely used and researched personality inventories (Franklin-Ross, 2009). The NEO-PI-3 was developed from the NEO-PI–R, to be a more readable and understandable version which could be more widely applicable (Costa et al., 2008; De Fruyt et al., 2009; McCrae, Costa & Martin, 2005; McCrae, Martin & Costa, 2005). It is a 240 item questionnaire with a Likert-type scale that measures the 5 major domains of personality as detailed by the FFM, and gives insights into the 6 facets that define each domain (Allik & McCrae, 2004; Costa, McCrae & Martin, 2008; McCrae & Costa, 2007; McCrae, Costa & Martin, 2005).

Respondents were asked to rate statements on a range from Strongly Disagree (0) to Strongly Agree (4) in approximately 35-40 minutes (Allik & McCrae, 2004; Costa, McCrae & Martin, 2008; De Fruyt et al., 2009; McCrae & Costa, 2007; McCrae, Costa & Martin, 2005). There are two forms of the test.

Form S is self-rating, with items in the first person and Form R is other-rating with items phrased in the third person (McCrae & Costa, 2007). Form S was used in this study.

The norm groups of the NEO-PI-3 are based on an English first language, American sample. Here, separate norms where developed for adolescents aged 12 to 20, and adults over 21 years of age. According to McCrae, Costa, and Martin (2005), the NEO-PI-3 showed psychometric properties similar to the NEO-PI-R, with slight improvement.

2.6. Research Design

This study utilised a quantitative, non-experimental research design. This is in keeping with previous studies conducted on other forms of the NEO-PI; which will result in the opportunity for research to be compared to previous studies. According to Gravetter and Forzano (2003), this study does not meet the requirements of an experimental design as it does not seek to establish cause-and-effect relationships between variables. There is also no attempt to control extraneous variables (Gravetter & Forzano, 2003). Moreover, data was collected at one point in time from different groups that shared certain characteristics to allow for descriptions of possible relationships between variables (Gravetter & Forzano, 2003). Therefore, this study may be described as cross-sectional and correlational (Gravetter & Forzano, 2003).

2.7. Ethical Considerations

Ethical clearance was obtained from the Human Research Ethics committee at the University of the Witwatersrand (Protocol Number: MPSYC/13/007 IH). A cover letter was provided with the questionnaire in order to outline and elaborate on all necessary ethical considerations for this study. Informed consent was ensured by providing participants with all the relevant information regarding the study and the use of data obtained.

Participants were also informed of approximately how much time was required for the questionnaire completion. The participants' rights in terms of voluntary participation and no consequences for withdrawal or refusal to participate were outlined. Moreover, anonymity was ensured as participants were not required to provide the researcher with any personally identifying information. Confidentiality was also ensured, since only the researchers and the researchers' supervisor would have access to the questionnaires and data. Test data was securely stored in a locked cupboard at the university so there was no risk of access by unauthorized persons and confidentiality was further maintained.

Finally, participants were informed that returning the completed questionnaire indicated that they consented to their data being used for analysis, reporting, and possible publication or conference presentation. Participants were informed that they may receive general feedback on the outcomes of the study at a specified point in time; however, individual feedback is not possible due to the anonymous submission of the questionnaire. Feedback is available to participants on request.

Data was collected by the 4 researchers in the study group by distributing the questionnaire to the general public. In addition, RDA 2A students at the University of the Witwatersrand were offered the incentive of a 1% course credit to source one participant to anonymously complete a questionnaire. Permission for students to assist with this in return for 1% course credit was received from the course coordinator, Ms. Nicky Israel. The researchers kept a record of student names and student numbers on the returned questionnaires and gave it to the course coordinator for students to receive credit. Since these questionnaires were not completed by the students, but by their sourced participant instead, there was no compromise on anonymity and confidentiality.

2.8. Procedure

A group of 4 postgraduate psychology students collected data by administering the questionnaire to volunteers in the general public. Undergraduate RDA 2A students were also asked to collect data from volunteers as described in the sampling section. Once all data was collected, it was combined, captured and scored as per the test developer specifications in the NEO-PI professional manual (McCrae & Costa, 2010). Thereafter, the data was analysed using the SPSS (Version 21) and Lavaan package in the R computer program as described in the data analysis section to follow.

2.9. Data Analysis

According to Salkind (2009), describing data is the first step in analysis. This not only assists the researcher to organize and summarise the data, it also provides a simple and clear picture of the general characteristics of the data set. For this study, the frequency statistics for the demographic information are displayed; including gender, population group, home language, education, English proficiency and test wiseness. In addition, the means, standard deviations, skewness coefficients and range of scores are calculated for age, and the NEO-PI-3 scores.

2.9.1. Reliability

Reliability was investigated by determining internal consistency by means of the Cronbach-Alpha reliability coefficient to ensure comparability with results provided by Costa and McCrae (McCrae & Costa, 2010; Schweizer, 2011). Cronbach Alpha is another form of the Kuder-Richardson 20 (KR-20) formula that is often used in research as an estimate of the reliability of psychometric measuring instruments (Jooste, 2006). Cronbach Alpha was specifically selected here due to the applicability to large scale data; which the KR-20 does not as easily allow for (Yu, 2001).

2.9.2. Validity

In this study, the construct validity of the NEO-PI-3 was investigated via exploratory factor analysis (EFA), orthogonal Procrustes rotation and congruence coefficients using a principal components analysis with varimax rotation. This approach is regarded as "a simple but effective method of determining factors that explains all the variance, including the error variance in any particular correlation matrix" in addition to evaluating structural equivalence (Laher, 2010, p. 2). EFA allows one to analyse the interrelationships of variables and simplify large amounts of data (Foxcroft & Roodt, 2013; Laher, 2013).

Specifically, factor analysis allows for the identification of common traits underlying items in personality measurement instruments, and is widely utilized in research conducted with cross-cultural and diverse groups (Laher, 2010).

In consideration of the number of factors to be retained, it was found that there is widespread debate regarding the number of factors to be retained in order to accurately and comprehensively measure personality across different cultures and subgroups (Laher, 2013). The chosen techniques for factor extraction in this study were the Guttman-Kaiser eigenvalue greater-than-one rule (K1 rule), Cattell's scree tests, parallel analysis, and Velicer's minimum average partial (MAP) as these methods are widely used (Laher, 2010). The combination of these methods is regarded as an efficient and effective way to determine the precise number of factors to retain (Laher, 2010). Varimax rotation was used for the factor matrix. Varimax rotation allows for the simplification of principal components analysis and is regarded as the most effective way to successfully locate clusters when researching personality assessment (Laher, 2010). It is also the technique used by Costa and McCrae (2010), with the NEO-PI-3. Loadings of $\pm$ .40 were used to determine whether a facet loaded on a factor or not (Kline, 1994).

Construct validity was also assessed using Confirmatory factor analysis (CFA). It has been found that studies utilizing EFA often do not conduct CFA, but future studies should go a step further in confirming the factor solution found in EFA (Gignac, 2009). In order to provide a comprehensive analysis, once the underlying factor structure was identified via EFA, confirmatory factor analysis was conducted to verify the factor structure found in this study (Fountoulakis, et al., 2014). The approach to CFA in this study entails utilizing the factor solution obtained in EFA, and then estimating model fit by means of maximum likelihood estimation, as well as goodness-of-fit indices and significance statistics (Gignac, 2009; Hurley, et al., 1997). The Hu and Bentler (1999) cut-off values are generally used for the goodness of fit statistics and these were used in this study as well. The produced statistics were Satora-Bentler scaled test statistic as a significance test, Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) for incremental fit, Root Mean Square Error of Approximation (RMSEA), as well as Standardised Root Mean Square Residual (SRMR) for absolute fit displayed in Table 3.8. (Herrmann & Pfister, 2013). The indices assess different approaches to assess model fit that are regarded as valuable when analyzing data on personality questionnaires (Herrmann & Pfister, 2013; Parker, Bagby, & Summerfeldt, 1993). The cut-off values regarded as adequate for model fit are a non-significant Chi-square result, .90 and above for CFI and TLI, .08 and below for SRMR, and .06 and below for RMSEA (Hu & Bentler, 1999; Parker et al.; Gignac, 2009; Fountoulakis, et al., 2014).

2.9.3. Bias and Equivalence

The presence of bias for a particular group negatively impacts on the level of equivalence in a measurement instrument across all groups (Visser & Du Toit, 2004). Here, equivalence relates to the level of equality in measurement across various cross-cultural groups and bias relates to the effect of factors that impact on this equality in measurement (Foxcroft & Roodt, 2013).

Construct bias or structural equivalence was investigated in this study across the groups of gender, race or population group, and home language by comparing the factor structures per group at the scale level. Factor Analysis with varimax rotation was conducted with one of the factor pattern matrices in each group selected as the target, and the other as secondary group. Congruence between the two matrices was then established by using Procrustes rotation. Specifically, when conducting the analysis for the gender group, the male varimax rotated matrix was compared to the equivalent female matrix. The Black group was the target group when analyzing the population groups and the English first language speaking group was the target group when analyzing the language groups.

This method is in keeping with previously conducted cross-cultural research, practical considerations within the South African context, and defined groups set out in the Employment Equity Act (Laher, 2013; Office of the President, 2014).

Designated groups in the Employment Equity Act include Black, female, and individuals with disability (Office of the President, 2014). A further specification is made that the Black group include African, Indian, Coloured and Chinese individuals (Office of the President, 2014). When considering the applicability of a particular instrument in the South African context, it is vital to be cognisant of these designated groups. Moreover, South Africa has 11 official languages, with the majority of the population speaking English as a second language (Statistics South Africa, 2011). Taking a test in a language that is not a first language has a significant impact on results (Foxcroft, 1997; Foxcroft, Paterson, Le Roux & Herbst, 2004; Foxcroft & Roodt, 2013; Laher, 2013). As such, it is vital to consider home language in determining the utility of a psychometric tool in the South African context.

2.10. Conclusion

Chapter 2 presented the rationale and aims of this study, in addition to the specific research questions and the manner in which data collection and analysis was carried out. The important ethical considerations and aspects of validity, reliability and bias were also outlined. Chapter 3 presents the statistical results in relation to reliability, validity, and bias.

Chapter 3: Results

3.1. Introduction

Chapter 3 presents the results obtained in the study. Descriptive statistics for gender, population group, and home language are presented as these groups are pertinent to the analysis. Thereafter, the descriptive statistics for the NEO-PI-3 are presented. In line with the aims of the study, the results pertaining to internal consistency reliability, construct validity, and construct bias are reported.

3.2. Descriptive Statistics: Demographic Information

Table 3.1 presents the collapsed descriptive statistics for the three demographic variables relevant for the analysis; namely gender, population group, and home language. The frequencies for home language were collapsed into variables of English first language speakers and English second language speakers since the group sizes were grossly unequal; which would have compromised further statistical analyses (Laher, 2010). Language has a significant influence on test performance, being an important source of bias to be explored when the language of a measure is not the first language of the respondent (Abrahams, 2002; Foxcroft, 1997; Foxcroft, Paterson, Le Roux & Herbst, 2004; Foxcroft & Roodt, 2013; Franklin-Ross, 2009; Jooste, 2006; Laher, 2013). Coloured and Indian individuals are classified as Black according to the Employment Equity Act of 1998 (Office of the President, 1998); therefore the population groups were collapsed to reflect this differentiation. As such, the decision was taken to collapse the groupings and remain cognizant of the within group variance, as it is common practice when making important decisions about individuals (Laher, 2010).

Table: 3.1. Frequencies for Gender, Population Group, and Home Language

Variable		Frequency	Percentage
Gender	Male	85	31.4
	Female	182	66.9
Population Group	Black	196	71.7
	White	75	27.6
Home Language	English first language	151	55.5
	English second language	117	43

As is evident from Table 3.1, the majority of the sample was made up of female participants; with females representing 66.9% of the sample, males representing 31.4% of the sample, and the remaining 1.7% of the sample not indicating gender. Most participants were Black, representing 71.7%

of the sample, followed by White participants at 27.6% of the sample. 55.5% of the sample spoke English as a first language, with 43% speaking English as a second language.

3.3. Descriptive Statistics: NEO-PI-3

Table 3.2 presents the means, standard deviations, skewness coefficients, alpha coefficients, as well as the minimum and maximum values for the domain and facet scales of the NEO-PI-3. It is evident that all the variables are normally distributed since the skewness coefficients are within the range of +1 to -1 (Huck, 2009).

Neuroticism has a mean of 84.60, with a standard deviation of 20.99, and scores ranging from 12 to 151. From Table 3.2, it is evident that all the Neuroticism facets, with the exception of Vulnerability (M=11.68) have means between 14 and 16, and standard deviations between 4.48 and 5.22. Minimum and maximum scores are in the appropriate range of 0-32; with minimum scores ranging between 0 and 1 for all facets except for anxiety which has a minimum score of 4. The maximum scores range between 25 and 31.

Extraversion has a mean of 109.73, with a standard deviation of 20.40 and scores ranging between 44 and 158. Descriptive statistics for the facets of Extraversion are also presented in Table 3.2, indicating that the facets have means between 16 and 18; except for Warmth (M=21.28) and Positive Emotions (M=20.70). Standard deviations for these facets range between 4.41 and 5.65. Minimum scores fell within the normal range of 0 to 32. The maximum scores corresponded with the upper limit of the scale (32) with some variation in the Assertiveness score of 28.

Openness to Experience has a mean of 110.99 with a standard deviation of 18.52 and scores ranging between 54 and 162. The Openness to Experience facets have means that range between 17 and 19, with the exception of Actions (M=16.06). Standard deviations range between 3.77 and 5.77. The minimum and maximum scores fall within the normal range of 0 to 32. The minimum scores were 5, with some variation in Feelings with a minimum score of 8, and a Values score of 6. The maximum scores corresponded with the upper limit of the scale (32), with some variation in the Actions score of 26, and the Feelings score of 27.

Agreeableness has a mean of 117.71, with a standard deviation of 15.32 and scores ranging between 71 and 157.The Agreeableness facets demonstrated some variation in their mean scores, with Trust having a mean score of 16.35, Compliance 17.08, Modesty 18.97, Straightforwardness 19.80, Tender

mindedness 22.72, and Altruism 22.79.The standard deviations were in the range of 4 and 5. The minimum scores showed variation with a Compliance score of 4, Modesty score of 5, Trust 7, Straightforwardness 8, and Altruism and Tender mindedness 11. The maximum scores were within the appropriate range, with some variation in the Trust score of 27.

Conscientiousness has a mean of 123.20, with a standard deviation of 21.50 and scores ranging between 52 and 177. The Conscientiousness facet means are also presented in Table 3.2, with means ranging from 20 to 22, except for Deliberation (M=18.81). The standard deviations range between 4 and 5. The minimum scores are within the lower limit (0), with the Competence score of 10 being the highest. The maximum scores corresponded with the upper limit of 32.

3.4. Internal Consistency Reliability

Cronbach Alpha reliability coefficients were calculated for each of the domain and facet scales of the NEO-PI-3 in an attempt to comment on the internal consistency of the instrument, and are presented in Table 3.2. Nunnally and Bernstein (2014), indicate that Cronbach Alpha coefficients of between .60 and .70 are considered acceptable. Internal reliability coefficients are .91 for Neuroticism, .88 for Extraversion, .87 for Openness to Experience, .78 for Agreeableness, and .92 for Conscientiousness.

All reliability coefficients for the Neuroticism and Extraversion facets are in excess of .60. Neuroticism facets range between .60 for Impulsiveness and .74 for Depression, while Extraversion facets range between .60 for Activity and .76 for Positive Emotions.

With the exception of Actions (α = .53) and Values (α = .52), all other reliability coefficients for the Openness to Experience facets are in excess of .60, with a range of .52 to .78 for Aesthetics. Agreeableness coefficients range between .49 and .67; with all facets in excess of .60 except Straightforwardness (α = .49), Modesty (α = .58), and Tender Mindedness (α = .53). All Conscientiousness facets exceed .60 and yield coefficients ranging from .61 for Dutifulness to .79 for Achievement Striving.

Table: 3.2. Descriptive Statistics and Internal Reliability Coefficients for the NEO PI-3

Scale	Mean	SD	Minimum	Maximum	Skewness	α
Neuroticism	84.60	20.99	12	151	.02	.91
Anxiety	16.75	4.85	4	31	.23	.72
Angry Hostility	14.71	4.69	.0	26	.07	.65
Depression	14.70	5.22	1	28	.06	.74
Self-Consciousness	14.77	4.99	0	29	.14	.70
Impulsivity	16.32	4.48	0	31	-.01	.60
Vulnerability	11.68	4.73	0	25	.22	.71
Extraversion	109.73	20.40	44	158	-.23	.88
Warmth	21.28	4.51	9	31	-.31	.71
Gregariousness	16.08	5.65	2	32	-.85	.63
Assertiveness	16.66	4.68	2	28	.02	.70
Activity	17.21	4.41	4	32	.11	.60
Excitement-Seeking	18.02	5.19	5	31	-.21	.64
Positive Emotions	20.70	5.07	4	32	-.37	.76
Openness to Experience	110.99	18.52	54	162	.16	.87
Fantasy	17.19	4.55	5	32	.23	.64
Aesthetics	18.49	5.77	0	32	-.31	.78
Feelings	17.60	3.77	8	27	.02	.60
Actions	16.06	3.89	5	26	.004	.53
Ideas	19.50	5.18	5	32	-.13	.77
Values	19.48	4.08	6	30	-.04	.52
Agreeableness	117.71	15.32	71	157	-.13	.78
Trust	16.35	4.32	7	27	.01	.66
Straightforwardness	19.80	4.05	8	29	-.23	.49
Altruism	22.79	4.07	11	32	-.23	.67
Compliance	17.08	4.95	4	31	-.14	.67
Modesty	18.97	5.09	5	32	.54	.58
Tender-Mindedness	22.72	4.02	11	32	-.29	.53
Conscientiousness	123.20	21.50	52	177	.04	.92
Competence	20.64	4.01	10	32	-.07	.67
Order	20.26	4.83	5	32	-.19	.71
Dutifulness	22.00	4.06	7	31	-.09	.61
Achievement Striving	21.11	5.17	5	32	-.11	.79
Self-Discipline	20.38	4.96	7	32	-.12	.74
Deliberation	18.81	4.69	2	32	-.15	.72

3.5. Construct Validity

Factor analysis on the facets of the NEO-PI-3 was conducted in an attempt to comment on the construct validity of the instrument. All loadings above .40 or below -.40 were considered as a loading on that specific factor, as recommended by Costa and McCrae (1992). Results for the factor analyses assessing the construct validity of the NEO-PI-3 are presented in this section.

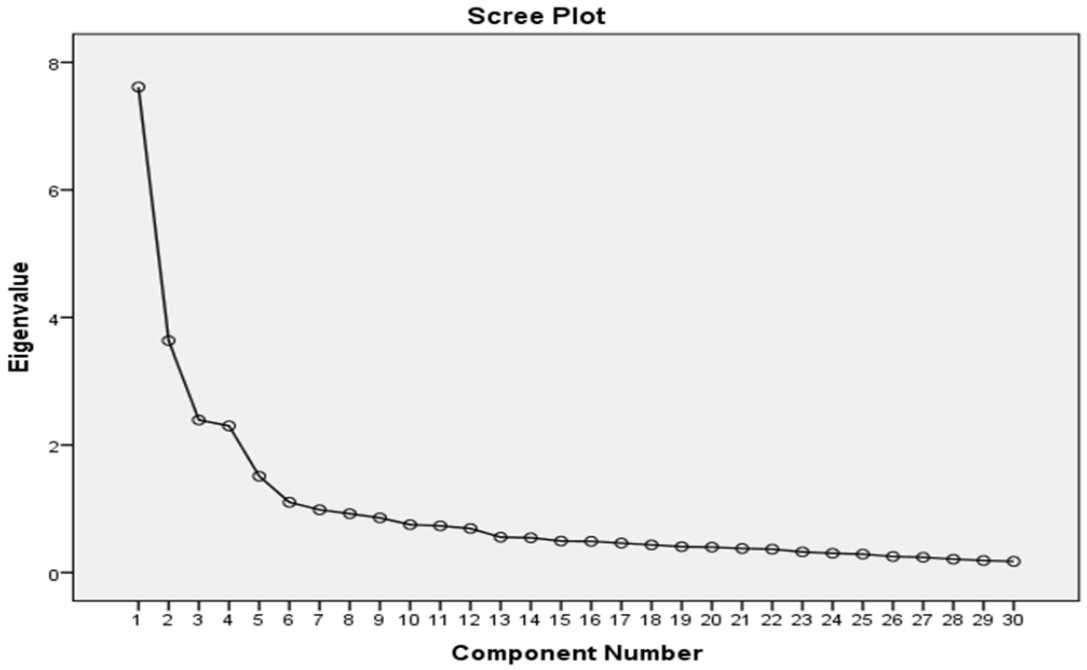

Figure: 3.1. Scree Plot for the NEO PI-3 Factors

In determining the number of factors to be examined, both theoretical and empirical factors were taken into consideration. On a theoretical level, the FFM postulates 5 broad factors. Using the eigenvalues greater than one rule, six factors are indicated. Parallel analysis (PA) and Velicer's MAP was also utilised to determine the number of factors to be retained; both indicating the extraction of five factors, as demonstrated in Table 3.3. Examination of the steep gradient on the Scree plot (Figure 3.1.) also indicated the extraction of five factors. As a result, a five factor solution was examined in this study.

3.5.1. NEO-PI-3 Five Factor Solution

A five-factor solution was examined using principal components analysis with varimax rotation. From the initial five-factor solution results in Table 3.3, it is evident that 58.17% of the shared variance is accounted for by the five factors. Factor one explains 25.38% of the variance, Factor two 12.12% Factor three 7.97% Factor four 7.66% and Factor five 5.04%.

The varimax solution is presented in Table 3.4, and shows all loadings above .40 in bold. From Table 3.4, it is evident that Factor 1 may described as the Conscientiousness Factor as all six facets load positively and above .58. Assertiveness (an Extraversion facet) showed a small positive loading of .42 on Factor 1; this being the highest loading of Assertiveness overall. Vulnerability, a Neuroticism facet, shows a high negative loading of -.610 on Factor 1.

Table: 3.3. Eigenvalues for the NEO PI-3

Factor	Actual Eigenvalue	Cumulative % of Variance	Random Eigenvalue PA Mean	Random Eigenvalue PA 95th Percentile
Factor 1	7.61	25.38	1.68	1.77
Factor 2	3.64	37.50	1.58	1.65
Factor 3	2.39	45.47	1.50	1.57
Factor 4	2.30	53.13	1.45	1.50
Factor 5	1.51	58.17	1.39	1.44
Factor 6	1.10	61.84	1.34	1.38
MAP Factors to Retain	5			

Factor 2 shows high positive loadings on the Neuroticism facets, with all loadings above .55. The highest loadings were Anxiety (.774), Self-Consciousness (.722), and Depression (.711). There were no cross loadings on this factor. Openness to Experience may be regarded as Factor 3 as all Openness to Experience facets loaded positively and above .56 on Factor 3. There was a small cross loading of Excitement-Seeking (.424) on Factor 3.

Extraversion and Agreeableness both showed positive and moderate to high loadings on Factor 4. The Extraversion facets showed higher loadings for Warmth (.834), Gregariousness (.712), Positive

Emotions (.558), and Activity (451). While the Agreeableness facets showed loadings for Altruism (.599), Trust (.469), and Tender-Mindedness (.402). However, some Agreeableness facets also loaded on Factor 5. Here, moderate loadings were seen for Compliance (.630), Modesty (.599), and Straightforwardness (.539). All factors did not load as expected and, therefore, this five factor solution may not be the optimal solution. As a result, a six factor solution was examined.

Table: 3.4. 5 Factor Solution for the NEO-PI-3 using Varimax Rotation

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Neuroticism					
Anxiety	-.164	**.774**	.054	-.130	.081
Angry Hostility	-.015	**.602**	-.317	-.173	-.417
Depression	-.336	**.711**	-.129	-.120	.111
Self-Consciousness	-.232	**.722**	-.142	-.296	.105
Impulsivity	-.366	**.608**	.127	.170	-.263
Vulnerability	-.610	**.554**	-.155	-.149	-.017
Extraversion					
Warmth	.139	-.111	.204	**.834**	.028
Gregariousness	-.200	-.260	.061	**.712**	-.163
Assertiveness	**.423**	-.298	.244	.250	-.397
Activity	.387	.033	.125	**.451**	-.467
Excitement-Seeking	-.081	-.029	**.424**	.338	-.446
Positive Emotions	.153	-.263	.395	**.558**	-.099
Openness to Experience					
Fantasy	-.237	.074	**.680**	.126	-.213
Aesthetics	.122	.018	**.660**	.206	-.071
Feelings	.109	.331	**.566**	.271	-.044
Actions	.007	-.297	**.576**	.213	-.122
Ideas	.307	-.143	**.718**	-.021	-.108
Values	.083	-.140	**.578**	-.028	.223
Agreeableness					
Trust	.151	-.157	.053	**.469**	.313
Straightforwardness	.164	.008	-.164	.284	**.539**
Altruism	.388	.082	.300	**.599**	.309
Compliance	-.188	-.257	-.060	-.002	**.630**
Modesty	.083	.203	-.005	.000	**.598**
Tender-Mindedness	.385	.289	.228	**.402**	.282
Conscientiousness					
Competence	**.774**	-.261	.150	.116	-.067
Order	**.713**	-.094	-.080	-.043	.055
Dutifulness	**.749**	-.023	.061	.264	.081
Achievement Striving	**.789**	-.054	.198	.112	-.207
Self-Discipline	**.785**	-.231	.003	.026	.020
Deliberation	**.582**	-.303	.007	-.014	.226

3.5.2. NEO-PI-3 Six Factor Solution

From the six factor solution presented in Table 3.5, it is evident that Factor 1 may described as the Conscientiousness Factor, as all six facets load positively and above .64. Assertiveness no longer loaded on this factor. Two Neuroticism facets, Impulsiveness and Vulnerability, show moderate negative loadings on Factor 1 of -.424 and -.595 respectively.

Factor 2 shows moderate to high positive loadings on the Neuroticism facets, with all loadings above .46. The highest loadings were Self-Consciousness (.750), and Depression (.765). There was a negative cross loading of -.431 on Assertiveness (an Extraversion facet) and of -.422 on Actions (an Openness to Experience facet). Factor 3 may be regarded as an Openness to Experience factor as all Openness to Experience facets loaded positively and above .48 on Factor 3. There was a small cross loading of Excitement-Seeking (.491) on Factor 3. There appears to be a clearer loading of Extraversion on Factor 4, with all facets loading positively and above .45; except for Assertiveness (.214) which had a stronger loading on Factor 6 at .419. Altruism, an Agreeableness facet, also showed a positive cross loading of .450.

There also appears to be a clearer loading of Agreeableness facets on Factor 5, with all facets loading positively and above .44; except for Compliance (.240). There was a cross loading of Values (an Openness to Experience facet) of .413 on factor 5. Factor 6 did not show clear loadings on any of the domains, with moderate loadings on Impulsiveness (a Neuroticism facet), Assertiveness and Activity (Extraversion facets). Compliance showed a high negative cross loading on Factor 6, with no significant positive loading on any of the Factors. As such, it was decided to remove Compliance and rerun the five factor solution to determine whether or not this would be an optimal solution.

Table: 3.5. 6 Factor Solution for the NEO-PI-3 using Varimax Rotation

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Neuroticism						
Anxiety	-.190	**.733**	.110	-.171	.140	.140
Angry Hostility	-.006	**.607**	-.238	-.090	-.323	.361
Depression	-.315	**.765**	-.051	-.091	.033	-.056
Self-Consciousness	-.232	**.750**	-.078	-.287	.028	.007
Impulsivity	**-.424**	**.464**	.162	.121	.026	**.487**
Vulnerability	**-.595**	**.592**	-.093	-.097	-.096	.007
Extraversion						
Warmth	.133	-.171	.201	**.763**	.308	.085
Gregariousness	-.158	-.239	.077	**.755**	-.020	.000
Assertiveness	.382	**-.431**	.207	.214	-.096	**.419**
Activity	.379	-.055	.147	**.458**	-.124	**.444**
Excitement-Seeking	-.001	.007	**.491**	**.471**	-.358	.075
Positive Emotions	.180	-.284	.397	**.557**	.060	.002
Openness to Experience						
Fantasy	-.220	.014	**.705**	.153	-.118	.097
Aesthetics	.187	.049	**.706**	.261	-.066	-.142
Feelings	.046	.159	**.564**	.151	.261	.329
Actions	-.027	**-.422**	**.530**	.154	.055	.163
Ideas	.332	-.175	**.721**	-.008	-.078	-.027
Values	-.032	-.356	**.481**	-.230	.413	.191
Agreeableness						
Trust	.114	-.213	.010	.344	**.446**	-.062
Straightforwardness	.100	-.044	-.217	.110	**.608**	-.122
Altruism	.351	-.002	.284	**.450**	**.543**	.005
Compliance	-.113	-.067	-.061	.025	.240	**-.761**
Modesty	.013	.143	-.050	-.177	**.595**	-.153
Tender-Mindedness	.358	.229	.236	.279	**.462**	.012
Conscientiousness						
Competence	**.755**	-.314	.119	.063	.080	.125
Order	**.722**	-.064	-.083	-.057	.057	-.043
Dutifulness	**.726**	-.070	.048	.180	.258	.094
Achievement Striving	**.800**	-.079	.211	.113	-.054	.164
Self-Discipline	**.761**	-.267	-.033	-.035	.119	.078
Deliberation	**.643**	-.180	.009	.019	.052	-.383

3.5.3. NEO-PI-3 Five Factor Solution Excluding Compliance

The five factor solution excluding Compliance resulted in all the facets loading appropriately, as presented in Table 3.6. Conscientiousness loads as it should on Factor 1, with high positive values ranging from .709 to .822 with the exception of Deliberation (.571).

There were positive cross loadings with two Extraversion facets, namely Assertiveness (.458) and Activity (.441). A negative cross loading of -.588 on Vulnerability was also produced. The cross-loading with Activity is not a concern as it shows a higher loading of .579 on Factor 4 as expected. However, Assertiveness is a concern as this was the highest loading for this facet.

Neuroticism loaded on Factor 2, with positive loadings ranging from .583 for Vulnerability to .768 for Anxiety. This solution produced positive values of .720 for Depression, .719 for Self-Consciousness, .657 for Angry Hostility, and .623 for Impulsiveness. No cross loadings were produced on Factor 2 with this solution.

Table: 3.6. 5 Factor Solution for the NEO-PI-3 excluding Compliance

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Neuroticism					
Anxiety	-.163	**.768**	.075	-.179	.080
Angry Hostility	.033	**.657**	-.281	-.013	-.355
Depression	-.328	**.720**	-.117	-.158	.065
Self-Consciousness	-.235	**.719**	-.126	-.331	.017
Impulsivity	-.345	**.623**	.164	.233	-.094
Vulnerability	**-.588**	**.583**	-.141	-.112	-.103
Extraversion					
Warmth	.129	-.131	.206	**.733**	.397
Gregariousness	-.167	-.233	.055	**.748**	.090
Assertiveness	**.458**	-.270	.256	.373	-.208
Activity	**.441**	.082	.147	**.579**	-.159
Excitement-Seeking	-.013	.031	**.429**	**.509**	-.272
Positive Emotions	.171	-.255	.388	**.556**	.128
Openness to Experience					
Fantasy	-.207	.086	**.685**	.208	-.149
Aesthetics	.142	.017	**.654**	.216	.028
Feelings	.097	.295	**.587**	.216	.164
Actions	.006	-.315	**.577**	.237	-.022
Ideas	.319	-.154	**.712**	.014	-.084
Values	.033	-.212	**.576**	-.146	.212
Agreeableness					
Trust	.082	-.235	.052	.263	**.520**
Straightforwardness	.086	-.073	-.172	.009	**.627**
Altruism	.339	.014	.299	.375	**.597**
Modesty	-.030	.078	-.003	-.305	**.619**
Tender-Mindedness	.349	.235	.231	.206	**.499**
Conscientiousness					
Competence	**.769**	-.276	.149	.098	.061
Order	**.709**	-.101	-.086	-.086	.086
Dutifulness	**.737**	-.046	.061	.168	.264
Achievement Striving	**.822**	-.032	.201	.161	-.067
Self-Discipline	**.772**	-.250	-.001	-.018	.098
Deliberation	**.571**	-.316	-.022	-.098	.183

Openness to Experience loaded on Factor 3, with positive values ranging from .576 for Values to .712 for Ideas. This solution produced positive values of .685 for Fantasy, .654 for Aesthetics, .587 for Feelings, and .577 for Actions. No cross loadings were produced on Factor 3 with this solution.

Extraversion loaded on Factor 4, with moderate to positive values with the exception of Assertiveness (.373). This solution produced positive values of .748 for Gregariousness, .733 for Warmth, .579 for Activity, .556 for Positive Emotions, and .509 for Excitement-Seeking. No cross loadings were produced on Factor 4 with this solution.

Agreeableness loaded on Factor 5, with positive values ranging from .499 for Tender-Mindedness to .627 for Straightforwardness. This solution produced positive values of .619 for Modesty, .597 for Altruism, and .520 for Trust.

3.5.4. Factor Analysis using Procrustes Rotation with Congruence Coefficients

In order to assess the level of agreement between the results from this study and those of Costa and McCrae (2010), the varimax solutions were subjected to Procrustes rotation and congruence coefficients were calculated. Congruence coefficients of .90 are considered to indicate significant agreement at the 1% level, while those of .85 indicate agreement at the 5% level of significance (Haven & Ten Berge, 1977; McCrae, Zonderman, Costa, & Bond, 1996).

From Table 3.7, it is evident that the facets of Anxiety, Angry Hostility, Depression, Self-Consciousness, Vulnerability, Warmth, Assertiveness, Activity, Fantasy, Feelings, Actions, Trust, Straightforwardness, Competence, Dutifulness, Achievement-Striving, and Self-Discipline evidenced congruence coefficients at or above .94; which indicates agreement at the .01 level of significance.

In addition, the facets of Impulsiveness, Excitement-Seeking, Positive Emotions, Ideas, Altruism, Modesty, Gregariousness, Compliance, Order, and Deliberation evidenced congruence coefficients at or above .85; which indicates agreement at the .05 level of significance. The facets that show congruence coefficients below .84 are Aesthetics (.77), Values (.79), and Tender-Mindedness (.80); which is less than expected to support factor replication.

Table: 3.7. NEO-PI-3 5 Factor Solution using Varimax & Procrustes Rotation with Congruence Coefficients

Scale	Varimax Rotation					McCrae et al. (2010)					Procrustes Rotation					
	F1	F2	F3	F4	F5	F1	F2	F3	F4	F5	F1	F2	F3	F4	F5	CC
Anxiety	-.16	**.77**	.05	-.13	.08	**.83**	.11	.03	.22	.19	**.79**	-.09	.05	.05	-.10	**.98****
Angry Hostility	-.02	**.60**	-.32	-.17	**-.42**	**.80**	-.01	-.03	-.19	-.17	**.59**	-.13	-.17	-.38	.03	**.95****
Depression	-.34	**.71**	-.13	-.12	.11	**.81**	-.14	.04	.19	.01	**.74**	-.12	-.14	.06	-.28	**.97****
Self-Consciousness	-.23	**.72**	-.14	-.30	.11	**.77**	-.20	-.10	-.06	.07	**.76**	-.25	-.17	-.01	-.16	**.99****
Impulsiveness	-.37	**.69**	.13	.17	-.26	**.48**	.29	.23	-.33	**-.49**	**.61**	.20	.20	-.15	-.32	**.93***
Vulnerability	**-.61**	**.55**	-.16	-.15	-.02	**.77**	-.13	.29	.10	-.28	**.60**	-.16	-.11	-.08	-.56	**.96****
Warmth	.14	-.11	.20	**.83**	.03	-.12	**.64**	.27	**.41**	-.20	-.19	**.70**	.18	.36	.07	**.99****
Gregariousness	-.20	-.26	.06	**.71**	-.16	.03	**.70**	**.43**	.20	.00	-.32	**.52**	.18	.15	-.28	**.87***
Assertiveness	**.42**	-.30	.24	.25	-.40	-.24	**.53**	.39	-.21	.39	-.35	.33	.30	-.22	.38	**.97****
Activity	.39	.03	.13	**.45**	**-.47**	-.18	**.44**	**.60**	-.35	.16	-.05	**.47**	.22	-.18	.36	**.98****
Excitement-Seeking	-.08	-.03	**.42**	.34	**-.45**	-.18	**.51**	-.16	**-.51**	-.17	-.03	**.54**	.36	-.27	-.08	**.92***
Positive Emotions	.15	-.26	.40	**.56**	-.10	.06	**.53**	**.45**	.26	.03	-.31	**.59**	.31	.13	.10	**.91***
Fantasy	-.24	.07	**.68**	.13	-.21	.38	**.65**	-.01	-.09	-.34	.11	.33	.61	-.13	-.22	**.97****
Aesthetics	.12	.02	**.66**	.21	-.07	.31	-.03	**.46**	.38	**.58**	.02	**.43**	**.48**	.01	.14	.77
Feelings	.11	.33	**.57**	.27	-.04	.27	**.59**	**.44**	.27	.17	.32	**.40**	**.46**	.07	.14	**.99****
Actions	.01	-.30	**.58**	.21	-.12	-.24	-.03	**.73**	-.11	.17	-.29	.31	**.54**	.00	-.02	**.98****
Ideas	.31	-.14	**.72**	-.02	-.11	-.14	-.09	-.02	-.18	**.50**	-.13	.26	**.55**	-.10	.32	**.88***
Values	.08	-.14	**.58**	-.03	.22	-.19	**.51**	-.13	.22	-.18	-.11	.06	**.47**	.16	.10	.79
Trust	.15	-.16	.05	.47	.31	-.05	**.46**	.15	**.40**	-.03	-.21	.30	.00	**.45**	.10	**.94****
Straightforwardness	.16	.01	-.16	.28	**.54**	-.07	-.17	.26	**.59**	-.01	-.05	-.07	-.07	**.65**	.11	**.98****
Altruism	.39	.08	.30	**.60**	.31	.00	**.71**	-.18	.29	.00	.00	.45	.25	**.55**	.35	**.92***
Compliance	-.19	-.26	-.06	-.002	**.63**	.05	**-.47**	.08	**.48**	.05	-.23	-.15	-.18	**.50**	-.21	**.86***
Modesty	.08	.20	-.01	.000	**.60**	.03	.10	-.14	**.47**	.03	.19	-.22	.02	**.59**	.08	**.92***
Tender-Mindedness	.39	.29	.23	**.40**	.28	.19	**.41**	-.18	**.46**	**.52**	.23	.33	.15	**.45**	.37	.80
Competence	**.77**	-.26	.15	.12	-.07	-.26	.39	-.11	-.01	**.75**	-.33	.17	.11	.01	**.75**	**.99****
Order	**.71**	-.09	-.08	-.04	.06	-.02	-.13	.22	.28	**.78**	-.16	-.14	.02	.09	**.69**	**.90***
Dutifulness	**.75**	-.02	.06	.26	.08	.02	.02	.15	**.40**	**.83**	-.11	.19	.07	.23	**.71**	**.94****
Achievement-Striving	**.79**	-.05	.20	.11	-.21	-.10	.15	.24	-.11	**.88**	-.13	.20	.20	-.09	**.78**	**1.0****
Self-Discipline	**.79**	-.23	.003	.03	.02	-.13	.04	.12	.22	**.87**	-.30	-.04	.07	.07	**.75**	**.95****
Deliberation	**.58**	-.30	.01	-.01	.23	-.09	-.38	-.02	**.41**	**.72**	-.35	-.05	-.04	.21	**.55**	**.93***
Factor Congruence											**.96****	**.91***	**.89**	**.96****	**.95***	**.93***

3.5.5. Confirmatory Factor Analysis

Confirmatory factor analysis was conducted using Lavaan in the R statistical package, using a robust maximum likelihood estimation method.

As illustrated in Table 3.8, in running the CFA, the Chi-square value was found to be significant ($x^2(395) = 1.155$, p = .000), indicating a poor overall model fit (Satorra & Bentler, 2001). The fit indices that did not reach the acceptable standard for a good fitting model, confirming inadequate model fit were CFI at.674, and TLI at .641 (Hu & Bentler, 1999). However, RMSEA at .095, and SRMR at .112 indicated adequate model fit (Chen, Curran, Bollen, Kirby, & Paxton, 2008; MacCallum, Widaman, Preacher, & Hong, 2001). Considering the Chi-square and fit indices in combination, the model did not reach an acceptable standard of fit to the data overall and the model was thus rejected.

Table: 3.8. Fit indices from the confirmatory factor analyses for the NEO-PI-3

Statistic	Value
SB-x^2	1.155
df	395
p	.000
RMSEA (90% CI)	.095 (.090, .100)
CFI	.674
TLI	.641
SRMR	.112

In practical application, CFA retains explorative characteristics, resulting in modifications of the assessed model in an attempt to obtain an adequate model fit (Gignac, 2009; Hurley, et al., 1997). For the EFA in this study, excluding Compliance resulted in a more optimal five factor solution. Aligned to this approach, Compliance was excluded and the CFA was rerun in an attempt to obtain a more optimal model fit.

Table: 3.9. Fit indices from the confirmatory factor analyses for the NEO-PI-3 excluding Compliance

Statistic	Value
SB-x^2	1.150
df	367
p	.000
RMSEA (90% CI)	.093 (.088, .099)
CFI	.697
TLI	.665
SRMR	.109

As is evident from Table 3.9, there was a slight improvement in the statistics measuring model fit. The Chi-square value was significant ($x^2(367) = 1.150$, p = .000), indicating a poor overall model fit (Satorra & Bentler, 2001). The fit indices that did not reach the acceptable standard for a good fitting model, confirming inadequate model fit were CFI at .697, and TLI at .665 (Hu & Bentler, 1999). However, RMSEA at .093, and SRMR at .109 indicated adequate model fit. (Chen F. , Curran, Bollen, Kirby, & Paxton, 2008; MacCallum, Widaman, Preacher, & Hong, 2001). Considering the Chi-square and fit indices in combination, the modified model did not reach an acceptable standard of fit to the data overall and the model was thus rejected.

3.6. Construct Bias and the NEO-PI-3

As discussed in Chapter 2, construct bias in the NEO-PI-3 was explored using factor analysis with varimax rotation. Thereafter, Procrustes rotation with congruence coefficients (at the 1% and 5% level) was calculated to establish whether the factors manifest in the same way across the designated groups (McCrae et al., 1996). Here, congruence coefficients of .85 and above are significant at the 5% level, and congruence coefficients of .90 and above are significant at the 1% level (Haven & Ten Berge, 1977; McCrae et al., 1996). To follow is a presentation of the results according to gender, population group, and home language.

3.6.1. Gender and the NEO-PI-3

From the factor analysis results presented in Table 3.10, it is evident that the matrices for the Male and Female groups load congruently for Conscientiousness, Neuroticism, and Openness to Experience. For the Procrustes rotation, the Male and Female varimax rotated matrices are presented in Table 3.10, with the Male matrix as the target matrix and the Female matrix as the ancillary matrix. Factor 1 can be described as Conscientiousness for both groups. Factor 2 can be regarded as the Neuroticism factor. Factor 3 is the Openness to Experience factor. Factor 4 is the Extraversion factor. Factor 5 may be regarded as Agreeableness.

The results suggest that there is a certain amount of agreement between the groups. To assess agreement more effectively, the obtained congruence coefficients are explored at the 5% and 1% levels of significance. Factor 1 (.95), 2 (.97), 3 (.94), 4 (.91), and 5 (.92) yielded congruence coefficients above .90, indicating significance at the .01 level.

For the gender group, facets that obtained congruence coefficients of .90 and above (α=.01) were Anxiety, Angry Hostility, Depression, Self-Consciousness, Impulsiveness, Vulnerability, Warmth,

Gregariousness, Assertiveness, Activity, Positive Emotions, Fantasy, Aesthetics, Feelings, Actions, Ideas, Values, Trust, Altruism, Compliance, Competence, Order, Dutifulness, Achievement-Striving, and Self-Discipline. Facets that obtained congruence coefficients of .85 and above (α=.05) were Modesty, Tender-Mindedness, and Deliberation. Excitement-Seeking (.80) and Straightforwardness (.74) obtained non-significant congruence coefficients.

3.6.2. Population group and the NEO-PI-3

From the factor analysis results presented in Table 3.11, it is evident that the matrices for the Black and White population groups load congruently for Conscientiousness and Neuroticism. Factor 1 is Conscientiousness. Factor 2 is the Neuroticism factor. For the Black group, Factor 3 is Openness to Experience. Extraversion, Openness to experience, and Agreeableness loaded on Factor 3 for the White group. Factor 4 is Extraversion for the Black group. Agreeableness is Factor 4 for the White population group. Factor 5 is Openness to Experience for the White population group. Factor 5 is not clearly replicated for the Black population group.

The results suggest that there is a certain amount of agreement between the population groups. To assess agreement more effectively, the obtained congruence coefficients are explored at the 5% and 1% levels of significance. Factor 1 (.95), 2 (.94), 4 (.92), and 5 (.90) yielded congruence coefficients at or above .90, indicating significance at the .01 level. Factor 3 (.88) yielded a congruence coefficient above .85, indicating significance at the .05 level.

For the population group, Anxiety, Angry Hostility, Depression, Self-Consciousness, Impulsiveness, Vulnerability, Warmth, Assertiveness, Activity, Fantasy, Aesthetics, Trust, Altruism, Compliance, Tender-Mindedness, Competence, Order, Dutifulness, Achievement-Striving, Self-Discipline, and Deliberation obtained congruence coefficients of .90 and above (α=.01). Congruence coefficients at or above .85 (α=.05) were Gregariousness, Excitement-Seeking, Positive Emotions, Feelings, Actions, Values, and Ideas. Facets that obtained non-significant congruence coefficients were Straightforwardness (.77), and Modesty (.80).

3.6.3. Home language and the NEO-PI-3

From the factor analysis results presented in Table 3.12, it is evident that the matrices for the English first language (EF) and English second language (ES) speaking groups load congruently for Conscientiousness. Factor 1 is Conscientiousness. Factor 2 is Neuroticism for the ES group, without a clear replication for the EF group. Extraversion and Agreeableness load on Factor 3. Factor 4 is

Openness to Experience for the ES group. Factor 4 loaded on Openness to Experience and Agreeableness for the EF group. Factor 5 is Agreeableness for the EF group and Extraversion for the ES group.

For the Procrustes rotation, the EF and ES group varimax rotated matrices are presented in Table 3.12, with the EF group matrix as the target matrix and the ES group as the ancillary matrix. The results suggest that there is a certain amount of agreement between the language groups. To assess agreement more effectively, the obtained congruence coefficients are explored at the 5% and 1% levels of significance. Factor 1 (.93), 2 (.93), 3 (.94), 4 (.92), and 5 (.92).

Congruence coefficients at or above .90 (α=.01) were obtained for Anxiety, Depression, Self-Consciousness, Impulsiveness, Vulnerability, Warmth, Gregariousness, Assertiveness, Activity, Excitement-Seeking, Positive Emotions, Fantasy, Feelings, Actions, Ideas, Trust, Altruism, Competence, Dutifulness, Achievement-Striving, and Self-Discipline facets in the language group. Congruence coefficients at or above .85 (α=.05) were obtained for Angry Hostility, Aesthetics, Compliance, Modesty, Tender-Mindedness, and Order facets. Non-significant congruence coefficients were obtained for Values (.79), Straightforwardness (.82), and Deliberation (.83).

Table 3.10 Factor analysis using Procrustes rotation for gender and the NEO-PI-3

Scale	Varimax Rotation - Male					Varimax Rotation - Female					Procrustes Rotation					
	F1	F2	F3	F4	F5	F1	F2	F3	F4	F5	F1	F2	F3	F4	F5	CC
Neuroticism																
Anxiety	-.265	**.824**	-.002	-.109	.170	-.145	**.751**	.077	-.166	.118	-.22	**.84**	.00	-.09	.18	**.99****
Angry Hostility	.117	**.629**	-.224	**-.466**	-.185	.016	**.644**	-.328	-.053	-.356	.02	**.70**	-.25	-.04	**-.40**	**.99****
Depression	**-.435**	**.690**	-.064	-.096	-.101	-.287	**.723**	-.080	-.150	.095	-.39	**.66**	-.07	-.30	.05	**.97****
Self-Consciousness	-.259	**.791**	-.017	-.003	-.196	-.238	**.706**	-.123	-.334	.029	-.19	**.72**	-.00	**-.41**	.02	**.98****
Impulsiveness	-.164	.387	.049	**-.627**	.261	-.325	**.642**	.099	.257	-.137	-.32	**.57**	-.01	**.42**	-.20	**.96****
Vulnerability	**-.607**	**.553**	-.086	-.182	-.267	**-.575**	**.590**	-.197	-.076	-.064	**-.59**	**.53**	-.11	-.37	-.08	**.93***
Extraversion																
Warmth	.310	-.280	.281	-.071	**.695**	.153	-.103	.156	**.743**	.360	.24	-.14	.27	**.72**	.27	**.98****
Gregariousness	.002	**-.465**	.226	-.352	**.442**	-.179	-.228	-.017	**.764**	.011	-.15	-.29	.17	**.67**	-.03	**.96****
Assertiveness	**.645**	-.362	.191	-.224	.148	.383	-.277	.305	.343	-.237	**.50**	-.26	.18	**.48**	-.28	**.97****
Activity	**.672**	-.035	.123	-.350	.279	.372	.071	.139	**.568**	-.219	**.52**	.11	.11	**.56**	-.25	**.99****
Excitement-Seeking	.322	-.114	**.589**	-.252	.057	-.145	.048	.376	**.591**	-.288	.18	-.03	**.57**	.32	-.28	.80
Positive Emotions	.227	**-.475**	.340	-.074	**.497**	.159	-.265	.379	**.571**	.083	.14	-.36	.32	**.61**	.14	**.99****
Openness to Experience																
Fantasy	-.093	.022	**.644**	-.134	.296	-.262	.132	**.638**	.228	-.220	-.17	.10	**.62**	.31	.08	**.91****
Aesthetics	.076	.101	**.767**	-.029	.034	.181	.049	**.672**	.213	.073	.02	.11	**.76**	.07	-.06	**.94****
Feelings	-.020	.178	**.492**	-.169	.301	.192	.335	**.537**	.287	.106	-.09	.26	**.48**	.30	.06	**.91****
Actions	.254	-.295	**.665**	-.065	-.025	-.076	-.298	**.601**	.269	-.037	.16	-.27	**.65**	.19	-.20	**.92****
Ideas	.311	-.184	**.697**	.084	-.032	.240	-.118	**.777**	.018	-.088	.26	-.20	**.71**	.08	-.11	**.99****
Values	.011	-.219	**.538**	.250	.137	-.002	-.163	**.552**	-.076	.137	.04	-.26	**.55**	.05	.20	**.96****
Agreeableness																
Trust	.030	-.169	.020	.125	**.499**	.162	-.221	.084	.257	**.509**	.06	-.12	.03	.36	.39	**.94****
Straightforwardness	.102	-.106	-.116	**.630**	.107	.049	-.007	-.145	.047	**.638**	.30	-.25	-.05	-.24	**.49**	.74
Altruism	.356	.049	.298	.394	**.601**	.355	.030	.301	**.470**	**.510**	**.45**	.03	.35	.30	**.56**	**.97****
Compliance	**-.568**	-.278	.055	**.521**	.130	-.222	-.327	-.046	-.205	**.524**	**-.40**	-.39	.08	-.23	**.57**	**.97****
Modesty	-.003	.325	-.197	**.569**	.082	-.025	.170	.017	-.198	**.561**	.21	.17	-.13	-.36	**.50**	**.88***
Tender-Mindedness	.368	.282	.041	.050	**.668**	.316	.225	.307	.203	**.497**	.39	.36	.07	**.47**	**.40**	**.87***
Conscientiousness																
Competence	**.729**	-.226	.126	.307	.105	**.769**	-.291	.150	.100	-.011	**.76**	-.27	.17	.12	.07	**.99****
Order	**.654**	-.027	.032	**.443**	.095	**.690**	-.077	-.166	-.065	-.003	**.75**	-.12	.10	-.04	.20	**.90****
Dutifulness	**.749**	-.199	.143	.269	.146	**.745**	.025	.053	.218	.231	**.77**	-.23	.19	.17	.06	**.92****
Achievement-Striving	**.834**	-.162	.227	.102	.097	**.771**	-.058	.233	.163	-.108	**.80**	-.16	.26	.24	-.11	**.99****
Self-Discipline	**.767**	-.262	.058	.172	.126	**.769**	-.261	.003	-.068	.076	**.76**	-.27	.09	.22	-.02	**.92****
Deliberation	.250	-.055	.028	**.687**	.020	**.593**	-.321	.031	-.083	.169	**.45**	-.23	.11	-.31	**.43**	**.85***
Factor Congruence											**.95****	**.97****	**.94****	**.91****	**.92****	**.94****

Table 3.11 Factor analysis using Procrustes rotation for race and the NEO-PI-3

Scale	Varimax Rotation - Black					Varimax Rotation - White					Procrustes Rotation					
	F1	F2	F3	F4	F5	F1	F2	F3	F4	F5	F1	F2	F3	F4	F5	CC
Neuroticism																
Anxiety	-.185	**.705**	.066	-.181	.112	-.051	**.869**	.043	-.155	.066	-.11	**.74**	-.08	-.12	.02	**.98****
Angry Hostility	-.048	**.653**	-.324	-.119	-.323	.013	**.411**	-.275	-.702	-.151	.03	**.50**	-.11	**-.52**	-.34	**.93****
Depression	-.313	**.709**	-.198	-.056	.113	-.291	**.825**	-.169	.016	.041	-.24	**.72**	-.00	-.14	-.26	**.90****
Self-Consciousness	-.247	**.727**	-.131	-.272	.114	-.135	**.819**	-.265	.086	-.068	-.17	**.76**	-.20	-.14	-.16	**.96****
Impulsiveness	-.375	**.583**	.173	.050	-.222	-.323	**.564**	.370	**-.420**	.113	-.29	**.52**	.14	-.41	.12	**.97****
Vulnerability	**-.633**	**.522**	-.117	-.164	.071	**-.442**	**.690**	-.210	-.222	-.153	**-.57**	**.58**	-.11	-.14	-.14	**.97****
Extraversion																
Warmth	.130	-.107	.234	**.828**	-.012	.201	-.233	**.793**	-.019	.168	.12	-.20	**.84**	.04	.10	**.99****
Gregariousness	-.193	-.248	.017	**.758**	-.157	-.161	-.266	**.488**	-.146	.259	-.21	-.36	**.72**	-.09	-.07	**.87***
Assertiveness	.376	-.324	.243	**.235**	**-.482**	**.416**	-.338	.265	-.253	.296	.36	**-.49**	.22	-.32	.26	**.97****
Activity	.312	.032	.153	**.452**	**-.513**	**.603**	-.038	.252	**-.444**	.168	.37	.07	**.48**	**-.56**	.07	**.90****
Excitement-Seeking	-.093	.024	**.434**	.371	-.335	-.057	-.173	.183	**-.528**	**.560**	-.06	-.08	**.43**	-.32	.38	**.88***
Positive Emotions	.226	-.270	**.454**	**.479**	-.047	-.001	-.288	**.725**	-.147	.220	.21	-.31	**.51**	.07	.39	**.87***
Openness to Experience																
Fantasy	-.209	.015	**.736**	.027	-.140	-.290	.175	.285	-.246	**.552**	-.18	.06	.16	-.13	**.73**	**.93****
Aesthetics	.158	-.036	**.671**	.224	-.032	.067	.165	.186	-.088	**.582**	.17	-.02	.33	.02	**.62**	**.92****
Feelings	.099	.345	**.628**	.124	-.060	.205	.054	**.501**	-.088	**.534**	.16	.34	.27	-.13	**.56**	**.88***
Actions	.018	-.337	**.531**	.250	-.158	.038	-.256	-.014	.034	**.733**	.00	-.35	.30	-.03	**.52**	**.86***
Ideas	.377	-.195	**.657**	.030	-.128	.082	-.006	.064	.021	**.793**	.37	-.20	.12	-.01	**.66**	**.89***
Values	.183	-.261	**.526**	-.063	.098	-.142	.007	.070	.344	**.513**	.16	-.17	.00	.20	**.54**	.81
Agreeableness																
Trust	.206	-.186	.024	**.489**	.153	-.004	-.162	**.551**	**.441**	.000	.18	-.21	**.46**	.22	-.05	**.91****
Straightforwardness	.204	.019	-.205	.350	**.462**	.254	.001	.018	**.694**	-.048	.18	.07	.32	**.44**	-.30	.77
Altruism	.351	.031	**.402**	**.611**	.232	**.467**	.070	**.639**	.320	.038	.35	.02	**.67**	.25	.27	**.95****
Compliance	-.164	-.235	-.096	.065	**.649**	-.199	-.083	.032	**.790**	-.040	-.22	-.02	.04	**.67**	-.12	**.99****
Modesty	.072	.127	.005	-.002	**.641**	.384	.322	-.217	**.438**	.002	.06	.31	.03	**.58**	-.05	.80
Tender-Mindedness	**.417**	.291	.264	.355	.316	.355	.205	**.623**	.110	.093	**.44**	.30	**.43**	.25	.14	**.93****
Conscientiousness																
Competence	**.754**	-.298	.167	.099	-.156	**.751**	-.256	.246	.021	.030	**.72**	**-.40**	.08	.00	.18	**.95****
Order	**.681**	-.145	-.072	-.068	.079	**.784**	-.064	.073	-.023	-.119	**.65**	-.18	-.10	.17	-.06	**.92****
Dutifulness	**.725**	-.025	.101	.291	-.023	**.806**	-.084	.163	.204	.015	**.72**	-.13	.29	.04	.04	**.96****
Achievement-Striving	**.764**	-.051	.231	.123	-.222	**.838**	-.099	.082	-.151	.212	**.77**	-.18	.14	-.13	.21	**.99****
Self-Discipline	**.772**	-.209	.077	.051	.008	**.785**	-.357	-.050	.020	-.157	**.74**	-.27	.03	.13	.08	**.95****
Deliberation	**.614**	-.339	-.010	.071	.172	**.505**	-.088	-.109	.326	-.072	**.56**	-.34	.03	.31	-.01	**.92****
Factor Congruence											**.95****	**.94****	**.88***	**.92****	**.90****	**.92****

Table 3.12 Factor analysis using Procrustes rotation for language and the NEO-PI-3

Scale	Varimax Rotation – English first language speaker					Varimax Rotation – English second language speaker					Procrustes Rotation					
	F1	F2	F3	F4	F5	F1	F2	F3	F4	F5	F1	F2	F3	F4	F5	CC
Neuroticism																
Anxiety	-.098	**-.598**	-.346	.230	-.011	-.204	**.818**	-.036	.061	-.056	-.02	**.70**	-.20	.03	-.04	**.95****
Angry Hostility	-.214	**-.644**	-.100	-.213	-.291	.124	**.643**	-.253	-.226	.427	-.19	**.54**	-.15	-.38	.31	**.88***
Depression	-.270	**-.771**	-.120	.002	.000	-.341	**.742**	-.095	-.022	-.164	-.24	**.74**	-.04	-.26	.03	**.92****
Self-Consciousness	-.201	**-.781**	-.284	.085	-.035	-.208	**.722**	-.277	-.059	-.241	-.14	**.81**	-.18	-.17	.02	**.93****
Impulsiveness	**-.458**	**-.517**	.058	.163	-.274	-.328	**.595**	.202	.200	.329	**-.40**	**.56**	.08	-.00	.33	**.95****
Vulnerability	**-.645**	**-.530**	-.184	-.023	.014	**-.532**	**.658**	-.126	-.066	-.049	**-.61**	**.57**	-.15	-.12	.01	**.98****
Extraversion																
Warmth	.174	.079	**.764**	.342	.122	.081	-.211	**.800**	.176	.157	.15	-.12	**.83**	.15	.02	**.98****
Gregariousness	-.102	.162	**.805**	-.086	-.055	-.254	-.263	**.637**	.165	.261	-.17	-.33	**.69**	-.14	.23	**.92****
Assertiveness	.260	**.469**	.297	.145	**-.440**	**.494**	-.276	.200	.197	**.401**	.28	**-.45**	.20	.26	**.45**	**.93****
Activity	.257	.003	.391	.313	**-.433**	**.424**	-.039	.368	.037	**.558**	.31	.01	.38	.20	**.48**	**.96****
Excitement-Seeking	-.068	.110	.352	.397	-.356	-.088	-.043	.288	**.440**	**.524**	-.01	-.01	.35	.36	**.41**	**.98****
Positive Emotions	.245	**.411**	**.526**	.294	-.133	.091	-.241	**.583**	.362	.184	.24	-.39	**.52**	.30	.20	**.96****
Openness to Experience																
Fantasy	-.356	.313	.014	**.570**	-.196	-.159	.158	.166	**.674**	.251	-.26	-.04	.08	**.69**	.19	**.95****
Aesthetics	.127	.253	.304	**.628**	-.049	.160	.096	.145	**.674**	.106	.19	-.07	**.43**	**.58**	.08	**.89***
Feelings	-.097	-.167	.000	**.724**	-.042	.169	.174	.313	**.646**	.055	.01	**.43**	.21	**.58**	.03	**.91****
Actions	-.133	**.541**	.214	.338	-.112	.063	-.322	.169	**.561**	.169	-.10	-.39	.21	**.51**	.13	**.96****
Ideas	.348	**.440**	.006	**.543**	-.160	.262	-.133	-.059	**.714**	.142	**.42**	-.23	.10	**.62**	.10	**.94****
Values	.184	**.573**	-.103	.356	.043	-.071	-.077	.022	**.519**	-.174	.22	-.38	-.04	**.54**	-.11	.79
Agreeableness																
Trust	.173	.201	**.526**	.065	.203	.091	-.195	**.440**	.021	-.262	.11	-.28	**.54**	.00	-.11	**.95****
Straightforwardness	.225	.061	.379	-.029	**.481**	.088	.094	.234	-.313	**-.478**	.14	-.17	**.45**	-.14	**-.40**	.82
Altruism	.306	.108	**.522**	**.499**	.271	.411	.044	**.668**	.188	-.202	.30	-.05	**.68**	.32	-.19	**.97****
Compliance	.095	.167	.154	-.110	**.637**	-.297	-.149	.094	-.043	**-.717**	.00	-.24	.23	-.12	**-.60**	**.89***
Modesty	-.016	-.023	.001	.069	**.654**	.102	.265	-.002	-.092	**-.563**	-.06	.04	.15	.00	**-.64**	**.86***
Tender-Mindedness	**.447**	-.187	.181	**.549**	.269	.269	.208	**.572**	.044	-.115	**.48**	.29	**.42**	.29	-.26	**.87***
Conscientiousness																
Competence	**.746**	.349	.022	.147	-.087	**.765**	-.317	.141	.102	.071	**.75**	-.33	.05	.17	.02	**.99****
Order	**.625**	.153	.024	-.195	.112	**.785**	-.024	.006	-.044	-.094	**.57**	-.27	.01	-.21	-.15	**.88***
Dutifulness	**.754**	-.021	.224	.072	.023	**.756**	-.124	.297	.057	-.025	**.73**	-.07	.27	-.09	-.03	**.98****
Achievement-Striving	**.808**	.069	.069	.252	-.140	**.780**	-.108	.108	.193	.285	**.84**	-.05	.14	.13	.08	**.97****
Self-Discipline	**.783**	.199	.002	-.004	.138	**.767**	-.287	.041	-.024	.054	**.75**	-.25	.05	-.04	-.20	**.95****
Deliberation	**.776**	.275	.176	-.036	.062	**.487**	-.239	-.066	.049	-.366	**.73**	-.37	.18	-.06	-.09	.83
Factor Congruence											**.93****	**.93****	**.94****	**.92****	**.92****	**.93****

3.7. Conclusion

Chapter 3 presented the statistical results in relation to reliability, validity, and bias according to gender, race, and language. To follow is a discussion of the obtained results in alignment with the structure of the methods and results sections.

Chapter 4: Discussion

4.1. Introduction

Chapter 4 is a discussion of the results obtained in the study aligned to the structure of Chapter 3. Descriptive statistics for the sample are discussed, followed by a discussion of the descriptive statistics for the NEO-PI-3. The remainder of the chapter contains a discussion of the results pertaining to internal consistency reliability, construct validity, and construct bias. A discussion of the overall results, in relation to issues highlighted throughout this report, conclude the chapter.

4.2. Descriptive Statistics: Demographic Information

It is pertinent that the descriptive statistics of the sample be mentioned due to the impact on the generalizability of the results in relation to the size and composition of the sample. The subgroupings according to gender, population group, and home language required for bias analyses were predominantly unequal and must also be explored.

The size of this sample was 272, a fair sample size that allowed for statistical analyses. The sample was made up of more female (67%) and Black (72%) participants; as shown in Table 2.1 and Table 3.2. As previously mentioned, the population group categories were collapsed according to the specifications of the Employment Equity Act (Office of the President, Department of Labour Publication of the Employment Equity Amendment Act, 2014). Considering the 2011 South African Census statistics, the population is represented by 79.6% Black, 9% Coloured, 2.5% Indian, and 8.9% White individuals (Statistics South Africa, 2011). The sample of this study; consisting of 40% Black, 7% Coloured, 23.2% Indian, and 27.6% White individuals is not truly representative of the South African population. It should be noted that the majority of this sample was constituted by individuals with access to higher education and employment. This mirrors the inequality of access to higher education and employment rife within the South African context, despite endeavors to ensure equal access to education and employment opportunities aligned to legislature such as the Employment Equity Act (Office of the President, Employment Equity Act (Act No. 55, 1998), 1998).

There was less of a discrepancy between English first language (56%) and English second language (43%) speaking individuals; as seen in Table 3.2. Moreover, the majority of the English second language participants indicated at least satisfactory to excellent English reading skill (98%) and English comprehension (97%); as reflected in Table 2.1. This is significant because, as previously mentioned; language has an impact when the language of the questionnaire is not the first language of the

respondent (Foxcroft, 1997; Foxcroft, Paterson, Le Roux, & Herbst, 2004; Foxcroft & Roodt, 2013; Laher, 2013). Due to the majority of the sample being English first language speakers, as well as 98% of the English second language speakers of the sample indicating at least satisfactory comprehension; there are no concerns with regards to the understanding of the NEO-PI-3. As a result, the differences between language groups were examined and considered to be reflective of actual differences between language groups.

The sample is not perfectly representative of the South African population, and the subgroup sample sizes were not ideal and did not meet the 100 standard indicated by Kline (1994). However, due to the paucity of research on the NEO-PI-3 within a South African context and exploratory nature of the study; it provides a sufficient comparison to establish a base from which future research might benefit. In addition, there was a concerted effort to obtain a unique sample that did not consist solely of university students (predominantly studying Psychology); as most research in the field of Psychology and personality are based on samples consisting of university students studying Psychology (Valchev, 2012). The value of this study can be seen in the attempt to provide a more reasonably representative sample that may be used as impetus for future research in this field, both locally and internationally.

4.3. Descriptive Statistics: NEO-PI-3

The descriptive statistics of means, standard deviations, skewness coefficients, as well as minimum and maximum vales for the domain and facet scales of the NEO-PI-3 were examined at the domain and facet level. Examination of Table 3.2 showed normal distribution for the scales. The means, standard deviations, as well as minimum and maximum vales were within the ranges specified in the latest version of the NEO Inventories professional manual (McCrae & Costa, 2010). The means and standard deviations obtained from the normative adult American sample (MUS) are presented in Table 4.1 and were compared to the South African sample (MSA) (McCrae & Costa, 2010).

The standard deviations on the facet scales appear similar between the South African and American adult groups examined. A 3 point difference was found in mean scores on the Openness to Experience domain, indicating that South African adults tended to show more appreciation for art and beauty, as well as having more openness to new ideas than their American counterparts. However, South African adults showed less openness to feelings, not placing as much emphasis on either positive or negative feelings as American adults.

There was also a 2 point mean score difference between the groups on the Conscientiousness domain, indicating a slightly stronger emphasis on ambition and a stronger drive to succeed in the

Table: 4.1. Means and standard deviations for the NEO-PI-3 (Form S, Adults)

Domain/Facet	Mean	Standard Deviation	Diff (M_{SA}-M_{US})
Neuroticism	**82.7**	**22.3**	**1.90**
Anxiety	15.7	5.6	1.05
Angry Hostility	13.6	4.7	1.11
Depression	13.3	5.5	1.40
Self-Consciousness	13.4	5.0	1.37
Impulsiveness	15.7	4.2	.62
Vulnerability	11.1	4.3	.58
Extraversion	**110.4**	**19.3**	**-.67**
Warmth	22.3	4.4	-1.02
Gregariousness	17.1	5.1	-1.02
Assertiveness	16.1	4.9	.56
Activity	17.7	4.3	-.49
Excitement-Seeking	17.2	5.1	.82
Positive Emotions	20.2	4.9	.50
Openness to Experience	**107.7**	**18.6**	**3.29**
Fantasy	17.1	4.6	.09
Aesthetics	16.4	5.7	2.09
Feelings	20.4	4.1	-2.80
Actions	15.9	3.6	.16
Ideas	17.8	5.4	1.70
Values	20.1	4.2	-.62
Agreeableness	**119.1**	**18.2**	**-1.39**
Trust	19.5	4.5	-3.15
Straightforwardness	20.3	4.7	-.50
Altruism	23.4	3.9	-.61
Compliance	16.4	4.5	.68
Modesty	19.1	4.4	-.13
Tender-Mindedness	20.4	3.9	2.32
Conscientiousness	**121.1**	**19.9**	**2.10**
Competence	21.4	3.8	-.76
Order	19.3	5.0	.96
Dutifulness	22.3	4.0	-.30
Achievement Striving	19.6	4.5	1.51
Self-Discipline	20.5	4.6	-.12
Deliberation	17.9	4.5	.91

South African adult group. There was a 1.9 mean score difference between the groups on the Neuroticism domain, indicating that the South African adults were slightly more likely to show more fear, moodiness, worry or frustration than did the American group overall.

The South African group also showed a slightly lower score on the Agreeableness domain, tending to be much more skeptical and less trusting of others than the American group even though they show stronger preferences for showing concern and empathy for others. The South African group also obtained a slightly lower score on the Extraversion domain; showing slightly lower preferences for warmth and personal intimacy, as well as for spending time with others than their American counterparts.

Overall, South African adults appeared to score higher on the Neuroticism, Openness to Experience, and Conscientiousness domains; while American adults appeared to score slightly higher on Extraversion and Agreeableness. McCrae et al. (2005) also reported that European and American college students tend to score higher on Extraversion and Openness to Experience than Asian and African students when completing the NEO-PI-R. On the NEO-PI-3, South African adolescents obtained higher scores on Neuroticism, but lower on Extraversion, Openness to Experience, Agreeableness, and Conscientiousness than American adolescents (Boshoff, 2014). It may be tentatively concluded that individuals in an African culture show more Neuroticism, as well as less Extraversion, Agreeableness and Openness to Experience. Further analysis of the data is warranted in order to draw reasonable conclusions regarding the significance of the variability observed.

4.4. Internal Consistency Reliability

Internal consistency reliability coefficients for this study are lower overall than those reported for the American normative sample in McCrae and Costa's professional manual, as well as for a South African study piloting the use of the NEO-PI-3 with student and adolescent samples (Boshoff, 2014; McCrae & Costa, 2010; Quy, 2011). A recent study utilising the NEO-PI-3 in a Greek population also obtained internal consistency coefficients lower than the American normative sample even though the five factor structure was well replicated in the Procrustes rotation analysis (Fountoulakis, et al., 2014). As shown in Table 4.2, the domain internal consistency reliability coefficients showed no significant difference between the samples considered, except for Agreeableness which had a reliability coefficient of .78 (normative sample =.90) (McCrae & Costa, 2010; Quy, 2011). However, the internal consistency reliability coefficients of this study were higher in comparison to South African adolescents. This study reported a reliability coefficient of .75 for Neuroticism, .79 for Extraversion, .69 for Openness to Experience, .61 for Agreeableness, and .83 for Conscientiousness (Boshoff, 2014).

At the facet level, the internal consistency reliability coefficients were also lower than the normative American and comparative South African sample (McCrae & Costa, 2010; Quy, 2011). The Neuroticism

facets of Anxiety, Angry Hostility, Self-Consciousness, and Impulsiveness showed lower coefficients than both the normative and comparative samples (McCrae & Costa, 2010; Quy, 2011). However, the Depression and Vulnerability facet coefficients of this study were similar to those in the comparative study (Quy, 2011). In comparison to the South African adolescent sample, reliability coefficients in study were higher except for Gregariousness (adolescent sample =.64), Straightforwardness (adolescent sample =.54), Modesty (adolescent sample =.68), and Tender-Mindedness (adolescent sample=.56).

Table: 4.2. Internal consistency reliability coefficients for the NEO-PI-3

Domain/Facet	South African Adults	Quy (2011)	McCrae & Costa (2010)
Neuroticism	**.91**	**.91**	**.93**
Anxiety	.72	.77	.83
Angry Hostility	.65	.71	.75
Depression	.74	.77	.83
Self-Consciousness	.70	.75	.77
Impulsiveness	.60	.66	.66
Vulnerability	.71	.72	.77
Extraversion	**.88**	**.89**	**.89**
Warmth	.71	.76	.79
Gregariousness	.63	.75	.76
Assertiveness	.70	.75	.77
Activity	.60	.57	.69
Excitement-Seeking	.64	.64	.69
Positive Emotions	.76	.77	.80
Openness to Experience	**.87**	**.89**	**.89**
Fantasy	.64	.77	.75
Aesthetics	.78	.81	.83
Feelings	.60	.76	.71
Actions	.53	.48	.54
Ideas	.77	.79	.81
Values	.52	.63	.70
Agreeableness	**.78**	**.87**	**.90**
Trust	.66	.77	.82
Straightforwardness	.49	.67	.76
Altruism	.67	.72	.78
Compliance	.67	.67	.71
Modesty	.58	.75	.76
Tender-Mindedness	.53	.66	.69
Conscientiousness	**.92**	**.92**	**.92**
Competence	.67	.70	.75
Order	.71	.79	.80
Dutifulness	.61	.69	.70
Achievement Striving	.79	.78	.77
Self-Discipline	.74	.77	.78
Deliberation	.72	.76	.76

All Openness to Experience facets showed significantly lower coefficients than the American normative sample, except for Actions at .53 (normative sample =.54) and Ideas at .77 (normative sample = .81) (McCrae & Costa, 2010). The Actions and Values coefficients were also not within the .60 cut-off recommended in the literature (Nunnally & Bernstein, 1994). In comparison to Quy's (2011) sample, Actions had a higher coefficient of .53 as compared to the sample coefficient of .48. Further analysis is required in order to determine the cause of the consistently low alpha coefficients for the Actions facet. The coefficients for Aesthetics at .78 (comparative sample =.81) and Ideas at .77 (comparative sample =.79) were similar in this study and the comparative sample (Quy, 2011).
All Agreeableness facets showed lower coefficients than both the normative and comparative samples, except for Compliance; which showed the same coefficient of .67 in this study and the comparative sample (McCrae & Costa, 2010; Quy, 2011). Other Agreeableness facet coefficients in this study ranged between .49 and .67, with the normative sample's coefficients ranging between .69 and .82 (McCrae & Costa, 2010). Straightforwardness, Modesty, and Tender-Mindedness coefficients did not fall within the recommended cut-off and further analysis is required to determine the cause of the low coefficients for these facets (Nunnally & Bernstein, 1994).

For the Conscientiousness facets, Achievement Striving had a coefficient of .79; which was higher than both the comparative (.78) and normative (.77) samples (McCrae & Costa, 2010). All other facets had lower coefficients in comparison to both samples. Competence had a coefficient of .67 (normative sample =.75), Order .71 (normative sample =.80), Dutifulness .61 (normative sample =.70), Self-Discipline .74 (normative sample =.78), and Deliberation .72 (normative sample =.76).

The aim of this study was to determine whether the NEO-PI-3 scales were reliable within a South African context. In other words, the focus was on the consistency of measurement. In alignment with previous cross-cultural studies conducted with African samples, the alpha coefficients were adequate but lower than the American sample overall in this study (McCraeet al., 2005; Teferi, 2004; Quy, 2011). From the results of the reliability analysis, it is clear that the internal consistency of the NEO-PI-3 is comparable to the American normative sample and a comparative South African sample at the domain level. As such, the questionnaire appears to be a consistent measure of broad personality domains in the South African context. Regardless of the internal consistency coefficients being lower in this study than the American normative sample and the comparative South African sample, the coefficients indicated adequate internal consistency and point to the consistency of measurement at the facet level as well. However, the validity and bias results need to be examined in relation to these findings

before concluding arguments can be made regarding the applicability of the NEO-PI-3 in the South African context.

4.5. Construct Validity

Construct validity in this study of the NEO-PI-3 was explored by means of exploratory factor analysis (EFA) with varimax rotation, as well as Confirmatory Factor Analysis. The aim of this study was to determine whether the NEO-PI-3 factored into a five factor solution within the South African context, with a concern for the precision and accuracy of measurement. The NEO-PI-R has evidenced sufficient construct validity across different cultures in previous studies, supporting the generalizability of the NEO-PIs and the FFM (McCrae et al., 2005). To follow is a description of the factor analyses results.

4.5.1. Exploratory Factor Analysis

As discussed in Chapter 3, five factors were retained on the basis of theoretical and empirical grounds. On examination of Table 3.4, it is evident that all factors in this five factor solution did not load in an order congruent with the FFM (McCrae & Costa, 2010). Here, Conscientiousness facets loaded positively and above .58 on Factor 1. Factor 2 evidenced high positive loadings above .55 for the Neuroticism facets. Openness to Experience facets loaded positively and above .56 on Factor 3. However, Extraversion and Agreeableness loaded together on Factor 4 with some Agreeableness facets also loading on Factor 5. As a result of all factors not loading as expected, a six factor solution for the NEO-PI-3 using varimax rotation was investigated.

On examination of Table 3.5, it is evident that all factors did not load as expected with the six factor solution analysed. Here, Conscientiousness facets loaded on Factor 1, with all facets loading positively and above .64. Assertiveness no longer loaded on Factor 1 as it did with the 5 factor solution. Neuroticism facets loaded positively and above .46 on Factor 2. Openness to Experience facets loaded positively and above .48 on Factor 3, with a cross loading on Excitement-Seeking (.491) that was slightly weaker on the expected Factor 4 (.471). Extraversion facets loaded positively and above .45 on Factor 4, except for Assertiveness; which showed a stronger loading on Factor 6. Agreeableness facets loaded more clearly on Factor 5 with positive loadings above .44, except for Compliance (.240) which did not show any positive loadings above .40 on any of the factors. None of the domains loaded clearly on Factor 6, with only moderate loadings with Impulsiveness, Assertiveness, and Activity. Interestingly, Compliance evidenced no positive loadings on any of the Factors and showed a high negative loading on Factor 6.

In order to obtain a more optimal solution, Compliance was removed and the five factor solution was rerun. The five factor solution excluding Compliance resulted in all the facets loading according to the FFM, except for Assertiveness; which showed a higher positive loading on Factor 1 than it did on Factor 4 (McCrae & Costa, 2010). Aesthetics and Feelings also loaded positively on the Neuroticism domain. Costa and McCrae (1992) assert that personality traits are related, so cross-loadings are to be expected and should not be of concern. However, the higher loading should occur on the expected factor; which occurred with Aesthetics and Feelings, but not for Assertiveness (Cost & McCrae, 1992).

The Procrustes solution (as presented in Table 3.7) evidenced significant congruence coefficients for all domains and facets except Assertiveness, Aesthetics, Values, and Tender-Mindedness. Even so, there was sufficient agreement with the normative sample to support the applicability of the NEO-PI-3 and FFM in a South African context at the domain and facet levels. These results point to the appropriateness of using the NEO-PI-3, and the FFM on which it is based, in this context; as opposed to previous studies that were not able to replicate this model adequately (Teferi, 2004; Quy, 2011). For example, Teferi (2004) reported that there was a distinct difference in the pattern of the structure, where Extraversion and Openness to Experience did not replicate sufficiently in Tigrigna culture with the NEO-PI-R.

The exception to this is the Compliance facet; which needed to be removed for the FFM to replicate. Compliance concerns the way in which individuals address conflict with others (McCrae & Costa, 2010). Perhaps in the South African context, there is not a clear distinction between conflict situations being addressed by either competition or cooperation as this facet is defined for a Westernised context (McCrae & Costa, 2010). It could be possible that there is a more complex interplay and delicate balance, in a multicultural context such as South Africa, between competing with others in an overtly aggressive manner and simply complying. However, further investigation into the conceptualisation of the Compliance facet within a South African context is recommended for future research in order to determine the reason for this facet not replicating adequately.

One Extraversion facet, Assertiveness, appeared to be problematic as it loaded on Factor 4 at .33; which is below the recommended cut-off. Costa and McCrae (2010) indicate that high scorers tend to be dominant and forceful, while low scorers prefer to remain in the background. This facet was not problematic in the American normative sample, loading on the Extraversion facet as expected at .53; indicating that the facet is only problematic with this sample. Unfortunately there were no comparative studies found with an adult South African population to confirm these results and further

investigation is recommended to determine whether this construct is conceptualised differently in the South African population.

In this study, Factor 1 accounted for 25.38% of the shared variance, Factor 2 accounted for 12.12% of the variance, Factor 3 7.97%, Factor 4 7.66%, and Factor 5 5.04%. These unequal percentages possibly point to a difference in the contribution of certain factors over others to personality within the South African context. This possibility is a point for future research in order to substantiate the specific contributions made by each factor.

With regards to the order of the factors, Costa and McCrae (2010) assert that Neuroticism can be described as Factor 1, Extraversion as Factor 2, Openness to Experience as Factor 3, Agreeableness as Factor 4, and Conscientiousness as Factor 5. In the initial 5 factor solution, Conscientiousness loaded on Factor 1, Neuroticism on Factor 2, Openness to Experience on Factor 3, Extraversion on Factor 4, and Agreeableness on Factor 5. However, once the Compliance facet was removed and the 5 factor solution was rerun, the order of the factors changed. In this instance, the order of the factor loadings matched that of Costa and McCrae's (2010). Here, the factors loaded positively with Neuroticism on Factor 1, Extraversion on Factor 2, Openness to Experience on Factor 3, Agreeableness on Factor 4, and Conscientiousness on Factor 5 as expected. These results appear to support the construct validity and applicability of the NEO-PI-3 and FFM in the South African context.

4.5.2. Confirmatory Factor Analysis

The CFA results in this study led to the rejection of the proposed model, even after the Compliance facet was removed from the analysis; as was done with the EFA. The Chi-square value was found to be significant, indicating a poor overall model fit. The fit indices did not reach the acceptable standard for a good fitting model; except for the RMSEA and SRMR, which indicated adequate model fit.

The use of CFA to assess personality questionnaires based on the FFM has been debated, due to the inadequate performance of and ambiguous results produced by various FFM personality questionnaires in CFAs (Herrmann & Pfister, 2013; Hurley, et al., 1997). It has been questioned whether or not CFA is suitable for this type of analysis in terms of effectively measuring particular personality questionnaires' structure due to the level of detail required (Herrmann & Pfister, 2013; Parker et al., 1993). Parker et al. (1993) posit that this is not the case for the NEO-PIs however; as the questionnaire was designed "to conform to a detailed model that identifies specific links between items, first order factors, and second order factors" and has been successfully utilised with other

factor structured personality questionnaires such as the Tridimensional Personality Questionnaire (TPQ) (p. 465). The effect on the construct validity of a questionnaire of using more complex models in CFA has also been questioned (Herrmann & Pfister, 2013; Parker et al., 1993). In addition, Gignac (2009) mentioned opposition of some researchers regarding the use of the same dataset for EFA and CFA. As a result, Hermann and Pfister (2013) have recommended that a model of personality, as well as construct validity, should not be rejected on the basis of CFA results alone. Moreover, Hurley et al. (1997) stated that "If one does apply CFA to the data and subsequently finds poor fit, then I think that one should revert to EFA and that reviewers should not penalize the author for doing so" (p. 673). Alternatively, using Procrustes rotation has recently been proposed as a means of assessing the factor structure of the NEO-PI-3 (Fountoulakis, et al., 2014).

A previous study conducted on the NEO-PI-R, with a sample size of 1 000 participants, showed poor fit between the tested and hypothesized 5 factor model even when the model was modified in an attempt to obtain a more optimal fit (Parker et al., 1993). The Chi-square test is often said to be overly sensitive, unnecessarily producing a significant result especially with larger samples (Gignac, 2009; Parker et al., 1993). The sample in this study would not be considered large, and this may not have contributed to the significant Chi-square obtained, but it is important to keep in mind when considering the need for multiple goodness-of-fit statistics to assess model fit (Herrmann & Pfister, 2013; Parker et al., 1993).

A recent study conducted with a sample of 734 Greek participants using the NEO-PI-3 produced an acceptable model fit when utilizing CFA, confirming a five factor structure (Fountoulakis, et al., 2014). Adding to the debate regarding the applicability of CFA for assessing the structure of a personality scale, the researchers indicated that a simplistic model (with facets loading on to one specified dimension) is unlikely, but testing more complex models (taking cross-loadings into account) is also unlikely to present a clear indication of factor structure (Fountoulakis, et al., 2014).

4.6. Construct Bias in the NEO-PI-3

Construct bias was investigated for the gender, population group and home language variables to compare factor structures and determine structural equivalence.

4.6.1. Gender and Personality

The Procrustes rotation and congruence coefficients for gender and the NEO-PI-3 are presented in Table 3.10. Overall, there was significant agreement between the gender groups, as evidenced by the

congruence coefficients obtained. The only facets that did not exhibit significant agreement were Excitement-Seeking from the Extraversion domain (.80) and Straightforwardness from the Agreeableness domain (.74).

Previous cross-cultural studies conducted with earlier versions of the NEO-found negligible, if any, differences between the gender groups in African cultures (McCrae et al., 2005). A recent study with Greek participants has replicated the five factor structure of the NEO-PI-3, giving support to cross cultural application of the questionnaire (Fountoulakis, et al., 2014).

The aim of this study was to examine the influence of gender on responses to the NEO-PI-3 in order to ascertain the impact on the practical application of the questionnaire. As previously discussed, personality questionnaires are often utilized in decision making regarding access to employment, education and other organisations that have long term impact on individuals' access to resources for further development. As a result, it is essential that group differences are understood to ensure that the interpretation of personality questionnaire results are equal and fair across gender groups (Laher, 2013). Sufficient congruence between the gender groups in this study is evidenced by the factor analyses as well as the Procrustes rotation. The questionnaire may be fairly applicable in a South African context for the different gender groups.

4.6.2. Race and Personality

The Procrustes rotation and congruence coefficients for Race and the NEO-PI-3 are presented in Table 3.11. Overall, there was significant agreement between the Black and White race groups, as evidenced by the congruence coefficients obtained. The only facets that did not exhibit significant agreement were Values (.81), Straightforwardness (.77), and Modesty (.80).

Previous research conducted on earlier versions of the NEO-PI in a South African context, found that the five factors were clearly replicated for the White population group, but not the Black population group; particularly for Openness to Experience (Heaven & Pretorius, 1998; Heuchert, Parker, & Stumpf, 2000; Quy, 2011).

This study aimed to determine whether or not racial bias functions in responses to the NEO-PI-3. It is acknowledged that population groups are not homogenous and that variation will exist on certain personality traits (Laher, 2013). However, it is vital to have an understanding of these differences to ensure that the interpretation of results takes these differences into account when the tool is utilized

in practice. The factor analysis and Procrustes rotation indicates that there are some differences at the facet level, but there is sufficient overall congruence between the Black and White population groups studied. Regarding the applicability of the NEO-PI-3 in a South African context, the results of this study indicate that the responses on the domain and facet scales are not significantly influenced by race. Therefore, the FFM and NEO-PI-3 may be regarded as equally and fairly applicable across different population groups in the South African context.

4.6.3. Language and Personality

The Procrustes rotation for Language and the NEO-PI-3 are presented in Table 3.12; indicating that three of the five factors loaded clearly and according to the FFM for the Language group. There was also significant agreement between the language groups, as evidenced by the congruence coefficients obtained. The only facets that did not exhibit significant agreement were Values (.79), Straightforwardness (.82), and Deliberation (.83).

A previous study conducted in South Africa with the NEO-PI-R found that the five factor structure was replicated well for Afrikaans-speaking, but not Sotho-speaking individuals; particularly for Conscientiousness, Agreeableness and Openness to Experience (Franklin-Ross, 2009).

This study aimed to examine the influence of language on responses to the NEO-PI-3, particularly for those participants who spoke English as a second language. Here, it is assumed that language has an effect on how particular personality traits are understood or expressed (Laher, 2013). It is essential to go a step further and examine the impact of these differences in order to interpret results for different language groups more fairly when the questionnaire is practically utilised. The factor analysis and Procrustes rotation indicates that there are some differences at the facet level, but there is sufficient overall congruence between the language groups. Moreover, there were no significant differences at the domain level. Therefore, the FFM and NEO-PI-3 may be regarded as equally and fairly applicable across the different language groups in the South African context.

4.7. Conclusion

Chapter 4 presented a discussion of the results obtained in the study aligned to the structure of Chapter 3. Descriptive statistics for the sample were discussed, followed by a discussion of the descriptive statistics for the NEO-PI-3. The remainder of the chapter was made up of a discussion of the results pertaining to internal consistency reliability, construct validity, and construct bias. A

discussion of the limitations of this study and recommendations for future research will be the focus of Chapter 5.

Chapter 5: Limitations and Recommendations for future research

5.1. Introduction

This chapter consists of a more detailed discussion of limitations in this study; which has been highlighted throughout previous chapters. Recommendations for future research and concluding comments will follow.

5.2. Quantitative study limitations

This study set out to explore the applicability of a Western, individualistic construction of personality to a non-Western, collectivistic culture in a manner consistent with previously conducted studies (Laher, 2010; Branco e Silva & Laher, 2012; Fountoulakis, et al., 2014; McCrae et al., 2005). Due to the quantitative nature of this study, objective and scientifically rigorous data was obtained (Gravetter & Forzano, 2003). However, a more in-depth qualitative analysis that is able to account for individual variation in a multicultural context could prove even more valuable in highlighting cultural nuances in the conceptualization and expression of personality (Boshoff, 2014; Laher, 2013). For this study in particular, additional qualitative information may have been used to provide insight into the problematic nature of the Compliance facet in the South African context.

5.2.1. Nomothetic limitations

In-depth analysis of individuals was not possible due to the use of nomothetic methods and the position of the FFM within this approach; which is concerned with making broad generalisations based on the commonalities found in human personality (Branco e Silva & Laher, 2012). As a result, a focus specifically on quantitative data in this study allowed for the breadth of information required, but not necessarily the depth that would allow for more concrete hypotheses regarding the applicability of the NEO-PI-3 and FFM in a multicultural context such as South Africa.

5.2.2. Personality questionnaire limitations

It is vital to remain cognizant of the fixed nature of personality questionnaires, with the limited number and range of responses available to participants (Laher & Cockcroft, 2013; Laher, 2013). It remains a challenge to attempt to account for the range of complexity in human personality with a fixed instrument. Questionnaires are a good measure to begin with, and can add tremendous value when combined with qualitative interviews and practical behavioural exercises (Gravetter & Forzano, 2003; Boshoff, 2014).

5.2.3. Limitations in terms of self-report instruments and response bias

This study relied on self-reported information without considering the possible influence of response bias (as a result of acquiescence or socially desirable responses). The NEO-PI-3 does not contain formalized items that measure social desirability, faking, or acquiescence; and as such, it is not always feasible to measure response bias to determine the effect on results unless brought into the study's design before data collection occurs (McCrae & Costa, 2010; Laher, 2013).

5.3. Sampling limitations

Exploratory studies such as this are valuable regardless of sample size and representativeness (Fountoulakis, et al., 2014). Even though the sample size in this study could be considered adequate, the conclusions could not be stated as widely generalizable due to the limited size and composition as participants were from Johannesburg and surrounding areas only. In addition, non-probability convenience sampling did not allow for random selection that would have allowed all individuals in the population to have an equal chance of being selected for the study, making the sample more representative of the population (Gravetter & Forzano, 2003).

5.4. Correlational design limitations

Due to the correlational design of the study, an attempt to determine causal relationships between variables was not possible (Gravetter & Forzano, 2003). In addition, the relationship between variables that could be considered was not dynamic, but linear in nature (Laher, 2013). However, this is a limitation that did not significantly impact on the value that this study adds to the consideration of how applicable the NEO-PI-3 and FFM are in the South African context.

5.5. Reliability and validity limitations

Various additional types of validity and reliability were not explored in this study due to time constraints and the limitations imposed by the anonymity of responses to the questionnaire. Test-retest reliability could possibly be explored in future studies; along with face, content and criterion related validity should the research design allow it (Laher, 2013; Branco e Silva & Laher, 2012; Quy, 2011). For example, face validity is beneficial in obtaining respondents' views on what they think the questionnaire is aiming to determine, a critical step in adapting questionnaires for different cultures (Quy, 2011). In addition, criterion validity allows the questionnaire to be compared to a more

established test in a particular culture, providing a good measure for applicability of the new instrument (Branco e Silva & Laher, 2012).

5.6. Bias limitations

The distribution of the total sample across gender, race, and home language were not equal. This resulted in groups being collapsed to allow for fair statistical analysis (Laher, 2013). Even though this division could be justified as mirroring the Employment Equity Act, the groups remained heterogeneous (Office of the President, 2014). Future studies may consider a more structured manner of assessing differences in the diverse and multicultural South African context, rather than relying on past research and current legislature for the definition of variables for bias analysis. In addition, method and item bias could be explored in addition to construct bias as a more comprehensive exploration than focusing on one aspect of a complex construct.

5.7. Factor analysis limitations

Even though factor analysis is a widely utilized technique, there are some limitations with regards to implementation in this study specifically. Firstly, the number of participants per group utilized in the bias analysis was not equal and did not contain a large number of respondents. Moreover, there is some level of subjectivity that comes in to play with regards to the number of factors to retain and facets to exclude in order to ensure replicability. In addition, for the confirmatory factor analysis, it would have been preferable to utilize a dataset with data obtained from another sample rather than using the same dataset for the exploratory and confirmatory factor analysis (McCrae et al., 1996). Utilizing separate datasets allows for the factor structure identified in EFA to be confirmed with different data rather than being verified with the same dataset, thereby allowing wider generalizability of results (Rosseel, 2012). However, this is rarely possible in exploratory studies of this nature. This study aimed to ensure the most efficient and effective use of factor analysis by utilizing various methods and ensuring that both theoretical and empirical techniques were taken into account when deciding on the number of factors to retain.

5.8. Limitations in terms of socioeconomic status

One critical aspect that this study was not able to consider was the impact (if any) of socioeconomic status on personality in the South African context. It was considered to utilize the level of education and occupation data obtained from the sample in order to assess this impact. However, it was decided that only utilizing these two aspects would be an oversimplification of a complex and elaborate variable. Other basic factors that need to be considered in an exploration of socioeconomic status are

total household income, the number of individuals in the household dependent on that income, total household expenses and the relation between these in order to determine the level of disposable income. Especially when studying adolescents and students, it would be valuable to also consider parental education and income levels as a measure of historical socioeconomic status that might have an impact on the individual's level of disposable income. Therefore, when attempting to measure the impact of socioeconomic status, it is vital to take all potential extraneous factors into consideration when planning the study to avoid a reliance on a small number of factors and potentially basing recommendations on insufficient analysis of variables.

5.9. Recommendations

It is pertinent to mention the most readily addressable recommendations for future research consideration based on information obtained from the literature review, results, and limitations.

At the outset, future studies of this nature should also consider a mixed quantitative and qualitative methods technique in gathering and analyzing data. As mentioned, having quantitative data supported by qualitative data (and vice versa) could provide a broader and more insightful exploration of the complexity of personality within a multicultural context such as South Africa. Perhaps the quantitative data in this study could have been elaborated on with information acquired through qualitative analysis in order to understand the variation found at the facet level; with Compliance in particular.

Due to the limitations in sample size and composition, it is recommended that future research endeavors to obtain a larger and more representative sample of the South African population. This would allow for more widely generalizable conclusions, and perhaps enable a more effective exploration of issues of bias in a multicultural context such as South Africa.

The research design may also utilize techniques other than non-probability convenience sampling to ensure that all individuals in the sample have an equal chance of being selected. Non-response and volunteer bias is an important consideration that might be explored more effectively if the study considered random selection at the outset. It is recommended that future studies attempt to collect and analyse data related to response bias in relation to the responses to questions being analysed.
Perhaps this type of study might be able to better account for the complex nature of personality in an even more complex multicultural setting. An important addition to future studies might also be an exploration of how bias may adequately be accounted for in result interpretation and application in

practical settings, to ensure that differences between groups do not negatively impact any group in particular.

In order to address some of the concerns related to using self-report measures and response bias, future research should perhaps utilize a combination of self- and other-report instruments. This would enable more in-depth and dynamic analysis than enabled by participants' perceptions alone. The NEO-PIs has an observer version of the instrument that is available for use. One-on-one interviews to confirm, or probe differences or similarities between the self and observer reports could also provide much valuable insights.

Age differences in personality, as well as socioeconomic status may be explored should these variables be considered in the initial design of the study to ensure that the comprehensive and complex nature of these constructs can enhance the information obtained, rather than be a potential point of criticism. It is recommended that future research consider including sufficient measurement indicators to enable the multilevel analysis required when considering the impact of socioeconomic status, especially in a multicultural context with such a complex political history. For example, household income, education level, current position and employment status, rate of unemployment, disposable household and individual income, and region are but a few of the necessary factors to consider to determine the impact of socioeconomic status.

5.10. Concluding comments

The main aim of this study was to explore how applicable the NEO-PI-3 is in the South African context through the examination of reliability, validity and bias. With regards to the reliability results, the internal consistency reliability coefficients were adequate. The internal consistency reliability coefficients of the domains were comparable to those of the American normative sample, as well as a South African comparative sample (McCrae & Costa, 2010; Quy, 2011). However, the internal consistency reliability coefficients were consistently lower in this study than for the American normative sample and the South African comparative sample; indicating more variability at the facet level (McCrae & Costa, 2010; Quy, 2011). All Neuroticism, Extraversion, and Conscientiousness facets were at or above the .60 cut-off point. The facets below the .60 cut-off point were Actions and Values (Openness to Experience facets), as well as Straightforwardness, Modesty, and Tender-Mindedness (Agreeableness facets).

With regards to construct validity, Compliance was found to be problematic and removed from the five factor solution for the EFA. The result was clear replication of the five factors in the following order: Conscientiousness, Neuroticism, Openness to Experience, Extraversion, and Agreeableness. For the Procrustes rotation with the American normative sample, agreement was found between all facets except Aesthetics, Values, and Tender-Mindedness. The CFA did not reach an acceptable standard of fit to the data, and the model was rejected. However, this did not reflect on the adequacy of the model due to the debate regarding the efficacy of this technique with personality questionnaire data.

Race and language were not found to significantly influence responses to the NEO-PI-3; making the FFM and NEO-PI-3 applicable across these groups in the South African context. There was agreement between the male and female groups at the domain level, with congruence coefficients ranging from .91 - .97. Facets that did not yield significant congruence coefficients were Excitement-Seeking (.80) and Straightforwardness (.74). There was agreement at the domain level between the black and white population groups that ranged between .85 and .95. At the facet level, Straightforwardness (.77) and Modesty (.80) did not yield significant congruence coefficients. Congruence coefficients ranged between .92 and .94 at the domain level for the English first language and English second language speaking groups. Facets that did not yield significant congruence coefficients were Values (.79), Straightforwardness (.82), and Deliberation (.83). As such, bias does not appear to be operational at the facet level for the gender, race, and language groups in a South African context. The results suggest that the NEO-PI-3 may be effectively used in the South African context with the exception of certain facets identified as problematic in the reliability, validity and bias analyses. Further research with larger and more representative samples is required to determine if the structure will hold as in this study and if the variations with certain facets will be consistent or not.

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Appendix A: Cover Letter and Questionnaire

Psychology
School of Human & Community Development
University of the Witwatersrand
Private Bag 3, Wits, 2050
Tel: 011 717 4503 Fax: 011 717 4559

Dear Sir / Madam

Good day! We are currently completing our postgraduate degrees at the University of the Witwatersrand and are conducting research into personality theory and assessment. Part of this research requests your responses on the attached questionnaire. It should take you approximately 45 minutes to complete the questionnaire. We understand that this is a substantial investment of your time. However, your response is valuable as it will contribute towards a broader study on the understanding of personality and assessment in a South African context in addition to having an impact on research nationally and internationally. We would therefore like to invite you to participate in this research.

Your responses will remain confidential and anonymity is guaranteed. At no time will we know who you are, since the questionnaire requests no identifying information. Completion and return of the questionnaire will be considered to indicate permission for your responses to be used for the research project. Should you choose not to participate, this will not be held against you in any way. As we will only focus on group trends, and have no way of linking any individual's identity to a particular questionnaire, we will not be able to give you individual feedback. You may email any of us approximately 3 months after completion of this questionnaire should you require general feedback on the results of this study. If you have any further questions or require feedback on the progress of the research, please feel free to contact us on the details provided below.

Thank you for considering taking part in the research project. Please detach and keep this sheet for future reference.

Ms. E. Boshoff
boshoffemma@yahoo.com
Ms. K. Pillay
Kimerapillay14@gmail.com
Ms. S. Dockrat
safiad@hotmail.co.za
Ms. T. Frank
tanyajadefrank@gmail.com
Prof. S. Laher (Supervisor)
Sumaya.laher@wits.ac.za

Demographic Information

(Please cross the option that applies to you, where appropriate)

1. Age: _____

2. Gender: MALE FEMALE

3. Level of education: _____

4. Occupation: _____

5. Population group:

(This specific response is required for purposes of this research and is not meant to offend any research participant)

BLACK COLOURED INDIAN WHITE OTHER

If other, please specify _____

6. Home language:

AFRIKAANS ENGLISH isiNDEBELE sePEDI

siSWATI seSOTHO xiTSONGA seTSWANA

tshiVENDA isiXHOSA isiZULU OTHER

If other, please specify:_____

7. If English is not your home language, please rate your English reading skills with 1 being 'not so good' and 5 being 'excellent'.

1	2	3	4	5

8. If English is not your home language, please rate your English understanding/ comprehension skills with 1 being 'not so good' and 5 being 'excellent'.

1	2	3	4	5

9. Have you ever taken a psychological test before? YES NO

10. If yes, can you rate your familiarity with psychological testing processes from 1 to 5 with 1 being 'somewhat familiar' and 5 being 'very familiar'.

1	2	3	4	5

1. This questionnaire contains 240 statements. Please read each item carefully and place a cross (X) on the answer that best corresponds to your agreement or disagreement. The responses range from 0 to 4 with **0 indicating 'Strongly Disagree' and 4 indicating 'Strongly Agree'**. There are no right or wrong answers, and you do not need to be an 'expert' to complete this questionnaire. Describe yourself honestly and state your opinions as accurately as possible. Please answer every item.

2. If you find the phrasing or word in an item to be inappropriate or you cannot understand the item, please feel free to mark the item or word on the questionnaire.

		Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1.	I am not a worrier	0	1	2	3	4
2.	I really like most people I meet	0	1	2	3	4
3.	I have a very active imagination	0	1	2	3	4
4.	Often, people aren't as nice as they seem to be	0	1	2	3	4
5.	I'm known for my common sense	0	1	2	3	4

Due to copyright restrictions, the NEO-PI-3 may not be reproduced here

THANK YOU FOR YOUR CO-OPERATION

Appendix B: NEO-PI-3 Domain and Facet Table

NEO PI-3 Scale	Scale Description
Neuroticism	The tendency to experience negative affects such as fear, sadness, embarrassment, guilt and disgust.
Anxiety	Described individuals who are apprehensive, fearful, prone to worry, nervous, tense, and jittery.
Angry Hostility	The tendency to experience anger and related states such as frustration and bitterness.
Depression	Measures normal individual differences in the tendency to experience feelings of guilt, sadness, hopelessness and loneliness.
Self-Consciousness	The tendency to be uncomfortable around others, sensitive to ridicule, and prone to feelings of inferiority, usually characterized by the emotions of shame and embarrassment.
Impulsiveness	Refers to the ability to control cravings and urges and deals with levels of frustration tolerance.
Vulnerability	Measures ability to cope with stress, dependency issues and the tendency to feel hopeless or panicked when facing emergency situations.
Extraversion	A general tendency toward sociability, assertiveness, activeness and being talkative.
Warmth	Is associated with interpersonal intimacy in terms of general affectionate and friendly behavior and capacity to form close attachments to others.
Gregariousness	Refers to the preference for other people's company.
Assertiveness	Measures the tendency to be dominant, forceful and socially ascendant.
Activity	Refers to general pace of life, with high scores suggesting a rapid tempo and vigorous movement and a need to keep busy.
Excitement-Seeking	Refers to the tendency to crave stimulation and excitement like bright colours and noisy environments.
Positive Emotions	Refers to the tendency to experience positive emotions such as joy, happiness, love and excitement.
Openness to Experience	Describes levels of willingness to entertain novel ideas and unconventional values, as well as the degree to which a person is imaginative and curious as opposed to concrete-minded and narrow-thinking.
Fantasy	Refers to having a vivid imagination and an active fantasy life.
Aesthetics	Deals with capacity for appreciation or art and beauty.

Feelings	Measures receptivity to one's own inner feelings and emotions.
Actions	Refers to willingness to try different activities, go to new places or try different foods.
Ideas	The tendency to be open-minded and to consider new and sometimes unconventional ways of thinking.
Values	Refers to the readiness to re-examine social, political and religious values.
Agreeableness	Encapsulates constructs of sympathy, cooperativeness and helpfulness towards others.
Trust	Measures the degree to which individuals believe that others are honest and well-intentioned.
Straightforwardness	Describes the level to which an individual is frank, sincere and ingenuous.
Altruism	Refers to an active concern for the welfare of others as demonstrated in generosity, consideration of others and a willingness to assist others in need of help.
Compliance	Measures the extent to which individuals defer to others, inhibit aggression and forgive and forget.
Modesty	Refers to the extent that an individual demonstrates humility.
Tender-Mindedness	Measures attitudes of sympathy and concern for others.
Conscientiousness	Refers to the degree to which a person is persevering, responsible and organized.
Competence	Refers to the sense that one is capable, sensible, prudent and effective.
Order	Measures the extent to which an individual is neat, tidy and well organized.
Dutifulness	Characterised by strict adherence to ethical principles and scrupulous fulfilment of moral obligations.
Achievement Striving	Refers to the tendency to be ambitious, driven to succeed, diligent and purposeful.
Self-Discipline	Measures the ability to begin tasks and carry them through to completion despite boredom and other distractions.
Deliberation	Refers to the tendency to be cautious and think carefully before acting, especially in decision-making.

Note. Adapted from The NEO-PI-R in South Africa, by S. Laher (2013). In S. Laher and K. Cockcroft (Eds.), *Psychological Assessment in South Africa: Research and Applications.* (pp. 257-269). Johannesburg: Wits University Press.

Appendix C: Ethics Clearance Certificate

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

HUMAN RESEARCH ETHICS COMMITTEE (SCHOOL OF HUMAN & COMMUNITY DEVELOPMENT

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER: MPSYC/13/007 IH**
PROJECT TITLE:	Applicability of the NEO Personality Inventory-3 in a South African Context
INVESTIGATORS	Frank Tanya
DEPARTMENT	Psychology
DATE CONSIDERED	24/05/13
DECISION OF COMMITTEE*	Approved

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

DATE: 20 June 2013

CHAIRPERSON
(Professor A Thatcher)

cc Supervisor: Prof. S Laher

DECLARATION OF INVESTIGATOR (S)

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

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

This ethical clearance will expire on 31 December 2015

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES