

**South African Personality Inventory: The development of an investigation into the
psychometric properties of the intellect cluster**

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COMMENTS

The reader should keep the following in mind:

- The editorial style as well as the references referred to in this mini-dissertation follow the format prescribed by the Publication Manual (6th edition) of the American Psychological Association (APA). This practice is in line with the policy of the Programme in Industrial Psychology of the North-West University, Potchefstroom Campus, to use the APA style in all scientific documents as of January 1999.
- The mini-dissertation is submitted in the form of a research article. The editorial style specified by the South African Journal of Industrial Psychology (which agrees largely with the APA style) is used, but the APA guidelines were followed in constructing tables.

DECLARATION

I, Antoinette Labuschagne, hereby declare that “South African Personality Inventory: The development of an investigation into the psychometric properties of the intellect cluster” is my own work and that views and opinions expressed in this work are those of the author and relevant literature references as shown in the references.

I further declare that the content of this research will not be handed in for any other qualification at any other tertiary institution.

ANTOINETTE LABUSCHAGNE

OCTOBER 2010

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“I am only one, but still I am one. I cannot do everything, but still I can do something. And because I cannot do everything I will not refuse to do the something that I can do.”

Hellen Keller

It has been a privilege to be part of the South African Personality Inventory project. I hope my “something” will contribute to the bigger picture of how we view and understand personality in South Africa. I would like to thank the following individuals who supported me throughout:

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TABLE OF CONTENTS

	Page	
List of appendixes	vi	
List of tables	vii	
Abstract	ix	
Opsomming	xi	
 CHAPTER 1: INTRODUCTION		
1.1	Problem statement	1
1.2	Research objectives	10
1.2.1	General objective	10
1.2.2	Specific objective	10
1.3	Paradigm perspective of the research	11
1.3.1	The intellectual climate	11
1.3.2.	Meta-theoretical assumptions	12
1.3.2.1	Literature review	12
1.3.2.2	Empirical study	13
1.3.3	The market of intellectual resources	13
1.3.3.1	Theoretical beliefs	13
1.3.3.2	Methodological beliefs	15
1.4	Research method	16
1.4.1	Literature review	16
1.4.2	Empirical study	16
1.4.2.1	Research design	16
1.4.2.2	Participants and procedure	16
1.4.2.3	Measuring battery	17
1.4.2.4	Statistical analysis	18
1.4.2.5	Ethical considerations	19
1.5	Chapter division	19

1.6	Chapter summary	20
	Reference	21
	CHAPTER 2: RESEARCH ARTICLE	28
	CHAPTER 3: CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS	
3.1	Conclusions	74
3.2	Limitations of this research	78
3.3	Recommendations	79
3.3.1	Recommendations to solve the research problems	79
3.3.2	Recommendations for future research of the SAPI	79
	References	81

LIST OF APPENDICES

Appendix	Description	Page
Appendix A	Response-derived definitions of the 14 facets of the Intellect cluster	83

LIST OF TABLES

Table	Description	Page
Table 1	Characteristics of participants ($N = 524$)	42
Table 2	Descriptive statistics of the 202 items of the Intellect cluster	48
Table 3	Item correlations with facets	53
Table 4	Descriptive statistics, skewness, kurtosis and Cronbach alpha coefficients	55
Table 5	Eigenvalues of the intercorrelation matrix for the Intellect cluster	56
Table 6	Oblique factor pattern matrix of the 14 facets of the Intellect cluster	57
Table 7	Intercorrelations of the first-order factors of the Intellect cluster	58
Table 8	Hierarchical Schmid-Leiman factor solution for the 14 facets of the Intellect cluster	58
Table 9	Factor pattern matrices for White ($n = 287$) and African groups ($n=196$)	60

LIST OF FIGURES

Table	Description	Page
Figure 1	The factor solution of the Intellect cluster.	33
Figure 2.	Scree plot and parallel analysis for the Intellect cluster.	57
Figure 3.	The revised factor solution of the Intellect cluster	75

ABSTRACT

Title: South African Personality Inventory: The development of an investigation into the psychometric properties of the intellect cluster.

Key terms: South African Personality Inventory; Personality; Personality measure; Intellect; Race.

The Employment Equity Act, 55 of 1998, Section 8 (Government Gazette, 1998) provides clear guidelines for psychometric testing in South Africa. Due to the cultural complexity of the South African population, personality tests in particular do not always comply with these specifications. Most personality tests used in South Africa have been developed in and imported from other countries, and are consequently not always appropriate for all cultural groups. Also, the majority of indigenous personality tests were developed and standardised specifically for the white population. Today a major challenge in personality assessment development is to develop and standardise inventories for the 11 official language groups in South Africa.

The objectives of this study were to develop valid and reliable items for an Intellect-measuring instrument that will form part of a larger personality inventory, to investigate the factor solution of this Intellect cluster, and to compare the factor solutions of the white and African race groups respectively. An Intellect questionnaire consisting of 202 items was developed based on the qualitative phase of the South African Personality Inventory (SAPI). This research served as a pilot study. The sample consisted of ($N=524$) students from tertiary institutions in the Gauteng and the North West Provinces of South Africa. A quantitative design with an exploratory approach was used to collect data. Statistical analysis was used to analyse the data.

The results indicated that only 18 of the original 202 items proved to be unreliable. Acceptable reliability levels for all facets were found. First-order factor analysis produced two sub-clusters: Aesthetics and Intellect. The Aesthetics sub-cluster consisted of the Artistic, Concrete work and Creative facets, and the Intellect sub-cluster consisted of the Intellect, Knowledgeable, Logical, Self-insight, Articulate, Competent, Enterprising, Perceptive, Social Intellect and Understanding facets. Second-order factor analysis indicated a single-order factor for the Intellect cluster with two second-order factors: Aesthetics and Intellect. Support was found to discard the Musical and

Enterprising facets from the Intellect cluster. Similar factor solutions were found for the white and African groups – except for the Musical facet, which loaded on the Aesthetics sub-cluster for the white group and on the Intellect sub-cluster for the African group.

Recommendations were made for future research.

OPSOMMING

Titel: Suid-Afrikaanse Persoonlikheidsinventaris: Die ontwikkeling en ondersoek van psigometriese eienskappe vir die intellek-kluster.

Sleutel terme: Suid-Afrikaanse Persoonlikheidsinventaris; Persoonlikheid; Persoonlikheidsmeting; Intellek; Ras.

Die Wet op Indiensnemingsgelykheid, 55 van 1998, Artikel 8 (Staatskoerant, 1998), stel duidelike riglyne vir psigometriese toetsing in Suid-Afrika. Weens die kulturele kompleksiteit van die Suid-Afrikaanse bevolking voldoen veral persoonlikheidstoetse nie altyd aan hierdie vereistes nie. Die meeste persoonlikheidstoetse wat in Suid-Afrika gebruik word, is in ander lande ontwikkel en van daar af ingevoer, en is gevolglik nie altyd toepaslik vir alle kultuurgroepe nie. Voorts is die meerderheid inheemse persoonlikheidstoetse uitsluitlik vir die wit bevolking ontwikkel en gestandaardiseer. 'n Groot hedendaagse uitdaging in die ontwikkeling van persoonlikheidsassessering behels die ontwikkeling en standaardisering van inventarisse vir die 11 amptelike taalgroepe in Suid-Afrika.

Die doelstellings van hierdie studie was om geldige en betroubare items te ontwikkel vir 'n Intellek-meetinstrument wat deel sal uitmaak van groter persoonlikheidsinventaris, om die faktoroplossing van hierdie Intellek-kluster te ondersoek, en om die faktoroplossings van die wit en swart rassegroepe onderskeidelik te vergelyk. Die kwalitatiewe fase van die Suid-Afrikaanse Persoonlikheidsinventaris (SAPI) het as basis gedien vir die ontwikkeling van 'n Intellek-vraelys bestaande uit 202 items. Dié navorsing het as loodstudie gedien. Die steekproef het bestaan uit ($N=524$) studente van tersiêre instellings in Gauteng en die Noordwesprovinsie. 'n Kwantitatiewe ontwerp met 'n verkennende benadering is gebruik om data in te samel. Statistiese ontleding is gebruik om data te ontleed.

Die resultate het aangetoon dat slegs 18 van die oorspronklike 202 items onbetroubaar was. Alle fasette het aanvaarbare betroubaarheidsvlakke getoon. Eersteorde-faktoranalise het twee subklusters opgelewer: Estetika en Intellek. Die Estetika-subkluster het bestaan uit die Kunstige, Konkrete werk en Kreatiewe fasette, en die Intellek-subkluster het bestaan uit die Intellek, Kundigheid, Logies, Self-insig, Geartikuleerd, Bekwaam, Ondernemend, Waarnemend, Sosiale

intellek en Begrypend fasette. Tweeorde-faktoranalise dui op 'n enkelordefaktor vir die Intellek-kluster met twee tweedeorde-fasette: Estetika en Intellek. Genoegsame bewyse is gevind om weg te doen met die Musiek- en Ondernemend-fasette van die Intellek-kluster. Soortgelyke faktoroplossings is vir die wit en swart groepe gevind – met die uitsondering van die Musiek-faset, wat vir die wit groep op die Estetika-subkluster gelaai het en vir die swart groep op die Intellek-subkluster.

Aanbevelings is gemaak vir toekomstige navorsing.

CHAPTER 1

INTRODUCTION

The mini-dissertation focuses on the development of an investigation into the psychometric properties of the intellect cluster. This chapter contains the problem statement and a discussion of the research objectives, in which the general objective and specific objectives are set out. An outline of the research method is provided and the chapter is concluded by a brief overview of the division of chapters.

1.1 PROBLEM STATEMENT

The study of personality attempts to explain questions such as “Why don’t people appear and act identical?”; “Why do people respond so differently in the same situation, whereas in other circumstances, reactions and beliefs are similar?” and “Why do people from Western, Asian and African cultures differ in so many ways?” (Bergh & Theron, 2003). Attempting to define personality, Meyer, Moore and Viljoen (2003) state that personality is the continually changing although fairly constant organisation of all physical, psychological and spiritual characteristics of the person which determine his or her behaviour in interaction with the circumstance in which the human finds him or herself. However, it seems that personality also consists of individual characteristics, values, motives, genetic aspects, attitudes, emotional reactivity, abilities, self-image and intelligence – resulting from biochemistry, genetic and cultural factors (Caprara & Cervone, 2000; Gerber, Nel & Van Dyk, 1995).

The study of personality is relevant in understanding and assessing behaviour for job description, career development and occupation choice, work motivation, occupational well-being, management and leadership, entrepreneurship, work-satisfaction, productivity, as well as group work, counselling and therapy (Furnham, 1997). Human Resource specialists tend to believe that an individual’s personality can have a marked influence on his or her work performance and on the extent to which such a person adjusts to his or her work environment (Swanepoel, Erasmus, Van Wyk & Schenk, 2005). Using standardised and objective psychological assessments and ratings, personality can be measured in a quantitative manner, and correlations between

personality traits and relationships with other variables (e.g. work performance, adjustment, etc.) can be attained (Bergh & Theron, 2003). However, obtaining standardised and objective psychological assessments is no easy task, especially within the South African context.

The application of psychological assessment in South Africa has mainly followed international trends (Foxcroft, 1997). Since the early 1900s, tests have been brought in from overseas and applied in all segments of the community. Due to Apartheid, the initial tendency was to develop tests exclusively for the Afrikaans and English-speaking groups, leading to the segregation of the African language groups (Claassen, 1997). However, after 1994 the shift to diversity management placed the correct usage of psychological tests in South Africa in the limelight, especially with the emergence of the Employment Equity Act 55 of 1998, Section 8 (Government Gazette, 1998), which stipulates that “Psychological testing and other similar assessments are prohibited unless the test or assessment being used (a) has been scientifically shown to be valid and reliable, (b) can be applied fairly to all employees, and (c) is not biased against any employee or group”.

Psychological instruments introduced from other countries might have restricted appropriateness for South African use (Meiring, Van de Vijver, Rothmann & Barrick, 2005). Research has shown that personality inventories in South Africa are not cross-culturally relevant, as previously disadvantaged groups were not sufficiently represented in the adaptation of imported inventories (Meiring, Van de Vijver & Rothmann, 2006). Meiring et al. (2006) affirm that although personality structure is universal, the expression of personality not only differs among individuals but also between various culture groups. It is therefore critical to explore the understanding and meaning of personality in different cultural and language groups when assessing personality in a multi-cultural society (Foxcroft, 2004). South African research literature states that the present use of personality tests in South Africa presents two major challenges. Firstly, some participants will have a first language that is an indigenous African language, and there are only a few appropriate inventories that are available in African languages (De Bruin, De Bruin, Dercksen & Cilliers-Hartslief, 2005). Therefore, when an instrument is developed for use within the South African context, care should be taken to ensure that the content is translatable to the various African languages. Secondly, several individuals may have

poor English comprehension and reading skills (De Bruin et al., 2005), stressing the importance of developing instruments that can be translated into other languages and/or adapted for other modes of administration.

These challenges led to a project called the South African Personality Inventory (SAPI). According to Nel (2008), the first step was to obtain authentic, appropriate and accurate personality-descriptive terms from each of the 11 official languages in South Africa. The next step in the project was to develop a unified personality inventory that could be applied fairly to all 11 official language groups in South Africa (Nel, 2008). To date, nine personality clusters have been identified, including Extraversion, Soft-Heartedness, Conscientiousness, Emotional Stability, Intellect, Openness, Integrity, Relationship Harmony, and Facilitating (Nel, 2008). This study focuses on the Intellect cluster. According to Nel (2008), the cluster *Intellect* consists of the following facets: *Aesthetics*, *Reasoning*, *Skilfulness* and *Social Intellect*. Intelligence is often referred to in literature as accumulated knowledge and is used extensively to describe individuals, for instance: “he is very bright” or “she learns quickly”, indicating that intelligence should be regarded as a fundamental characteristic of a person and considered part of personality (Chamorro-Premuzic & Furnham, 2005).

From the above discussion, the objectives of this study include: (a) to develop valid and reliable items for an Intellect-measuring instrument that will form part of a larger personality inventory, (b) to investigate the factor solution of this Intellect cluster, (c) to compare the factor solutions of the white and African race groups respectively, and to make recommendations for future research.

Personality and personality measurement

Personality can be seen as a combination of interests, mental abilities, temperament, attitudes and other individual differences in thoughts, feelings and behaviour; it consists of individual characteristics, values, motives, genetic aspects, attitudes, emotional reactivity, self-image and intelligence (Aiken, 1994; Gerber, Nel & Van Dyk, 1995). In essence, personality is the sum total of all physical and mental characteristics or traits that give the individual his or her identity and unique nature; these characteristics include how the individual looks, behaves, feels and

thinks (Kreitner & Kinicki, 2004; Swanepoel et al., 2005). Newell (1990) affirms that a sole system (mind) produces all facets of behaviour. Although the mind has different components, they all work together as one to produce behaviour. However, Nadelson (2001) argues that a person cannot “have” a personality; personality is instead the term that describes specific characteristics of an individual’s behaviour. These unique characteristics or qualities are called *personality traits*, which are universal dimensions that go beyond time, place, and circumstance; with goals, beliefs, and plans fundamentally rooted in historical, cultural and social contexts (McCrae & Costa, 1995; Neill, 2003). The literature states that trait theorists attempt to classify individuals according to personality traits, particularly through the measurement of these psychological characteristics (Arnold, Cooper & Robinson, 1995; Edwards, 1993).

The Big Five personality structure model, which is based on the trait approach, can be seen as the most significant progress in understanding personality (Allport & Odbert, 1936; Angleitner & Ostendorf, 1989). The five factors are known as Neuroticism (ego strength, dominant assured, satisfaction, affect); Extraversion (talkative, assertive, energetic); Openness (imagination, curiosity, intellectualism, intelligence, intellect, intellectual interests, culture); Agreeableness (social adaptability, likeability, friendly compliance, agreeableness, love); and Conscientiousness (dependability, task interest, will to achieve, impulse control, work). McCrae and Costa developed the NEO-Personality Questionnaires (NEO-PI-R and NEO-FFI) to measure the Big Five personality factors (McCrae & Costa, 1995).

The NEO Personality Inventory Revised (NEO-PI-R) was applied by Heuchert, Parker, Strumpf and Myburgh (2000) to college students in South Africa, finding a noticeable five-factor solution for both African and white students, although the translation of the NEO-PI-R into isiXhosa was found to be complex due to limited vocabulary. A construct comparability study of the NEO-PI-R was carried out by Taylor (2000) on African and white employees in a work setting. However, the study indicated that the NEO-PI-R did not work equally well for African employees as it did for white employees, since the openness factor could not be extracted in the African sample (Taylor, 2000).

Multicultural studies regarding the validity and reliability of personality inventories that were also based on the five-factor model other than the NEO-PI-R have also been conducted across

the different cultural groups in South Africa (Abrahams, 1996, 2002; Abrahams & Mauer, 1999a; Abrahams & Mauer, 1999b; Boeyens, 1991; Meiring, 2006; Spence, 1982; Tact, 2000; Taylor, 2000; Visser & Du Toit, 2004; Wallis & Brit, 2003; Zhang & Akande, 2002). In one of these studies, Meiring (2006) obtained commonalities of three personality tests, namely the Fifteen Factor Questionnaire (15FQ+), Occupational Personality Profile (OPP) and Basic Traits Inventory (BTI), to develop a sole personality instrument. As a result, only three of the Big Five personality dimensions were found relevant for all cultures in South Africa, namely Emotional stability, Extraversion, and Openness to experience. Meiring et al. (2005) also investigated the sufficiency of the 15 FQ+ among participants from all the major ethnic groups in South Africa. The results indicated low internal consistencies of some scales as well as a lack of construct equivalence, confirming that the 15 FQ+ was not a suitable measurement of personality in the South African context (Meiring et al., 2005). According to Prinsloo and Ebersohn (2002), the main focus of cross-cultural personality research within South Africa has been on the cross-cultural comparability of the Sixteen Personality Factor Questionnaire (16PF). However, little proof was found for the equivalence of the 16PF across the diverse culture groups in South Africa, which led to the conclusion that the 16PF was not appropriate for use in South Africa (Meiring et al., 2005).

As can be seen from these findings, many currently used personality inventories in South Africa may not be cross-culturally relevant, mainly due to the fact that previously disadvantaged groups were not sufficiently represented in the adjustment process of imported inventories and that construct-irrelevance variance, such as that due to language dynamics or cultural factors, accounts for poorer performance of some groups (see Huysamen, 2002; Meiring et al., 2006). Evidently, it is important to take the unique South African cultural landscape into account when importing, translating, adapting or developing personality measuring instruments. Researchers made an effort during the 1970s to develop a personality questionnaire specifically for South African use, namely the South African Personality Questionnaire (SAPQ) (Steyn, 1974). In their study of the applicability of the SAPQ across cultures in South Africa, Taylor and Boeyens (1991) took four samples (two African and two white; all males from various universities) and analysed the data. The analyses indicated that one of the African groups did not fit into the original factor solution of the SAPQ and that 53% of the items showed item bias. The authors

concluded that the use of the SAPQ was limited and that a new applicable cross-cultural personality measurement should be developed for use in South Africa. Although bias in tests can be eliminated by using different measurements for each of the cultural groups in South Africa, the majority of South Africans consider the use of separate tests for diverse cultural groups intolerable (Maree, 2002; Nel, 2008).

Taking all of these findings into account, a project aimed at developing a South African Personality Inventory (SAPI), an indigenous personality measure for South Africa's multicultural environment (Nel, 2008), was initiated. According to Nel (2008), the first goal of the project was to obtain authentic, appropriate and accurate personality-descriptive terms from each of the 11 official languages in order to identify South Africa's conception of personality. Guided by the lexical approach, information was collected through 1308 structured interviews (cf. Nel, 2008). The huge number of descriptions were categorised and reduced to nine personality clusters, including: Extraversion, Soft-Heartedness, Conscientiousness, Emotional Stability, Intellect, Openness, Integrity, Relationship Harmony, and Facilitating (Nel, 2008). The next step in the project is to develop a questionnaire that could be applied fairly to all 11 official language groups in South Africa (Nel, 2008). The present study focuses on the Intellect cluster.

Intellect

Even though psychologists do not agree on how to define the term 'intelligence' (Foxcroft & Roodt, 2001), it is still important to investigate several definitions in order to obtain a broad idea of the concept. Earlier literature states that intelligence is certainly not complete at birth, usually increasing in power as the nervous system ripens in its capacity for intelligent adjustment to new situations, although certain intellectual capabilities – such as the talent for art, music, mathematics and the like – must be acknowledged as inborn and as undergoing maturation (Allport, 1971). Further definitions of intelligence include referring to intellect as an individual's ability to learn new things and resolve recent problems as well as problems of the past (Chamorro-Premuzic & Furnham, 2005), and the description of the general ability as well as the specific abilities that enable human beings to adapt to their environment (Bergh & Theron, 2003). It is also acknowledged in literature that intellectual behaviour is influenced by many factors, such as the way in which abilities are combined for a specific task, as well as non-

intellectual aspects such as motivation, interests, personality factors and emotional conditions (Bergh & Theron, 2003).

Personality and Intellect

Intelligence is often referred to as accumulated knowledge and is used extensively to describe individuals, for instance: “he is very bright” or “she learns quickly”, indicating that intelligence should be regarded as a fundamental characteristic of a person and considered part of personality (Chamorro-Premuzic & Furnham, 2005). According to Cattell (1969), abilities may be the simplest and most obvious manifestation through which some dynamic traits can be observed and measured. Some of the most significant capabilities, e.g. general intelligence, may be mostly constitutional and purely cognitive traits; however, measures of cognitive abilities must also be measuring dynamics and temperamental traits (Cattell, 1969).

Although intellectual competence, as conceptualised through standardised ability tests or academic examinations, has been renowned to be the predominant paradigm to indicate the relationship between intellect and personality, there are different ways to measure intellect (Chamorro-Premuzic & Furnham, 2005). More than 20 years ago, Eysenck and Eysenck (1985) suggested that self-assessment should be considered part of personality instead of intelligence – mainly because it is assessed through the self rather than objective power measures. Chamorro-Premuzic and Furnham (2005) state that several studies have indicated that subjective assessed intellect is in fact significantly related to intelligence test performance. Although the concept of general intelligence has served certain purposes, there are still distortions as some intelligence can only be appropriately characterised by saying that they are “poetic” or “musical”, arguing that to express them by an IQ is the roughest kind of approximation (Allport, 1971).

It is thus clear that intellect integrates with personality. According to Nel (2008), the results of the first phase in the SAPI project indicated that the cluster *Intellect* consists of the following facets: *Aesthetics*, *Reasoning*, *Skilfulness*, and *Social Intellect*. The term ‘aesthetics’ originates from the Greek word *aesthesis*, meaning sense perception. The modern Western understanding of aesthetics was elaborated on the basis of a taxonomy of the five arts, namely architecture, sculpture, painting, music and poetry (Rée, 2000). Furthermore, aesthetics refers to an emotional

and insightful experience derived from an interaction with anything (Eaton, 1998; Gadamer, 1998). Reasoning, on the other hand, refers to the ability to think logically, to solve problems through planning and the use of principles, as well as the capacity to shape one's beliefs and behaviour to accord with one's knowledge of the world (Allport, 1937; Simons, Irwin & Drinnin, 1987).

Social intelligence can be described as an individual's ability to understand and manage other people, a general tendency to act wisely in human relations, as well as having self-awareness and learned or practised interpersonal skills (Albrecht, 2006; Thorndike, 1920). Nel (2008) defines skilfulness as the ability to do things well, particularly in terms of a high level of competence in work situations or having sufficient communication skills. By examining original SAPI responses, Intellect as a sub-cluster can be described as the capacity for thinking and acquiring knowledge, having a special natural ability or aptitude, being knowledgeable and observant of external and internal things, having a degree of efficiency in certain issues, and having insight into emotions and internal disturbances of others (Nel, 2008).

Intellect and culture

Culture can be defined as those collective norms, values, beliefs, thinking, perceptions and behaviours which characterise the unique ways in which individuals or communities share (Bergh & Theron, 2003). Culture is passed on through the modelling of behaviour, through language, cultural institutions and practices and media messages (Benet-Martínez, 2006). In a multicultural environment such as South Africa, it should be established whether a construct (e.g. Intellect) is understood and interpreted in the same ways in various cultural and language groups. If not, construct bias can occur (Foxcroft, 2004). Construct bias takes place when behaviours which characterise a construct are not identical across cultures or when a construct is assessed and it is not equal across cultures (Meiring et al., 2005).

There is a common assumption that intellectual abilities are structured in the same manner for all individuals; yet, these Western conceptions of intelligence are not shared by all cultures around the world (Berry, 1984; Kane, Oakland & Brand, 2006; Sternberg & Kaufman, 1998). Sternberg

(2000) states that the understandings of intellect in African and Asian cultures emphasise social skills much more than Western conceptions do. According to Murphy and Davidshofer (2005), there are still distortions in the assessment of intellect since most tests measure a very narrow domain of what it means to be smart (Murphy & Davidshofer, 2005). It is clear that more research is needed to compare conceptions of intellect. However, these cross-cultural comparisons are frequently difficult and costly, since most cultural research involves translations, novel instruments and hypotheses and overseas trips to study different cultures (Benet-Martínez, 2006). Nevertheless, by understanding the nature of intelligence for dissimilar individuals, different ability levels and diverse cultures, researchers, educators, and psychologists can better appreciate and respond to the diversity of the human condition (Kane et al., 2006).

Value-add of research to the field of Industrial Psychology

The use of personality inventories as predictors of job performance has been a subject of controversy since the mid-1960s (Murphy & Davidshofer, 2005). Guion and Gottier (1965) concluded that there was insufficient evidence to prove that personality inventories could be used for selecting personnel. However, due to a number of recent re-evaluations, the results have changed; the current findings show that career success are aided by personality factors, such as being optimistic, serious minded, energetic, contended, open, spontaneous, self-confident, self-sufficient, ambitious and free from negative feelings (Bergh & Theron, 2003; Murphy & Davidshofer, 2002). The basic rationale is therefore that successful employees have a specific personality structure (Muchinsky, Kriek & Schreuder, 2002).

Research findings indicate an increased awareness in South Africa regarding personality in the workplace. Consequently, personality assessment tools are increasingly being applied within South African organisations (Swanepoel, Erasmus, Van Wyk & Schenk, 2005). Personality tests can be used in selection and placement of employees as part of a management development programme, as career counselling, to assess training needs, to assess an individual worker's performance, and to assess the success of training programmes (Bergh & Theron, 2003; Murphy & Davidshofer, 2002). Studies conducted in South Africa by Saville and Holdsworth (1999) verify the usefulness of personality in predicting work performance across cultures as well as across different jobs. Furthermore, managing and developing diverse workforces may

increasingly depend on the ability to understand expressions of the human personality (Berg & Theron, 2003).

The following research questions can be formulated based on the above-mentioned description of the research problem:

- Can valid and reliable items be developed for an Intellect scale that will form part of a larger personality inventory?
- What does the factor solution of the Intellect cluster look like?
- What are the differences and/or similarities between the factor solutions of the white and African race groups respectively?
- Which recommendations can be made for future research and practice?

In order to answer the above research questions, the following research objectives are set:

1.2 RESEARCH OBJECTIVES

The research objectives consist of general objectives and specific objectives.

1.2.1 General objective

The study aims to develop a valid and reliable measuring instrument for the Intellect cluster of the South African Personality Inventory.

1.2.2 Specific objectives

The specific objectives of this study are to:

- Develop valid and reliable items for an Intellect scale that will form part of a larger personality inventory.
- Investigate the factor solution of this Intellect cluster.

- Compare the factor solutions of the white and African race groups respectively.
- Make recommendations for future research and practice.

1.3 PARADIGM PERSPECTIVE OF THE RESEARCH

The next part of this chapter addresses perspectives that relate to core assumptions regarding behavioural sciences. A paradigm perspective is an experimental design, model or plan of the steps in research that includes the intellectual climate and market of intellectual resources, and that directs the research as it represents the thinking and practices of a researcher (cf. Bergh & Theron, 2003; Mouton & Marais, 1992; Vandenbos, 2007).

1.3.1 Intellectual climate

The intellectual climate subscribes to the range of non-epistemological value beliefs/systems that are endorsed in any particular era in a discipline. Furthermore, it also refers to a set of viewpoints/principles and assumptions that do not openly deal with the epistemological beliefs of the scientific study practice as the intellectual climate usually originated in a non-epistemological framework (Mouton & Marais, 1992).

The research done in this study falls within the boundaries of the behavioural sciences and more particularly Industrial Psychology. Industrial Psychology is a subdivision of Psychology where general psychological principals are applied to work-related matters, and it examines human behaviour in the work context (Vandenbos, 2007).

This study aims to develop a unified personality inventory, and, since the study of personality is relevant in understanding and assessing behaviour for job description, career development and occupation choice, work motivation, occupational well-being, management and leadership, entrepreneurship, work-satisfaction, productivity, as well as group work, counselling and therapy (Furnham, 1997), the sub-disciplines of Industrial Psychology that are focused on in this research are *Psychological Assessment*, *Personnel Psychology* and *Career Psychology*. According to Murphy and Davidshofer (2005), psychological assessment focuses on exploring the different

viewpoints and techniques for assessment of individual dissimilarities and similarities within or between persons. Bergh and Theron (2003) state that Personnel Psychology focuses on differences between individuals and forecast a match between the employees and the organisation. Career Psychology is focused on career planning, career counselling and change in career patterns (Bergh & Theron, 2003).

1.3.2 Meta-theoretical assumptions

Both the literature review and the empirical study are done within the *trait theory* boundaries.

1.3.2.1 Literature review

A certain approach is essential in developing a psychometric instrument (Foxcroft & Roodt, 2001). The SAPI is based on the trait approach. According to Vandebos (2007), the trait approach is a school of thought that explains personality in terms of traits, where traits are those characteristics that result in behaviour. The following basic assumptions are relevant in this regard (Arnold et al., 1995; Edwards, 1993; Nel, 2008; Chamorro-Premuzic & Furnham, 2005):

1. From the Lexical hypothesis, the Big Five personality framework was developed by Allport and Odbert. The lexical approach entails the assumption that the main dimensions of behaviour could be traced back to the language one uses to describe a person. Hence, the SAPI followed the lexical approach in order to uncover the core dimensions of personality in a South African context. Interviews were held in 11 South African languages and these responses were used to develop items for the personality inventory.
2. Literature states that trait theorists attempt to classify individuals according to personality traits by measuring psychological characteristics. According to Cattell (a well-known trait theorist), there are 16 main dimensions of personality. These personality traits were based on a large-scale empirical examination and consequent data reduction of the factors underlying a vast combination of words to describe individuals. In the SAPI, empirical examination entailed data reduction by means of qualitative semantic cluster analysis. The following nine personality factors were identified in the previous phase of the SAPI project: Extraversion, Soft-Heartedness, Conscientiousness, Emotional Stability,

Intellect, Openness, Integrity, Relationship Harmony, and Facilitating. In this study, the factor solution of the Intellect trait/cluster is investigated by means of quantitative procedures.

1.3.2.2 Empirical study

The Trait Approach assumes/emphasises that individuals can be classified according to personality traits; (Arnold et al., 1995; Edwards, 1993). From the Lexical hypothesis, the Big Five and the 16PF were developed based on a large-scale empirical examination and consequent data reduction of the factors underlying a vast combination of words to describe individuals. The SAPI is developed based on the universal-specific personality traits that were derived from the content analysis of the descriptive terms.

1.3.3 Market of intellectual resources

The market of intellectual resources can be explained as the set of viewpoints that frankly entail the epistemological standing of scientific statements. The methodological and the theoretical beliefs are the most important kinds of epistemological beliefs (Mouton & Marais, 1992).

1.3.3.1 Theoretical beliefs

Theoretical beliefs refer to beliefs that can create testable findings regarding social occurrences. These are all findings concerning the ‘why’ and the ‘what’ of human phenomena and contain all conceptual definitions and all models and theories of the study (Mouton & Marais, 1992).

A. Conceptual definitions

The relevant conceptual definitions are given below:

1. *Personality*: According to Meyer et al. (2003), personality is the continually changing although fairly constant organisation of all physical, psychological and spiritual characteristics of the person which determine his or her behaviour in interaction with the circumstance in which the human finds him or herself.

2. *Intellect*: By examining original SAPI responses, Intellect as a sub-cluster can be described as the capacity for thinking and acquiring knowledge, having a special natural ability or aptitude, being knowledgeable and observant of external and internal things, having a degree of efficiency in certain issues, and having insight into emotions and internal disturbances of others (Nel, 2008).
3. *Aesthetics*: The quality of being artistic, creative and talented, and the tendency to engage in practical work (Nel, 2008).
4. *Reasoning*: The ability to attain insight into things in general and oneself in particular; having knowledge and sharing it with others (Nel, 2008).
5. *Skilfulness*: The ability to do things well, specifically having a high level of competence in work situations and/or adequate communication skills in contact with others (Nel, 2008).
6. *Social Intellect*: The ability to understand others and social situations and to react appropriately (Nel, 2008).

B. Models and theories

A model is defined as the representation of a concept or basic behavioural processes in the form of a graph or theory, with the purpose of demonstration (Vandenbos, 2007). A theory is defined as a pattern of interconnected principles that supports, clarify or predict an amount of interrelated phenomena (Vandenbos, 2007).

Although different personality theories describe and conceptualise personality structures differently, Avdeyeva and Church (2005) state that two general approaches are commonly used to conceptualise the structure of personality: (1) the trait, nomothetic, or variable-centred approach (aims at delineating quantitative or continuous dimensions that can be used to describe the personalities of all individuals); and (2) the typological, idiographic, or person-centred approach (identifying a set of discrete, qualitatively different types of configurations of personality). This study will focus on the trait approach.

Other relevant theories and models for this study include:

- 1) *One general factor* of Spearman, suggesting that one single general factor can be used to explain differences among individuals (Carroll, 1993; Cattell, 1967);
- 2) *Multiple factors* as identified by Thurstone, identifying seven primary mental abilities, namely verbal comprehension, general reasoning, word fluency, memory, number, spatial, and perceptual speed abilities (Anastasi & Urbina, 1997);
- 3) *Multiple intelligences* (Gardner, 1983), differentiating between several mental skills, talents, or abilities, as constituting what he defines as intelligence, namely musical, bodily kinaesthetic, logical-mathematical, linguistic, spatial, interpersonal, and intrapersonal skills;
- 4) *Contextual intelligence* (Sternberg, 1984), suggesting that intelligence be seen in terms of the situation in which it occurs rather than solely as something that can be derived from test results, thereby taking social cultural factors and contexts into consideration; and
- 5) *Dynamic assessment* (Vygotsky, 1978), differentiating between the level of functioning a person can attain without any assistance and the level of functioning a person can reach with help; consequently, the lack of educational or socio-economic opportunities affects cognitive functioning and may prevent some people from reaching their full potential.

1.3.3.2 Methodological beliefs

Methodological beliefs can be defined as the philosophical worldview that underlies and informs a style of research (Jupp, 2006). This empirical study is presented within the trait theory and methodological approach frameworks.

1.4 RESEARCH METHOD

The research method consists of a literature review and an empirical study.

1.4.1 Literature review

The literature review focused on the relationship between intellect and personality, as well as on the development of the South African Personality Inventory (SAPI).

1.4.2 Empirical study

The empirical study consisted of the research design, participants and procedure, data collection, data analysis and ethical aspects that were considered.

1.4.2.1 Research design

For the purposes of this study, a *quantitative exploratory research design* was used. In this approach, the researcher is interested in the development of new methods (such as questionnaires, scales and tests) of data collection and/or validating this newly developed instrument through a pilot study (Mouton, 2008). Within the exploratory research design, the survey method was used to achieve the objectives of this research. Specifically a cross-sectional survey design was used since a sample from a population was drawn at a specific point in time (Shaughnessy & Zechmeister, 1997).

1.4.2.2 Participants and procedure

The current study's participants were recruited from various tertiary institutions in Gauteng and the North West Province within South Africa. In studies similar to the present study university students were also recruited (cf. Ashton et al., 2006; Boies et al., 2001; Cheung et al., 1996). In the present study, convenience sampling was used as this type of sampling involves participation of individuals who are members of a population and are conveniently available for study or investigation. According to Helmstadter (1964), in a pilot study the aim should be to recruit approximately 400 participants. In the present study, N=524.

A proposed research presentation was made to obtain permission to conduct research within the margins of tertiary institutions. Lecturers of the various institutions were contacted to explain the rationale and procedures of the proposed research and the opportunity to collect data within their specific classes. English, Afrikaans, and indigenous African language-speaking students from the different institutions received paper-and-pencil questionnaires to complete.

A consent form requesting participation was given to each individual prior to the administration of the measuring instrument. Ethical aspects and a motivation regarding the research were discussed with the participants before the questionnaires were handed out. The questionnaires were either handed to individuals to be completed within the class period, and immediately collected after completion, or were handed out to be completed and collected within a week of distribution.

1.4.2.3 Measuring battery

The objective of this study was to develop a measuring instrument for the Intellect cluster of the SAPI project by generating valid and reliable items, and to determine whether the facets and sub-facets confirmed the Intellect cluster. The development of the Intellect questionnaire was done in the following four steps:

Step 1: Considering original responses per facet

All the original responses that were attained through interviews in the qualitative phase concerning the Intellect cluster were grouped.

Step 2: Extracting content-representative responses and developing definitions for the various facets

All the original responses were examined and only those that were representative of the particular facets were extracted for further use. Based on the original responses, definitions were generated for all the Intellect facets.

Step 3: *Developing item stems*

Based on the facet's definition as well as the content-representative responses, items were generated. Item generation guidelines were utilised in order to ensure standardisation.

Step 4: *Final item writing phase*

Ultimately, items were prepared for inclusion in the Intellect questionnaire.

The self-report questionnaire was used to measure the Intellect cluster in terms of the sub-clusters Aesthetics (which consists of the Artistic, Concrete work, Creative and Musical facets), Reasoning (which consists of Intellect, Knowledgeable, Logical and Self-insight), Skilfulness (which consists of Articulate, Competent and Enterprising facets) and Social-Intellect (which consists of Social intellect, Perceptive and Understanding facets). Items were rated on a five-point Likert-type scale, with responses ranging from 1 (*Strongly Disagree*) to 5 (*Strongly Agree*).

Biographical information was gathered through generic questions. These questions referred to participants' age, education level, gender, English reading ability, language, and race.

1.4.2.4 Statistical analysis

The statistical analysis was carried out with the SPSS program (SPSS Inc., 2008). The following analytic techniques were employed in the quantitative phase:

- (a) The data was prepared by inspecting unexpected and missing values, investigating the minimum and maximum values, the means and standard deviations as well as the skewness and the kurtosis coefficients of the items from the questionnaire.
- (b) Items were correlated with the total Intellect score as well as with the total facet score by performing principal component analysis.
- (c) The Cronbach alpha coefficients were inspected to ensure reliability of the facets.
- (d) First-order unrestricted factor analysis was done to determine the dimensionality underling responses to the personality questionnaire. Specifically the following

techniques were used to determine the number of factors: (a) eigenvalues > 1 , (b) the scree plot, and (c) parallel analysis.

(e) A hierarchical Schmid-Leiman (1957) factor solution was used to analyse the second-order factor solution for the questionnaire. Whenever higher-order factor analysis (FA) was conducted, the Schmid-Leiman solution (SLS) can be used to gain additional insights into the relationship between variables and factors, since the SLS is a convenient tool to obtain the independent influence of first-order and higher-order factors on a set of primary variables and will thus ease the interpretation of factors of differing levels (Wolff & Preising, 2005).

(f) Lastly, construct equivalence between the white and African groups was explored to compare the factor solutions.

1.4.2.5 Ethical considerations

All persons completed the instruments voluntarily and data was treated confidentially. The data was used for research purposes only.

1.5 CHAPTER DIVISION

The chapters in this mini-dissertation were presented as follows:

Chapter 1: Research proposal and problem statement.

Chapter 2: Research article.

Chapter 3: Conclusions, limitations and recommendations.

1.6 CHAPTER SUMMARY

Chapter 1 introduces the problems regarding personality measurement in South Africa today, and investigates alternative approaches that could be implemented in order to deal with these problems. An approach is put forward for developing an indigenous measurement for South Africa. This approach is a modified version of the lexical approach. The next phase of the project is to develop a unified personality inventory that can be applied fairly to all 11 official language groups in South Africa. This personality inventory is developed by means of the universal-specific personality traits that were derived from the content analysis of the descriptive terms in the previous phase. The focus is on the development of a measuring instrument for the Intellect personality cluster.

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CHAPTER 2

RESEARCH ARTICLE

SOUTH AFRICAN PERSONALITY INVENTORY: THE DEVELOPMENT AND PSYCHOMETRIC PROPERTIES OF THE INTELLECT CLUSTER

ABSTRACT

The objective of this study was to develop a valid and reliable measuring instrument for the Intellect cluster of the South African Personality Inventory (SAPI). The sample consisted of 524 students from tertiary institutions located in the Gauteng and the North West Provinces of South Africa. Based on the data from the qualitative first phase of the project, an Intellect inventory was developed, which contained 202 Intellect items. Statistical analysis was used to analyse and interpret the data. A total of 18 items were discarded based on their psychometric properties. Results indicated acceptable reliability coefficients on all the subscales. Maximum likelihood factor analysis with a direct oblimin rotation produced two sub-clusters, Aesthetic and Intellect. Schmid-Leiman hierarchical factor solution revealed a single-order factor for the Intellect cluster. Construct equivalence across the African and white race groups showed similar factor solutions between the two groups – except for the Musical facet, which loaded on the Aesthetics sub-cluster for the white group and on the Intellect sub-cluster for the African group. Recommendations were made for future research.

OPSOMMING

Die doelstelling van hierdie studie was om 'n geldige en betroubare meetinstrument te ontwikkel vir die Intellek-kluster van die Suid-Afrikaanse Persoonlikheidsinventaris (SAPI). Die steekproef het bestaan uit 524 studente van tersiêre instellings in Gauteng en die Noordwesprovinsie. Die eerste fase van die projek het gedien as basis vir die ontwikkeling van 'n Intellek-inventaris bestaande uit 202 Intellek-items. Statistiese analise is gebruik om die data te ontleed en te interpreteer. 18 Items is geëlimineer op grond van hul psigometriese eienskappe. Resultate het gedui op aanvaarbare betroubaarheidskoëffisiënte vir alle subskale. Maksimumwaarskynlikheid-faktorontleding met 'n direkte-oblimin-rotasie het twee subklusters, Estetika en Intellek opgelewer. Schmid-Leiman-hiërargiesefaktoroplossing het 'n enkele faktor vir die Intellek-kluster opgelewer. Konstrukekwivalensie oor die swart en wit rasse-groepe heen het gedui op soortgelyke faktoroplossings tussen die twee groepe – met die uitsondering van die Musiek-faset, wat vir die wit groep op die Estetika-subkluster gelaai het

en vir die swart groep op die Intellek-subkluster. Aanbevelings is gemaak vir toekomstige navorsing.

Introduction

Meyer, Moore and Viljoen (2003) state that personality definitions vary in accordance with different approaches to personality. According to Eysenck (1970, p. 2), a well-known trait theorist, personality can be seen as “the more or less stable and permanent organisation of a person’s temperament, intellect and physique which determines his unique adaptation to the environment”. Traits can be used to predict an individual’s behaviour, as it offers clear, simple descriptions of people’s tendencies to act or behave in a particular way and it allows us to compare individuals (Bergh & Theron, 2003; Foxcroft & Roodt, 2001). A challenge for trait psychologists is to develop a basic set of traits that can be used to describe human personality (Foxcroft & Roodt, 2001; Murphy & Davidshofer, 2005). In an attempt to address this challenge, trait psychologists make use of factor analysis to cluster thousands of personality descriptive words into a more manageable number of factors or dimensions (Foxcroft & Roodt, 2001). Various personality instruments have been developed using the trait approach (e.g. 16 Personality Factor Questionnaire/16PF; Big Five/B5; NEO Personality Inventory/NEO-PI-R; Eysenck’s ‘Giant’ Three; the Big Seven; HEXACO; CPAI).

Murphy and Davidshofer (2005) state that one of the main challenges in personality testing is to establish whether a specific test constitutes an adequate measure of a particular trait. At present, none of the existing personality tests used in South Africa have been found valid and reliable for all cultural (and language) groups in South Africa (Rothmann & Cilliers, 2007); and psychological instruments introduced from other countries might have restricted appropriateness for South African use (Foxcroft, 2004; Meiring, Van de Vijver, Rothmann & Barrick, 2005). Imported personality tests rarely maintain the level of reliability when applied across cultures and the validity of the instruments weakens considerably (Retief, 1992). Meiring et al. (2005) conducted a study to determine item bias of the 15 FQ+ in the South African context. They reported low internal consistencies, particularly in the African language groups. Abrahams and Mauer (1996) did a similar study and found that only three factors of the 16 PF had alpha coefficients greater than 0,50 for the African population. This level is unacceptable, since a reliability score of 0,95 should be considered when important decisions are made based on specific test scores of individuals (see Nunnally & Bernstein, 1994). Ironically, Abrahams (1996)

reported that selection and promotion choices are frequently made based on tests that are not comparable across diverse racial and language groups.

These findings are contradictory to the South African law, since the Employment Equity Act, 55 of 1998, Section 8 (Government Gazette, 1998) clearly stipulates that “Psychological testing and other similar assessments are prohibited unless the test or assessment being used (a) has been scientifically shown to be valid and reliable, (b) can be applied fairly to all employees, and (c) is not biased against any employee or group”. It is apparent that there is an urgent need for personality measuring instruments that meet the Employment Equity Act’s requirements and can be used for all cultural and language groups in South Africa (Meiring, Van de Vijver & Rothmann, 2006).

This challenge led to a project aimed at developing a South African Personality Inventory (SAPI), an indigenous personality measure for South Africa’s multicultural environment (Nel, 2008). Nel (2008) reported that the goal was to obtain authentic, appropriate, and accurate personality-descriptive terms from each of the 11 official languages in order to identify South Africa’s conception of personality. Guided by the lexical approach, information was collected through 1308 structured interviews (cf. Nel, 2008). The huge number of descriptions were categorised and reduced to nine personality clusters, including: Extraversion, Soft-Heartedness, Conscientiousness, Emotional Stability, Intellect, Openness, Integrity, Relationship Harmony, and Facilitating (Nel, 2008). The next step in the project is to develop a questionnaire that could be applied fairly to all 11 official language groups in South Africa (Nel, 2008). The present study will focus on developing valid and reliable items for an Intellect-measuring instrument that will form part of the SAPI. Furthermore, this study will investigate the factor solution of the Intellect cluster, as well as determine the differences and/or similarities between the factor solutions of the white and African race groups respectively.

Personality and Intellect

Intelligence in Western society is predominantly measured by aptitude tests, which are designed to measure cumulative knowledge, abilities and skills, along with achievement tests, which assess one’s mastery of particular knowledge. The definition of intellect will therefore be

associated with the purpose of the intelligence test used (Foxcroft & Roodt, 2001; Murphy & Davidshofer, 2005).

Chamorro-Premuzic and Furnham (2005) argue that standardised ability tests and academic examinations are not the only ways to measure intellect. Intellect is for instance measured by the fifth factor of the lexical Big Five personality structure, specifically consisting of Introspective reflection, Intellectual knowledge and Artistic imagination (Ashton, Lee, Vernon & Jang, 2000; Goldberg, 1994; Saucier, 1994). According to Saucier (1992), the traits “Imaginative”, “Creative” and “Original” define the Big Five’s fifth factor the best. The Big Five personality test uses the self-report approach where the individual is asked to make judgements or evaluations about his or her own intellectual behaviour (Maloney & Ward, 1976). Following the lexical approach, Lee and Ashton (2004) developed the HEXACO personality model. They argue that personality structure consists of six major dimensions (Honesty, Agreeableness, Emotionality, Extraversion, Conscientiousness and Openness to experience) and the defining content of the HEXACO’s Openness to Experience factor is Aesthetic appreciation, Inquisitiveness, Creativity and Unconventionality. Some researchers have argued that intellectual abilities, capacities and talents are beyond the personality domain and are of doubtful relevance to personality (Lee & Ashton, 2004; McCrae & Costa, 1997). Instead, McCrae and Costa (1997) propose in the questionnaire-based Five Factor model that the fifth factor be named Openness to Experience, which involves facet scales measuring Openness to fantasy, Aesthetics, Feelings, Actions and Values. In both lexical models (i.e. personality structure derived from language) and questionnaire models (i.e. personality structure derived empirically), Openness and Intellect show significant overlap, and seem to complement each other by highlighting diverse aspects of one domain (Saucier, 1992).

However, when comparing the Openness factor between Western and non-Western cultures, Cheung et al. (2008) note that in comparison to the other four factors, this factor seems to reveal relatively weak psychometric properties in non-Western cultures. It also seems that, in lexical studies, this factor does not necessarily emerge as one of the five main dimensions in all European countries and that the Intellect factor is one of the least replicable factors of the big five (Ashton & Lee, 2001; Boies, Lee, Ashton, Pascal & Nicol, 2001). Nevertheless, during the

qualitative phase of the development of the SAPI, Intellect as well as Openness were derived from the data as personality clusters within this instrument. In this case, the traditional Openness to Experience seemed to correspond more with the Intellect cluster than with the Openness cluster, since many important features of SAPI's Openness are missing from the Openness to Experience factor (Nel, 2008). Based on the qualitative data of the SAPI project, Nel (2008) proposes the following indigenous structure for the Intellect cluster:

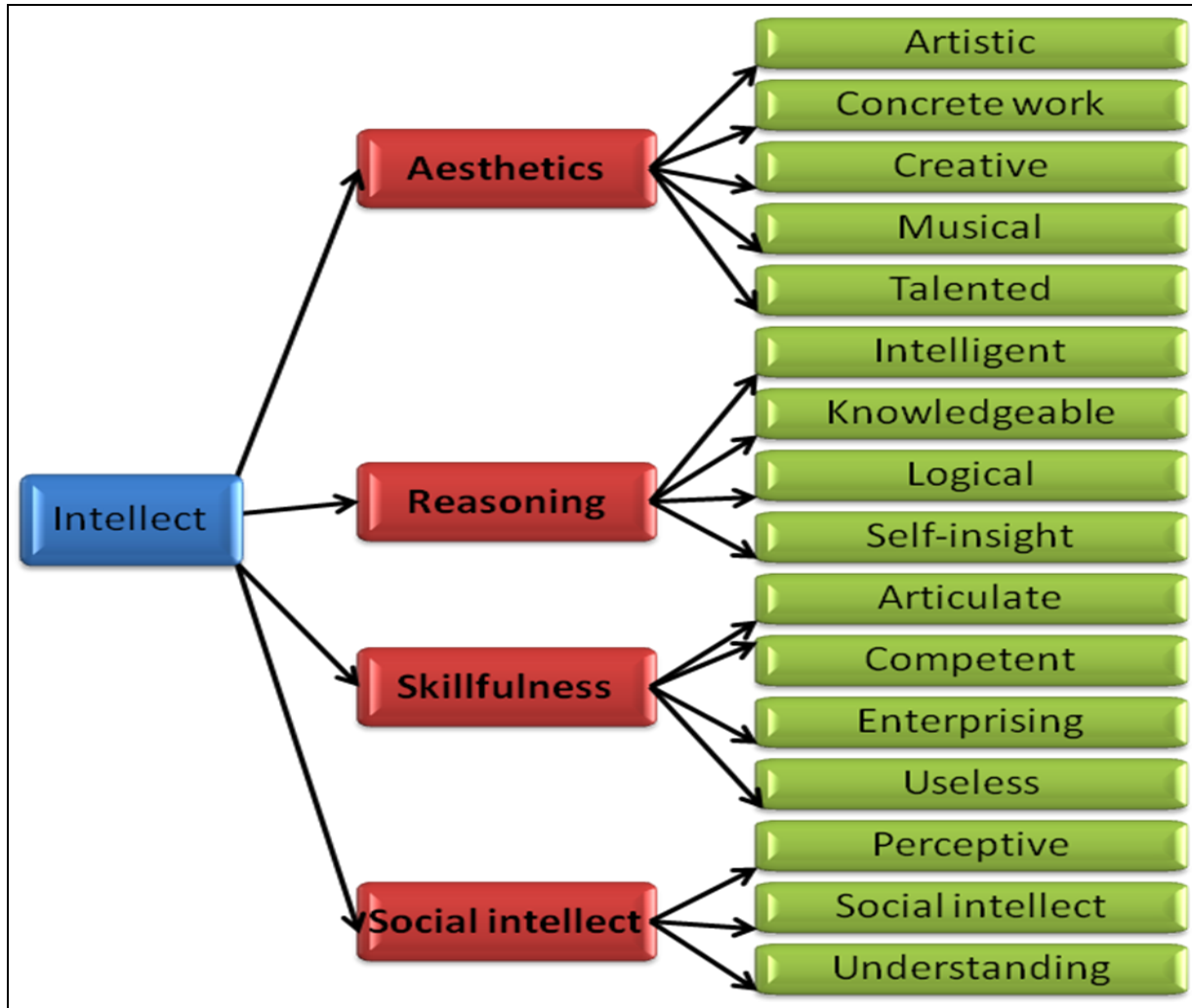


Figure 1. *The factor solution of the Intellect cluster (Nel, 2008)*

The structure consisted of a cluster (Intellect), sub-clusters (Aesthetics, Reasoning, Skillfulness and Social intellect) and facets (Artistic, Concrete work, Creative, Musical, Talented, Intelligent, Knowledgeable, Logical, Self-insight, Articulate, Competent, Enterprising, Useless, Perceptive,

Social intellect and Understanding) and the various original responses obtained in interviews (Nel, 2008). Nel (2008, p. 133) defines the Aesthetics sub-cluster as “the quality of being artistic, creative and talented, and the tendency to engage in practical work”. Furthermore, Nel (2008, p.133) states that Reasoning is “the ability to attain insight into things in general and oneself in particular; having knowledge and sharing it with others”. “Skilfulness, on the other hand, is the ability to do things well, specifically having a high level of competence in work situations and/or adequate communication skills in contact with others” (Nel, 2008, p. 133). According to Nel (2008), Social intellect is “the ability to understand others and social situations and to react appropriately” (p.133). Nel (2008) states that the Intellect cluster of the South African personality structure shows considerable overlap with the Intellect factor of the Lexical Big 5 as well as the Openness to experience factor of the HEXACO Personality Model. Based on this factor solution, the aim of this study is to develop valid and reliable items for the Intellect cluster of the South African Personality Inventory (SAPI).

Development of the SAPI Intellect-measuring instrument

Psychological assessment and psychometric testing are based on the notion that individuals are diverse in certain dimensions, and that these dimensions are identifiable and measurable by means of allocating numbers to objects to represent dimensions in accordance with specific rules (Maloney & Ward, 1976; Smit, 1991). There are currently two frameworks for psychometric test development: classical test theory and item response theory (IRT). In the classical test theory framework, a specific measurement determines its respondents’ ‘amount’ of a specific trait (i.e. attitude or ability in psychological instruments or educational tests) based on their raw score across all the items on the instrument (Wilson, Allen & Li, 2006). IRT utilises item responses to produce a linear scale that signifies ‘less’ to ‘more’ of a trait or covert variable (e.g. a specific ability) (Wilson, Allen & Li, 2006). Fan (1998) compared the classical test theory and the item response theory (IRT) in terms of their item or person statistics, and the results indicated that the two measurement approaches produced quite similar outcomes both in terms of the comparability of item and person statistics among the two approaches and in terms of the level of invariance of item statistics from the two opposing measurement approaches. In developing an Intellect measure, the classical test theory was used given that statistical analyses can be

performed with smaller representative samples of the population and the classical test theory involves fairly straightforward statistical procedures (Schumacker, 2005).

The development of a psychometric test entails various phases. These include specifying the aim of the test, defining the content/constructs of the test, developing items, conducting a pilot study, analysing the result from the pilot study, revising and standardising the final version of the measure, standardising the procedures for scoring and administering the measure, and, lastly, the technical evaluation of the test (Foxcroft & Roodt, 2001; Smit, 1991).

McIntire and Miller (2000) note that a statement identifying the applicable construct (e.g. personality), as well as how the outcome of the test will be used, should be included in the aim of the test. The central aim of the SAPI project is to develop an indigenous personality measure for South Africa's multicultural environment (Nel, 2008), and since the Intellect-measuring instrument will form part of the final SAPI, its aim will be the similar: to measure the SAPI's Intellect personality cluster in an unbiased manner within South Africa's multicultural environment.

The next step will be to define the content/constructs of the test and this can be done by undertaking a comprehensive literature study of the major theoretical perspectives concerning the construct that is to be measured (Foxcroft & Roodt, 2001). When planning to develop a measure for use in a multi-cultural environment, it should be established whether the construct is understood and interpreted in the same way in various cultural and language groups (Foxcroft, 2004). Nel (2008) states that by using the lexical approach in personality test development, different cultural and linguistic viewpoints can be examined, hence eliminating misinterpretation of the construct. The lexical approach is based on the assumption that important communication terms will be encoded in some or all languages, which will then portray personality differences or similarities (Goldberg, 1990; Ashton & Lee, 2001).

In order to obtain indigenous personality descriptive terms, semi-structured interviews were conducted in 11 indigenous languages of South Africa, where participants were asked to describe themselves and particular people they knew well (cf. Nel, 2008). From the interviews, personality-descriptive terms were derived and cleaned. Cleaning entailed deleting all non-

personality, unclear and unnecessary words; plural forms of all tenses and verbs were used to make the grouping of similar responses continuous. After the cleaning phase, all personality-descriptive terms were categorised into personality facets based on external resources (e.g. the original response “creative with her lessons” was categorised into the Creative facet, and “likes working with his hands” was categorised into the Concrete work facet). Semantic cluster analysis was then used to assemble 190 personality facets into broad clusters according to shared content or shared behavioural styles (e.g. Artistic, Concrete work, Creative and Musical). Collective labels were then given to the sub-clusters (e.g. Artistic, Reasoning, Skilfulness, and Social-intellect). Inherent behavioural styles or similarities of the sub-clusters led to further analysis and clustering. Finally, the 37 sub-clusters were condensed to nine major clusters: Extraversion, Soft-Heartedness, Conscientiousness, Emotional Stability, Intellect, Openness, Integrity, Relationship Harmony, and Facilitating (cf. Nel, 2008).

To define the sub-clusters and facets of the Intellect cluster, the original responses of each of the identified facets were extracted and examined. All the original responses that were obtained in phase 1 concerning the Intellect cluster were grouped and the content-representative responses were extracted. Based on the original responses, definitions were generated for all the facets relating to the Intellect cluster (see Appendix A). During this step, it was decided to discard facets that consisted of fewer than 4 items and that were represented by fewer than two language groups. Subsequently, the Talented and Useless facets were removed from the Intellect cluster.

As soon as the content/constructs of the test are defined, items can be developed (Foxcroft & Roodt, 2001). Usually item development is based on theory, empirical or criterion-referenced methods (Foxcroft, 2004). The South African Personality Inventory (SAPI) uses the theory-based method, since qualitative methods were utilised to develop an implicit personality theory (cf. Nel, 2008). In this approach, test developers draw on theory to guide the process of item development (Foxcroft, 2004). Hence, item development for the Intellect cluster was based on the theoretical basis that was established in the first phase of the SAPI project, specifically on the facets’ definitions and the content-representative responses.

Literature provides test developers with various guidelines that should be adhered to in writing personality test items, such as that item format should be in a logical sequence, or the item content should be relevant to the rationale of the measure (cf. Hawkes, Lindquist & Mann, 1936; Ebel, 1950; Steckline, 1956; Helmstadter, 1964; Foxcroft & Roodt, 2001; Hendriks, Hofstee & De Raad, 1999). For the development of the Intellect questionnaire, item generation guidelines were utilised in order to ensure standardisation. The following guidelines were obtained from Hendriks, Hofstee and De Raad (1999):

- Items must be short, simple, and clear.
- Items are written in the first person, starting with “I”, followed by concrete behaviours, the object and the context.
- Negations are excluded in the first part of an item – a clear statement has to be made by using a negative statement in the second part of an item, but not in the third part.
- Items describe a single activity, habit or preference (terms such as like/dislike are avoided).
- Temporal qualifiers are excluded, e.g. often, always, sometimes.
- Items have to be formulated in the direction of the cluster. That is to say: items dealing with the negative pole of the cluster are used (a) if there are many utterances in the original responses, or (b) if a significant item deals with the negative pole. Double-barrelled Items must refer to concrete behaviours and not beliefs, values, or orientations.
- Psychological trait terms must be avoided.
- Items must exclude the use of idioms and expressions/sayings in order to avoid confusion.
- Items must be written with their translatability kept in mind.

The final item writing phase for the Intellect questionnaire included the development of items from both the original data and added item stems obtained from other personality measures. Added item stems were incorporated if a facet had too few items to represent the facet. These added items were all referenced in order to trace them. Finally, items were prepared to be included in the Intellect questionnaire. The original Intellect cluster item pool was reduced to 202 items. The number of items per cluster was as follows: 44 Aesthetics items, 66 Reasoning items, 55 Skilfulness items, and 37 Social intellect items. Generally, a large pool of items is

developed by a team of experts (Foxcroft & Roodt, 2001). As a rule of thumb, twice the number of needed items should be developed for the initial item pool (Owen & Taljaard, 1996).

To ensure content validity, a panel of experts should examine and reconsider the items based on the item's capability to tap into the content domain, the wording of the items, and gender and cultural and linguistic appropriateness of the items (Foxcroft & Roodt, 2001). In the current project, content validity was ensured through a process called "quality control", which involved workshops as well as continuous consultations and meetings with SAPI members regarding item development.

Workshops

After the process of extracting content-representative responses and developing definitions for the various facets, a three-day workshop was held with all the SAPI members and collaborators. The aim of the workshop was to provide an overview of the conceptual issues of the SAPI project and clarification regarding item development procedures. An additional workshop was held after the completion of developing item stems in order to inspect and give feedback on developed items. The final item writing phase was introduced and opportunities, potential problems and pitfalls on the way forward were discussed.

Consultations and meetings

Regular consultations and Skype meetings were held throughout the item generation phase. All the steps were examined and checked by the SAPI members to ensure quality and to minimise subjectivity. If discrepancies did appear, items were flagged and discussed during these meetings.

Before a pilot test is conducted, the length of the measure should be finalised, items should be organised in a logical order and clear administration instructions should be developed to ensure optimal performance on the items (Foxcroft & Roodt, 2001). Then the pilot test should be administered to a sample of the target population (Smit, 1991). This study's purpose is to act as a pilot test to investigate the reliability and validity of the developed items. The pilot test will allow the researcher to perform item analysis, which will provide a preliminary general

indication of the performance of the items in the questionnaire and point out any items that perform particularly poorly or particularly well (Du Plessis-van Breda, 2004). Item analysis indicates whether items correlate with the total test score. Items that do not correlate are either unreliable or invalid and should be discarded from the test (Smit, 1991). Cook, Hepworth and Warr (1981) state that as few as three items can present sufficient internal consistency reliabilities.

Although this study will only report on the results gathered from the pilot phase, various phases remain that still need to be addressed within the context of developing a valid and reliable psychological measure. The first step is standardising. According to Guion (1965), standardising in psychometrics refers to constant procedures for scoring and administering the measure. Instructions and scoring procedures should be invariable to compare various candidates' results; this can be attained by providing detailed instructions to the test-taker, and the tester as well as giving objective scoring techniques to the tester (Smit, 1991).

The technical evaluation of the test is the last step in test development. It refers to the establishment of validity and reliability of the instrument, the creation of test norms, the development of a test manual, and the continuous improvement and refinement of the test. Bergh and Theron (2003) stress that reliability and validity are the most essential criteria for research and assessment efficiency, which might reflect all or most sources of measurement error in personality tests. According to Foxcroft and Roodt (2001), reliability of a measurement refers to the consistency in which it measures what it is assumed to measure. Validity, on the other hand, refers to the test's appropriateness for predicting or drawing inferences about criteria (Muchinsky, Kriek & Schreuder, 2002). According to the American Psychological Association (APA, 1995), sound psychological measures should include demonstrations of content validity, criterion-related validity, construct validity and internal consistency.

After examination of the psychometric properties of the measure, test norms should be established to indicate how the individual's scores compare with the scores of a similar group of people; this similar group of people is known as the norm group (Foxcroft & Roodt, 2001; Smit, 1991). When developing a measure in a multicultural environment, it must be documented

whether personality inventories developed for one culture can be applied fairly for measurement purposes of different cultures. Finally, a test manual should be developed to specify what the purpose of the test is, who can be tested by the specific test, how the tests should be administered and who can administer the test (Foxcroft & Roodt, 2001, Foxcroft 2004).

The method and results for this study will now be discussed in depth.

METHOD

Research design

A quantitative, exploratory research design was used for this study. Exploratory research is exploration in an area that has not been studied before, and which may enable the researcher to develop ideas and a more concentrated research question (Neuman, 2000; Bobby & Mouton, 1998). The main function of exploratory research is to formulate and clarify ideas and to develop questions and hypotheses for future research (Struwig & Stead, 2001). The survey method was used to achieve the objectives of this research. Specifically a cross-sectional survey design was used since a sample from a population was drawn at a specific point in time (Shaughnessy & Zechmeister, 1997).

Participants and procedure

Convenience sampling was used to collect the data. The sample consisted of students from tertiary institutions in Gauteng and the North West Province ($N = 524$). After a presentation of the proposed research was made to establishments, permission was granted to conduct research within the boundaries of tertiary institutions. Lecturers of the various institutions were contacted to explain the rationale and procedures of the proposed research and an opportunity to collect data in their specific classes was requested. Two options were presented to lecturers to allow data collection. The first option entailed one class period of 45 minutes to explain the rationale behind the study, to hand out the questionnaires, to give instructions and to allow the completion of the questionnaires in the classroom, and to collect the questionnaires upon completion. The second option required 15 minutes during which the researchers would explain the rationale behind the study, hand out the questionnaires and give instructions; questionnaires would then be collected within a week of distribution. English, Afrikaans, and indigenous African-speaking students from the different institutions received paper-and-pencil questionnaires to complete. Each participant received a consent form to complete. This form also contained a statement of confidentiality.

Table 1 presents some of the characteristics of the participants.

TABLE 1

Characteristics of the participants (N = 524)

Item	Category	Frequency	Percentage
Age	17 years	10	1,9
	18 years	160	30,5
	19 years	116	22,1
	20 years	80	15,3
	21 years	47	9,0
	22 years	26	5,0
	23 years	10	1,9
	Other	75	14,3
Education	Grade 9	15	2,9
	Grade 12	439	83,8
	Certificate	13	2,5
	Diploma	12	2,3
	Bachelors	10	1,9
	Master's	1	0,2
	Other	12	2,3
Gender	Male	253	48,3
	Female	263	50,2
English reading ability	Very poor	5	1,0
	Poor	25	4,8
	Good	333	63,5
	Very good	143	27,3
First language	Afrikaans	294	56,1
	English	25	4,8
	IsiNdebele	6	1,1
	IsiXhosa	10	1,9
	IsiZulu	40	7,6
	Sesotho sa Leboa	61	11,6
	Sesotho	32	6,1
	Setswana	15	2,9
	Siswati	6	1,1
	Tshivenda	8	1,5
	Xitsonga	15	2,9
	Other	3	0,6
	Race	White	287
African		196	37,4
Indian		6	1,1
Coloured		21	4,0

Table 1 shows that the sample consisted of mostly white (54,8%) and African (37,4%) students between the age of 18 and 20 years who, for the most part, had already completed Grade 12. The gender distribution was relatively equal, with males representing 48,2% of the sample and females 50, 2%. The vast majority of participants described their English reading ability as either “Good” (63,5%) or “Very good” (27,3%). While Afrikaans was the single most represented language (56,1%), the sum of the African languages represented a fair amount of the sample (37,7%).

Measuring battery

A self-report questionnaire was used to measure the Intellect cluster in terms of Aesthetics (e.g. Artistic: “I am artistic”; Concrete Work: “I am good at technical work”; Creative: “I am good at creating art”; Musical: “I make time to listen to music”), Reasoning (e.g. Intellect: “I like solving complex problems”; Knowledgeable: “I try to gain more knowledge”; Logical: “I use logic in everyday life”; Self-insight: “I know myself”), Skilfulness (e.g. Articulate: “I communicate well”; Competent: “I am a capable person”; Enterprising: “I can sell things to other people”) and Social-Intellect (e.g. Social Intellect: “I can tell when someone experiences problems”; Perceptive: “I have good intuition”; Understanding: “I understand other people”). The questionnaire contained 202 Intellect items. Items were rated on a five-point Likert-type scale, with responses ranging from 1 (*Strongly Disagree*) to 5 (*Strongly Agree*).

Biographical information was gathered through generic questions included on the answer sheet. These questions referred to participants’ age, education level, gender, English reading ability, language, and race.

Development of the Intellect questionnaire

The first objective of the study was to develop items for the Intellect cluster that would be valid and reliable for the South African population. The item generation process was described in detail in the literature review nevertheless in essence item generation included the following steps:

Step 1: *Considering original responses per facet*

Step 2: *Extracting content-representative responses and developing definitions for the various facets*

Step 3: *Developing item stems*

Step 4: *Final item writing phase*

Statistical analysis

Similar studies are being done on all the identified personality clusters of the SAPI project (e.g. Relationship Harmony, Conscientiousness, etc.). The following statistical procedure was the standard procedure that was followed for all the SAPI clusters. The statistical analysis was carried out with the SPSS (SPSS Inc., 2008).

Data preparation

The data of the questionnaire was inspected for missing and/or unexpected values. The minimum and maximum values, as well as the means and standard deviations were checked to determine their plausibility. Items lower than 1 or higher than 5 were corrected. Next, the skewness and the kurtosis coefficients of the items from the questionnaire were investigated, and items with skewness of > 2 and kurtosis of > 4 were identified. These items were excluded in further analyses as they would be unsuitable for factor analysis.

Item correlations with total score

A principle component analysis of items was performed. One component was requested and the component matrix was inspected to identify any item with a loading of $< 0,2$. These items indicate that they share less than 5% of their variance with the total score. Although more stringent criteria could be set with regard to the component matrix, it was decided to be over-inclusive at this stage of the analyses and to systematically remove the weakest items. Furthermore, the signs within the component loadings would indicate which items needed to be reversed scored.

Item correlations with facets

The same procedure to determine the item correlations with the total score was repeated for the items within the facets of the questionnaire. During the analyses, only items that were written to represent a particular facet were selected for the principal component analysis. One component was retained and the loadings of the items were inspected. It was expected that all the items would have relatively large loadings ($> 0,30$); however, items with loadings $< 0,20$ were removed since that served as an early indication that the item did not function as one would expect it to.

Reliability

The descriptive statistics, skewness and kurtosis coefficients, as well as the Cronbach alpha coefficients for the 14 facets of the Intellect cluster were inspected to determine the reliability of the facets. The calculation of a reliability coefficient proceeded on the assumption of unidimensionality within each facet. Cronbach alpha coefficients were used to assess the reliability of the facets measured (Cronbach, 1951). A reliability score at or above 0,95 should be considered when important decisions are made based on specific test scores of individuals (see Nunnally & Bernstein, 1994); however, a reliability coefficient at or above 0,70 was considered acceptable in this preliminary test development stage.

Factor analysis

First-order unrestricted analysis: The following techniques were used to determine the number of factors: (a) eigenvalues > 1 , (b) the scree plot, and (c) parallel analysis. Eigenvalues can be seen as the number of variance accounted for by each factor (Blanche, Durheim & Painter, 2006). A scree plot is a graph that consists of eigenvalues on the Y axis and the components that are plotted on the X axis (Blanche, Durheim & Painter, 2006). The scree test entails investigating the graph of the eigenvalues by looking for the natural break point or bend in the figure; the “break” typically indicates the number of factors to retain (Costello & Osborne, 2005). Lastly, parallel analysis focuses on the amount of components that explain more variance than the components derived from random data (O’Connor, 2000). An adequate solution will leave little of the common variance of the items unaccounted for and will make statistical and theoretical sense.

An oblique rotation method was employed. The Direct Quartimin is often recommended by factor analysis experts and is the rotation obtained in SPSS when a Direct Oblimin rotation is requested and the delta value is left unchanged at zero. An oblique rotation will produce a factor correlation matrix, which, in turn, can be subjected to a higher-order factor analysis. Maximum likelihood was used to analyse the factor solution of the Intellect cluster. The pattern matrix for the questionnaire was inspected to determine whether each of the facets was well defined with loadings $> 0,30$ and whether each factor corresponded with one of the hypothesised facets. The retention of additional factors leads to a poor solution with ill-defined factors that are psychologically trivial.

When inspecting the factor correlation matrix, it should be expected to find correlations $> 0,20$ between all of the factors. Factors that correlate weakly with other factors possibly do not belong in the same cluster. This does not necessarily mean that the factors should be discarded; they could be placed in another cluster at a later stage. If all the factors are correlated with one another, the presence of a higher-order factor is suggested, which allows for a second-order factor analysis to be used (using the factor correlation matrix as input).

Second-order factor analysis: A hierarchical Schmid-Leiman factor solution was used to analyse the second-order factor solution for the questionnaire. The Schmid-Leiman solution is a convenient tool to obtain the independent influence of first-order and higher-order factors on a set of primary variables and will thus ease the interpretation of factors of differing levels (Wolff & Preising, 2005). The input required are: (a) the obliquely rotated factor pattern matrix of the first-order analysis, (b) the second-order factor pattern matrix, and (c) a matrix containing the square roots of the unique variances of the second-order factor on the diagonal and zeros in the off-diagonal cells. A substantive loading on at least one factor will be $> 0,30$ (Wolff & Preising, 2005).

The Schmid-Leiman solution was also used to determine the independent total impact of the Intellect facets, i.e. the variance explained by each factor. In higher-order factor analysis, the explanatory power of first-order factors is connected to the intercorrelations of primary variables; the explanatory power of higher-level factors refers to the correlation between factors of the

adjacent lower level (Wolff & Preising, 2005). First-order factors therefore explain $x\%$ of the correlation between variables, and second-order factors explain $y\%$ of the correlations between first-order factors (Wolff & Preising, 2005). Additionally, in the Schmid-Leiman solution, the variance explained by different levels is partitioned into nonoverlapping contributions; therefore in the Schmid-Leiman solution, each factor explains $z\%$ of the correlation between variables, regardless of factor level (Wolff & Preising, 2005).

Construct equivalence between the white and African groups

To evaluate construct equivalence across different race groups, the factor solutions obtained in the different groups were used. Similar factor solutions would show that the constructs measured by the items were equivalent. Firstly, the Tucker's phi coefficient was used to determine the equivalence and ranges from zero to one, where a value of one indicates complete congruence and a value of zero indicates a complete lack of congruence. Generally, coefficients of congruence $> 0,95$ point to high levels of construct equivalence, whereas values $< 0,90$ would be indicative that the construct possibly differs in meaning across the different groups. However, the coefficient is insensitive to absolute differences in factor loadings across groups. Hence, a high Tucker's phi can be obtained even if the factor loadings in one group are consistently higher than the loadings of the other group(s). Against this background, the factor pattern matrices of the different groups were also inspected to learn whether the factor loadings were similar in size across the groups.

RESULTS

Descriptive statistics

Descriptive statistics specify how well an item corresponds to the content of a scale (Taylor, 2009). Essential information can be deduced from the items' means and standard deviations. The mean indicates the participants' general selection tendency of an item, while the standard deviation points towards the average deviation of responses from the mean of the item (Taylor, 2009). Table 2 indicates the means, standard deviations, skewness and kurtosis of the 202 intellect items (grouped according to the 14 facets of the intellect cluster).

Item correlations

A principal components analysis was conducted to determine how well an item represented the content of a scale. The analysis was carried out on all 202 items to determine whether all the items had a loading of at least 0,20 on the first unrotated component (see Table 2).

Table 2

Descriptive statistics of the 202 items of the intellect cluster

Item	Mean	SD	Skewness	Kurtosis	Component Matrix
AESTHETICS					
<i>Artistic</i>					
i001	2,95	1,19	-0,01	-0,96	0,23
i002	3,14	1,21	-0,17	-0,95	0,33
i003	2,67	1,13	0,25	-0,77	0,27
i004	2,27	1,16	0,75	-0,30	0,26
i005	2,30	1,28	0,75	-0,58	0,24
i006	2,69	1,30	0,26	-1,11	0,25
i007	2,47	1,22	0,47	-0,81	0,23
i008	3,65	1,10	0,58	-0,36	0,39
i009	4,03	1,06	-1,14	0,86	0,45
<i>Concrete Work</i>					
i010	2,85	1,25	0,02	-1,06	0,16
i011	2,35	1,22	0,58	-0,67	0,06
i012	2,09	1,03	0,75	-0,15	0,07
i013	2,35	1,12	0,61	-0,41	0,17
i014	2,02	1,11	0,90	-0,11	0,07
i015	2,43	1,36	0,50	-1,03	0,07
i016	3,72	1,22	-0,72	-0,43	0,31
i017	3,43	1,22	-0,43	-0,80	0,28
i018	3,37	1,27	-0,37	-0,96	0,27
i019	3,05	1,16	-0,15	-0,76	0,15
i020	2,72	1,08	0,18	-0,57	0,12
i021	2,71	1,08	0,24	-0,51	0,29
<i>Creative</i>					
i022	3,56	1,11	-0,46	-0,56	0,48
i023	3,84	0,93	-0,72	0,40	0,43
i024	3,88	0,97	-0,91	0,72	0,48
i025	3,63	0,89	-0,36	0,00	0,47
i026	3,83	0,93	-0,68	0,37	0,51
i027	3,31	1,17	-0,27	-0,75	0,35
i028	3,02	1,14	0,03	-0,85	0,33
i029	3,07	1,14	-0,08	-0,85	0,34
i030	3,28	1,24	-0,24	-0,94	0,32
i031	2,73	1,19	0,29	-0,79	0,23
i032	2,97	1,29	0,03	-1,08	0,24

i033		3,30	1,18	-0,22	-0,81	0,35
	<i>Musical</i>					
i034		4,23	1,02	-1,43	1,54	0,20
i035		3,39	1,29	-0,37	-0,95	0,26
i036		1,98	1,21	1,08	0,04	0,04
i037		2,28	1,37	0,79	-0,65	0,07
i038		4,40	0,92	-1,82	3,29	0,26
i039		3,44	1,18	-0,36	-0,78	0,15
i040		2,82	1,33	0,20	-1,11	0,24
i041		2,66	1,38	0,32	-1,14	0,22
i042		2,04	1,20	1,08	0,21	0,10
i043		3,35	1,25	-0,42	-0,78	0,33
i044		2,22	1,22	0,79	-0,35	0,06
REASONING						
	<i>Intellect</i>					
i045		3,47	1,00	-0,38	-0,11	0,49
i046		3,37	1,07	-0,42	-0,24	0,37
i047		3,06	1,16	-0,06	-0,76	0,29
i048		4,06	0,95	-1,14	1,38	0,53
i049		3,58	1,22	-0,53	-0,74	0,43
i050		3,98	0,97	-0,94	0,70	0,44
i051		3,96	0,95	-0,93	0,91	0,47
i052		3,71	0,92	-0,70	0,72	0,48
i053		3,73	0,86	-0,56	0,68	0,51
i054		3,81	0,89	-0,71	0,67	0,52
i055		3,76	0,91	-0,79	0,78	0,54
i056		3,69	0,84	-0,47	0,32	0,57
i057		3,54	0,91	-0,30	-0,12	0,46
i058		3,67	0,82	-0,42	0,28	0,39
i059		3,75	0,89	-0,83	1,06	0,39
i060		3,39	0,93	-0,18	-0,14	0,39
i061		3,63	0,90	-0,52	0,23	0,47
i062		4,08	0,79	-0,90	1,24	0,53
i063		3,69	0,88	-0,70	0,62	0,57
i064		3,86	0,85	-0,57	0,23	0,53
i065		3,97	0,84	-0,83	1,09	0,53
i066		3,48	0,79	-0,35	0,58	0,46
i067		3,75	0,82	-0,80	1,14	0,63
i068		3,97	0,86	-0,84	1,01	0,56
	<i>Knowledgeable</i>					
i069		4,09	0,88	-1,10	1,56	0,56
i070		3,58	1,20	-0,52	-0,69	0,58
i071		3,38	1,01	-0,21	-0,37	0,35
i072		3,73	1,00	-0,52	-0,19	0,40
i073		4,10	0,86	-0,80	0,36	0,51
i074		3,70	0,82	-0,37	0,10	0,58
i075		3,80	0,76	-0,63	1,32	0,57
i076		3,54	0,88	-0,61	0,45	0,57
i077		3,87	0,80	-0,71	1,02	0,57
i078		3,56	0,84	-0,46	0,21	0,58

i079		3,81	0,94	-0,61	0,21	0,54
i080		3,75	0,83	-0,55	0,40	0,46
i081		3,60	0,91	-0,50	0,10	0,59
i082		4,04	0,84	-0,88	1,08	0,41
i083		3,51	0,88	-0,32	0,03	0,57
i084		3,82	0,85	-0,89	1,27	0,52
i085		3,80	0,84	-0,37	-0,11	0,60
i086		3,68	0,86	-0,47	0,38	0,55
i087		3,34	0,87	-0,21	-0,08	0,49
i088		3,79	0,82	-0,80	0,95	0,35
i089		3,00	1,07	-0,06	-0,50	0,55
i090		3,49	0,85	-0,21	0,07	0,32
i091		4,09	0,88	-1,10	1,56	0,47
i092		3,79	0,83	-0,58	0,68	0,44
i093		3,72	0,90	-0,63	0,39	0,40
i094		3,93	0,84	-0,91	1,28	0,45
i095		3,53	0,94	-0,39	-0,07	0,52
i096		4,05	0,82	-1,10	2,02	0,52
i097		3,35	1,07	-0,15	-0,67	0,32
i098		3,79	0,87	-0,62	0,44	0,43
i099		3,56	0,91	-0,37	-0,02	0,48
i100		3,69	0,90	-0,47	0,01	0,47
i101		3,67	0,92	-0,62	0,43	0,46
i102		3,63	0,90	-0,57	0,43	0,50
i103		3,94	0,78	-0,69	0,88	0,58
	<i>Self-insight</i>					
i104		4,28	0,90	-1,31	1,52	0,51
i105		4,28	0,90	-1,31	1,52	0,40
i106		4,19	0,99	-1,28	1,18	0,43
i107		3,98	.847	-.708	.367	0,52
SKILFULNESS						
	<i>Articulate</i>					
i108		3,97	0,86	-0,83	0,96	0,54
i109		3,69	1,08	-0,64	-0,17	0,40
i110		3,44	1,09	-0,41	-0,43	0,45
i111		3,61	0,94	-0,52	0,09	0,45
i112		3,84	0,84	-0,58	0,51	0,51
i113		3,83	0,92	-0,84	0,65	0,54
i114		2,70	1,11	0,22	-0,68	0,06
i115		3,64	0,92	-0,55	0,31	0,49
i116		3,13	1,13	-0,19	-0,68	0,39
i117		3,64	0,89	-0,59	0,32	0,48
i118		3,63	0,98	-0,63	0,10	0,41
i119		3,72	0,87	-0,68	0,47	0,49
i120		3,17	0,96	-0,13	-0,13	0,30
i121		3,76	0,89	-0,75	0,66	0,47
i122		3,57	0,86	-0,51	0,20	0,52
i123		3,78	0,87	-0,86	1,16	0,58
i124		3,33	1,15	-0,29	-0,73	0,46

i125		2,98	1,21	0,04	-0,96	0,33
i126		3,46	0,96	-0,38	-0,13	0,46
i127		3,39	1,02	-0,50	-0,20	0,45
i128		3,78	0,89	-0,52	0,18	0,45
i129		3,70	0,79	-0,52	0,70	0,54
<i>Competent</i>						
i130		4,00	0,83	-0,92	1,30	0,57
i131		4,01	0,82	-0,86	1,15	0,63
i132		3,98	0,84	-0,66	0,24	0,57
i133		3,67	0,81	-0,48	0,37	0,58
i134		3,80	0,84	-0,44	0,09	0,54
i135		4,16	0,85	-1,09	1,45	0,53
i136		3,98	0,85	-0,78	0,66	0,51
i137		3,72	0,88	-0,58	0,39	0,51
i138		3,37	0,97	-0,36	-0,21	0,38
i139		3,92	0,80	-0,95	1,83	0,55
i140		4,03	0,82	-0,81	0,96	0,56
i141		3,86	0,85	-0,81	1,04	0,58
i142		3,75	0,83	-0,31	-0,19	0,55
i143		3,90	0,82	-0,89	1,59	0,60
i144		3,90	0,77	-0,71	1,20	0,53
i145		4,01	0,83	-0,97	1,63	0,59
<i>Enterprising</i>						
i146		3,69	1,06	-0,68	-0,07	0,44
i147		2,80	1,18	0,15	-0,86	0,11
i148		3,35	1,12	-0,35	-0,63	0,33
i149		2,99	1,16	-0,02	-0,84	0,19
i150		3,45	1,12	-0,44	-0,54	0,27
i151		3,61	1,15	-0,65	-0,34	0,31
i152		3,48	1,11	-0,49	-0,47	0,27
i153		3,04	1,13	-0,05	-0,73	0,25
i154		3,36	1,13	-0,49	-0,53	0,29
i155		3,87	0,96	-0,86	0,63	0,49
i156		3,36	1,11	-0,36	-0,58	0,29
i157		3,28	1,10	-0,33	-0,65	0,29
i158		3,34	1,10	-0,36	-0,57	0,27
i159		3,25	1,12	-0,33	-0,64	0,31
i160		3,71	1,06	-0,77	0,16	0,36
i161		3,32	1,17	-0,33	-0,74	0,21
i162		3,22	1,23	-0,26	-0,97	0,18
i163		3,43	0,93	-0,45	0,03	0,39
i164		3,73	1,07	-0,81	0,08	0,27
SOCIAL INTELLECT						
<i>Perceptive</i>						
i165		3,82	0,93	-0,76	0,44	0,48
i166		3,82	0,93	-0,67	0,38	0,54
i167		3,88	0,83	-0,69	0,55	0,50
i168		3,92	0,86	-0,74	0,68	0,55
i169		3,97	0,82	-1,00	1,71	0,58

i170		3,92	0,89	-0,84	0,71	0,51
i171		3,99	0,90	-0,87	0,80	0,48
i172		4,05	0,86	-1,02	1,43	0,51
i173		3,77	0,85	-0,67	0,79	0,49
i174		3,61	0,99	-0,43	-0,20	0,39
i175		3,81	0,83	-0,53	0,31	0,47
i176		4,00	0,84	-1,05	1,78	0,49
i177		3,92	0,82	-0,97	1,72	0,54
i178		3,94	0,90	-0,95	1,04	0,51
i179		3,94	0,84	-0,85	1,01	0,46
<i>Social Intellect</i>						
i180		3,67	0,91	-0,68	0,43	0,49
i181		3,77	0,90	-0,59	0,35	0,53
i182		3,53	0,86	-0,35	0,55	0,44
i183		2,56	1,01	0,36	-0,15	-0,02
i184		3,62	0,92	-0,62	0,29	0,39
i185		3,84	0,82	-0,60	0,45	0,52
i186		3,87	0,79	-0,75	1,05	0,52
i187		3,68	0,83	-0,34	-0,07	0,47
i188		3,51	0,88	-0,35	0,23	0,38
i189		3,75	0,81	-0,77	1,09	0,49
i190		3,84	0,75	-0,80	1,68	0,49
i191		3,87	0,93	-0,95	0,88	0,48
i192		3,78	0,89	-0,61	0,35	0,39
<i>Understanding</i>						
i193		3,81	0,82	-0,56	0,47	0,49
i194		3,65	0,87	-0,36	-0,02	0,46
i195		3,83	0,84	-0,95	1,58	0,50
i196		3,79	0,83	-0,63	0,60	0,44
i197		3,60	1,01	-0,53	0,01	0,34
i198		4,01	0,78	-0,92	1,78	0,54
i199		3,92	0,82	-0,76	1,03	0,56
i200		3,83	0,84	-0,64	0,61	0,53
i201		3,43	0,85	-0,12	0,16	0,37
i202		3,88	0,87	-0,82	0,87	0,48

Table 2 shows that all the items of the intellect cluster are normally distributed. The component matrix indicates that the inter-item correlations are considered acceptable. However, certain items (e.g. i010, i011, i020, i042, i163, i183, etc.) did not correlate with the total item score, since these items were considered weaker than the guideline of 0,2 for the component matrix. These items were therefore excluded from consequent analyses.

The principal components analysis was repeated for each of the 14 facets to determine the item correlations with the total score and the results are displayed in Table 3.

Table 3

Item correlations with facets ($N = 524$)

Items	Component Matrix	Items	Component Matrix	Items	Component Matrix	Items	Component Matrix
AESTHETICS							
<i>Artistic</i>		<i>Concrete Work</i>		<i>Creative</i>		<i>Musical</i>	
i001	0,70	i016	0,43	i022	0,75	i034	0,69
i002	0,78	i017	0,90	i023	0,67	i035	0,72
i003	0,74	i018	0,88	i024	0,57	i038	0,56
i004	0,57	i021	0,65	i025	0,62	i040	0,70
i005	0,55			i026	0,69	i041	0,65
i006	0,73			i027	0,55	i043	0,78
i007	0,77			i028	0,69		
i008	0,46			i029	0,67		
i009	0,56			i030	0,44		
				i031	0,47		
				i032	0,59		
				i033	0,73		
REASONING							
<i>Intellect</i>		<i>Knowledgeable</i>		<i>Logical</i>		<i>Self-insight</i>	
i045	0,48	i069	0,62	i092	0,67	i104	0,83
i046	0,48	i070	0,62	i093	0,65	i105	0,80
i047	0,34	i071	0,42	i094	0,64	i106	0,66
i048	0,58	i072	0,55	i095	0,72	i107	0,68
i049	0,49	i073	0,62	i096	0,60		
i050	0,54	i074	0,69	i097	0,39		
i051	0,52	i075	0,68	i098	0,52		
i052	0,57	i076	0,61	i099	0,59		
i053	0,62	i077	0,65	i100	0,68		
i054	0,59	i078	0,65	i101	0,55		
i055	0,65	i079	0,56	i102	0,70		
i056	0,67	i080	0,49	i103	0,59		
i057	0,60	i081	0,70				
i058	0,54	i082	0,49				
i059	0,55	i083	0,58				
i060	0,52	i084	0,61				
i061	0,58	i085	0,66				
i062	0,62	i086	0,59				
i063	0,62	i087	0,53				
i064	0,62	i088	0,47				
i065	0,55	i089	0,58				
i066	0,53	i090	0,44				
i067	0,68	i091	0,45				
i068	0,62						
SKILFULNESS							
<i>Articulate</i>		<i>Competent</i>		<i>Enterprising</i>			
i108		i130		i146			0,46
i109		i131		i148			0,60

i110	0,71	i132	0,70	i150	0,65
i111	0,68	i133	0,61	i151	0,71
i112	0,66	i134	0,61	i152	0,68
i113	0,71	i135	0,64	i153	0,77
i115	0,59	i136	0,57	i154	0,75
i116	0,46	i137	0,55	i155	0,55
i117	0,60	i138	0,41	i156	0,80
i118	0,56	i139	0,66	i157	0,77
i119	0,49	i140	0,65	i158	0,80
i120	0,38	i141	0,64	i159	0,70
i121	0,66	i142	0,62	i160	0,47
i122	0,59	i143	0,71	i161	0,63
i123	0,60	i144	0,62	i163	0,53
i124	0,66	i145	0,69	i164	0,36
i125	0,53				
i126	0,71				
i127	0,54				
i128	0,59				
i129	0,54				

SOCIAL INTELLECT

<i>Perceptive</i>		<i>Social Intellect</i>		<i>Understanding</i>	
i165	0,61	i180	0,63	i193	0,66
i166	0,68	i181	0,69	i194S	0,70
i167	0,60	i182	0,50	i195	0,67
i168	0,73	i184	0,59	i196	0,66
i169	0,68	i185	0,73	i197	0,46
i170	0,67	i186	0,65	i198	0,67
i171	0,62	i187	0,52	i199	0,72
i172	0,59	i188	0,43	i200	0,73
i173	0,59	i189	0,67	i201	0,53
i174	0,61	i190	0,70	i202	0,65
i175	0,62	i191	0,61		
i176	0,67	i192	0,57		
i177	0,71				
i178	0,68				
i179	0,71				

Table 3 shows that all the inter-item correlations are considered acceptable compared to the guideline of loadings $> 0,3$. Therefore, all the items in this table can be used for further analysis in the development of a measuring instrument of the Intellect cluster.

Reliability

The internal consistency coefficients were calculated for each facet. The calculation of a reliability coefficient proceeds on the assumption of unidimensionality within each facet. The results are presented in Table 4.

Table 4

Descriptive statistics, skewness, kurtosis and Cronbach alpha coefficients (N = 524)

Item	Mean	SD	Skewness	Kurtosis	α
Artistic (9 items)	26,16	6,98	0,06	-0,33	0,83
Concrete Work (4 items)	15,58	3,93	-0,22	-0,20	0,70
Creative (12 items)	40,42	8,15	-0,29	-0,03	0,85
Musical (6 items)	20,85	4,97	-0,27	-0,30	0,77
Intellect (24 items)	88,96	12,34	-0,38	1,02	0,90
Knowledgeable (23 items)	84,96	11,71	-0,43	1,10	0,91
Logical (12 items)	44,65	6,49	-0,25	0,94	0,84
Self-insight (4 items)	16,69	2,70	-0,95	1,07	0,73
Articulate (21 items)	75,05	11,76	-0,23	0,37	0,90
Competent (16 items)	62,07	8,36	-0,51	1,43	0,90
Enterprising (16 items)	55,27	11,24	-0,31	0,06	0,91
Perceptive (15 items)	58,36	8,52	-0,58	1,58	0,90
Social Intellect (12 items)	44,71	6,25	-0,44	1,17	0,84
Understanding (10 items)	37,74	5,50	-0,42	1,57	0,84

To ensure the assumption of normality, items with skewness of > 2 and kurtosis of > 4 were identified. It can be seen from Table 4 that all the items in the Intellect cluster are normally distributed. Table 4 also indicates that the Cronbach alpha coefficients show acceptable levels of reliability, since the scores obtained are higher than the $\alpha > 0,70$ guideline (Nunnally & Bernstein, 1994), ranging from 0,70 to 0,91. Although this level is satisfactory for the preliminary test development stages, ultimately a reliability score of 0,95 should be considered when important decisions are made based on specific test scores of individuals (see Nunnally & Bernstein, 1994).

Factor analysis

Principal axis factor analysis with a Direct Quartimin rotation was performed. The following techniques were used to determine the number of factors to be extracted: (a) eigenvalues (>1) (b) the scree plot and (c) parallel analysis. Maximum likelihood was used to analyse the factor solution of the Intellect cluster. The results based on the eigenvalues of the intercorrelation matrix are presented in Table 5.

Table 5

Eigenvalues of the intercorrelation matrix for the Intellect cluster (N = 524)

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	6,632	47,372	47,372	5,318	37,983	37,983	6,050
2	1,592	11,368	58,740	2,111	15,078	53,060	3,476
3	0,943	6,739	65,479				
4	0,839	5,991	71,470				
5	0,709	5,062	76,532				
6	0,666	4,760	81,291				
7	0,522	3,729	85,020				
8	0,496	3,546	88,566				
9	0,332	2,373	90,940				
10	0,323	2,304	93,243				
11	0,269	1,923	95,166				
12	0,256	1,832	96,998				
13	0,229	1,634	98,632				
14	0,192	1,368	100,000				

Table 5 shows that there were two eigenvalues >1 , suggesting that two factors should be retained. Two factors explain 58,7% of the variance of the data.

The results of the parallel analysis of the reduced intercorrelation matrix showed that two eigenvalues of the sample data were greater than the eigenvalues of the parallel random data. This suggests that only two factors should be retained (see Figure 1). Furthermore, Figure 1 also revealed a clear break after the third root. Therefore, the scree also suggests that two factors should be retained.

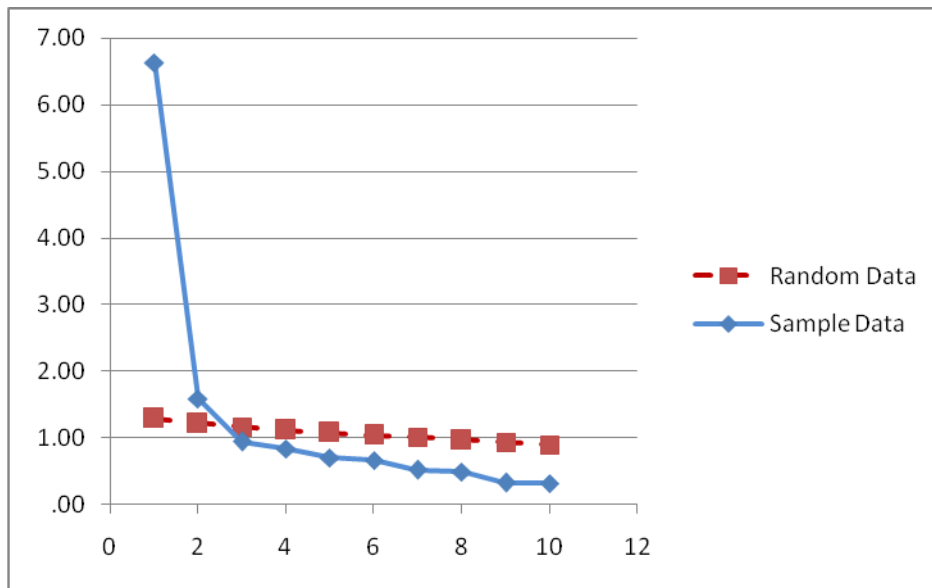


Figure 2. Scree plot and parallel analysis for the Intellect cluster.

Two factors were therefore retained and a maximum likelihood factor analysis was performed on the data.

Table 6

Oblique factor pattern matrix of the 14 facets of the Intellect cluster (N = 524)

	Factor 1	Factor 2
Artistic	0,00	<u>-0,70</u>
Concrete Work	-0,02	<u>-0,57</u>
Creative	0,00	<u>-0,97</u>
Musical	0,19	-0,26
Intellect	<u>0,76</u>	-0,11

Knowledgeable	<u>0,82</u>	-0,06
Logical	<u>0,77</u>	0,04
Self-insight	<u>0,57</u>	-0,10
Articulate	<u>0,69</u>	-0,09
Competent	<u>0,83</u>	-0,06
Enterprising	<u>0,45</u>	0,02
Perceptive	<u>0,81</u>	0,11
Social Intellect	<u>0,78</u>	0,04
Understanding	<u>0,75</u>	0,05

It can be seen from Table 6 that two factors were extracted with a cut-off of $>0,30$ for inclusion of a variable. The Musical facet was the only facet that did not load on any of the factors. The variables clustered into the first factor included Intellect, Knowledgeable, Logical, Self-insight, Articulate, Competent, Perceptive, Social intellect and Understanding. Artistic, Concrete Work and Creative loaded on the second factor.

The factor correlation matrix (see Table 7) indicates that both factors correlated significantly (large effect).

Table 7

Intercorrelations of the first-order factors of the Intellect cluster (N = 524)

Factor	1	2
1	1,00	-0,52*
2	-0,52*	1,00

* Correlation is practically significant $r > 0,50$ (large effect)

The intercorrelations between the two factors indicate the presence of a higher-order factor. As a result, the factor correlation matrix was transformed into an orthogonal Schmid and Leiman (1957) hierarchical factor solution. This transformation revealed a single-order factor and two

group primary factors, which were uncorrelated at all hierarchical levels for all the factors (see Table 8). An evaluation of the relative influences of factors at different levels of the factor hierarchy can be made on the basis of this transformation (McDonald, 1999).

Table 8

Hierarchical Schmid-Leiman factor solution for the 14 facets of the Intellect cluster (N = 524)

Sub-cluster	Intellect (higher-order factor)	Factor 1	Factor 2	h^2
Artistic	<u>0,61</u>	0,00	<u>-0,35</u>	0,49
Concrete Work	<u>0,47</u>	-0,01	<u>-0,28</u>	0,30
Creative	<u>0,85</u>	0,00	<u>-0,48</u>	0,95
Musical	<u>0,39</u>	0,09	-0,13	0,18
Intellect	<u>0,75</u>	<u>0,37</u>	-0,05	0,70
Knowledgeable	<u>0,77</u>	<u>0,40</u>	-0,03	0,75
Logical	<u>0,64</u>	<u>0,38</u>	0,02	0,55
Self-insight	<u>0,58</u>	<u>0,28</u>	-0,05	0,42
Articulate	<u>0,68</u>	<u>0,34</u>	-0,04	0,57
Competent	<u>0,77</u>	<u>0,41</u>	-0,03	0,77
Enterprising	<u>0,37</u>	0,22	0,01	0,19
Perceptive	<u>0,61</u>	<u>0,40</u>	0,05	0,54
Social Intellect	<u>0,65</u>	<u>0,39</u>	0,02	0,57
Understanding	<u>0,61</u>	<u>0,37</u>	0,03	0,51
% shared variance	77%	17%	6%	

Table 8 shows that the Schmid-Leiman transformation produced one distinct second-order factor and two weakly defined group factors. All the facets had their highest factor pattern coefficient on the second-order factor, where the coefficients ranged from 0,37 to 0,85. Table 8 also indicates that the Musical and Enterprising facets did not have first-order factor loadings above 0,30 in the Schmid-Leiman factor solution, although Enterprising's original loading on factor 1 in first-order factor analysis was above this criterion (0,45, see Table 6). This indicates that Enterprising and Musical are measuring the Intellect cluster. However, they are not measuring the two first-order factors. Reviewing the facets that loaded on the two factors, Factor 1 could be

labelled Intellect (Intellect, Knowledgeable, Logical, Self-insight, Articulate, Competent, Perceptive, Social intellect and Understanding facets) and Factor 2 could be labelled Aesthetics (Artistic, Concrete Work and Creative facets). Furthermore, the results indicate that the second-order factor explained 77% of the total variance of all the facets, while the two first-order factors only accounted for 17% and 6% respectively. This indicates that the participants' responses to the items of the various facets directed towards a general Intellect factor, with the two group factors having a comparatively minor influence.

The construct equivalence across different race groups was evaluated by comparing the factor pattern matrices of the two factors obtained for the different groups (see Table 9), as well as by evaluating the Tucker's phi coefficient.

Table 9

Factor pattern matrices for the white (n = 287) and African groups (n =196)

	Factor 1		Factor 2	
	White	African	White	African
Artistic	<u>0,78</u>	<u>0,42</u>	-0,04	0,13
Concrete Work	<u>0,54</u>	<u>0,64</u>	-0,01	-0,07
Creative	<u>0,99</u>	<u>0,71</u>	-0,03	0,15
Musical	<u>0,33</u>	-0,02	0,15	<u>0,38</u>
Intellect	0,07	0,28	<u>0,81</u>	<u>0,62</u>
Knowledgeable	0,01	0,28	<u>0,84</u>	<u>0,70</u>
Logical	-0,04	0,19	<u>0,80</u>	<u>0,62</u>
Self-insight	0,00	0,29	<u>0,64</u>	<u>0,43</u>
Articulate	0,14	0,08	<u>0,64</u>	<u>0,69</u>
Competent	0,04	0,17	<u>0,84</u>	<u>0,76</u>
Enterprising	0,02	0,03	<u>0,48</u>	<u>0,38</u>
Perceptive	0,00	-0,19	<u>0,77</u>	<u>0,91</u>
Social Intellect	-0,01	-0,10	<u>0,71</u>	<u>0,89</u>
Understanding	-0,09	-0,09	<u>0,65</u>	<u>0,89</u>

The results indicate that all the facets loaded on the same factors for the different groups – except for the Musical facet, which loaded on factor 1 for the white group and on factor 2 for the African group.

Lastly, the correspondence between factor loadings amongst the two groups was assessed with Tucker's phi. Usually, coefficients of congruence $> 0,95$ indicate high levels of construct equivalence, while values $< 0,90$ would signify that the construct probably varies in meaning across the diverse groups (Van de Vijver & Poortinga, 1994). The results indicate that for the first factor, the Tucker's phi was 0,82. This indicates relative mediocre factor similarity. The Tucker's phi result for the comparison of factor solutions between the two groups for second factor was 0,94; this consequently shows excellent factor similarity.

DISCUSSION

The general objective of this study was to develop a valid and reliable measuring instrument for the Intellect cluster of the South African Personality Inventory. More specifically, this study endeavoured to investigate the factor solution of the Intellect cluster, as well as to determine the differences and/or similarities between the factor solutions of the white and African race groups respectively.

The first step in achieving the objectives of this study was to eliminate items that failed to attain certain standards in the data preparation and item correlation phases. This process served a two-fold purpose: it revealed which items did not represent the Intellect cluster in a valid and reliable way, and it prepared the data for factor analysis. During this phase, 18 of the original 202 Intellect items were discarded. These items did not correlate with the Intellect cluster and could be seen as items that were not drawn from the fitting domain, which results in unreliability and error (Churchill, 1979). The problematic items were found in the following facets: Concrete Work (8 items, e.g. "I am good at technical work"), Musical (5 items, e.g. "I play in a music group"), Articulate (1 item, e.g. "I speak slowly"), Enterprising (3 items, e.g. "I work for myself") and Social Intellect (1 item, e.g. "I say things that are not called for"). By re-evaluating the discarded items on face value, it appears as though too specific items (e.g. "I compose music") discriminate against the majority of the test-takers. Another cause of problematic items could include the nature of the content covered, which is not relevant to the purpose of the

measure (e.g. “I work for myself”). The question can be raised that if an individual works for himself, does it necessarily mean that the person has an enterprising ability? Still, the 18 problematic items of the Intellect cluster are relatively few in view of Foxcroft and Roodt’s (2001) suggestion that usually after item analysis at least one third of the items end up being discarded. Following elimination of these items, all the remaining items correlated with their respective facets. Subsequently, the internal reliability of these facets was calculated. All 14 Intellect facets displayed high Cronbach alpha coefficients, indicating acceptable levels of reliability.

To develop a valid measuring instrument, reliability needs to be ensured, as reliability is a necessary condition for validity (Kerlinger, 1986), and given that reliability had been established validity could be investigated. According to Murphy and Davidshofer (2005), factor analysis is a technique to determine the construct validity of a measure. Three eigenvalue-based criteria were used to determine the number of factors to retain. All of these criteria indicated that two factors should be extracted. The first factor (or sub-cluster) that emerged seemed to represent an Intellect sub-cluster, which can be defined as the ability to achieve insight into things and oneself, having general knowledge, the capacity to do things well, having a high level of competence in work situations, adequate verbal skills, having the ability to understand others, and to react appropriately within a specific social context. The second sub-cluster that was identified, Aesthetics, can be seen as the quality of being artistic, creative and having an inclination to do practical work. These findings are contrary to Nel’s (2008) initial findings that four sub-clusters should be identified for the Intellect cluster, namely: Aesthetics, Reasoning, Skilfulness and Social Intelligence. The grouping of the factors as is implied in this study can be verified by Peabody and Goldberg’s (1989) notion that the Intellect cluster consists of both controlled facets of intelligence (e.g. reflective, intelligent, perceptive) and expressive facets (e.g. creative and artistic).

Interesting to note is that the musical facet did not load on any of the two factors. This indicates that this facet does not fit within the Intellect cluster. Since the qualitative stage of the SAPI project captured only 15 musical responses in merely 5 language groups (cf. Nel, 2008), it

confirms the findings of this study, demonstrating that this facet is rather weakly represented within the South African context.

The next step in determining the construct validity for the Intellect cluster pertained to the inspection of the factor correlation matrix by determining whether a general Intellect cluster was represented by the responses to the items. The factor correlation matrix of the two sub-clusters correlated significantly to a large extent, indicating that the existence of the general higher-order factor can be inferred (rather than observed as yet). Subsequently, the second-order factor analysis with a hierarchical Schmid and Leiman (1957) transformation confirmed the inferred general higher-order Intellect cluster. Regarding the variance accounted for by the first and second-order factors, Wolff and Preising (2005) state that the variance explained within the Schmid-Leiman solution is partitioned into non-overlapping contributions, and is attributed to the most general or highest level possible. At the highest level, all the variance that can be explained by the factors on this level is attributed to this level, while of the remaining variance, the maximum amount possible will be attributed to the second highest level (Wolff & Preising, 2005). The variance explained by the Intellect cluster was at least five times more than any of the two sub-clusters. This indicated that the explanatory power of the Intellect cluster was higher than that of the two sub-clusters (Aesthetics and Intellect). It might therefore be justified to compute one total score for the Intellect cluster (see De Bruin, 2006).

Besides loading on the higher-order factor, the Musical and Enterprising facets do not have second-order factor loadings above 0,30 in the Schmid-Leiman factor solution. Omitting the Musical facet from the Intellect cluster is thus affirmed by the second-order factor analysis, but Enterprising's original loading on factor 1 in first-order factor analysis is above this criterion. Interestingly, Enterprising together with Knowledgeable had the highest level of internal consistency of all the facets, suggesting that the Enterprising facet is a reliable measure although it does not necessarily fit the Intellect cluster. Cheung (2006) incorporated the Enterprising facet into the Neuroticism/Emotional Stability factor of the NEO-FFI. However, in this preliminary development stage of the SAPI further item facet delineation and item development is needed before a firm decision can be reached about the Enterprising facet.

The last objective of this study was to determine the differences and/or similarities between the factor solutions of the white and African race groups respectively. The factor pattern matrices for the white and African groups showed similar factor solutions for the two sub-clusters, except for the loading of the Musical facet. The Musical facet loaded on the Aesthetics sub-cluster for the white group and on the Intellect sub-cluster for the African group. This may indicate that the white group associates the Musical facet with the arts and with creativity, whereas the African group perceives this facet to be related to the mental processes of perception, judgment, and/or reasoning. No literature could be found to explain this phenomenon, therefore it can only be speculated that the Musical personality trait, in an African perspective, is synonymous with cognitive ability processes rather than an aesthetic talent.

In general, a similar factor solution between the white and African groups was found. Regarding differences in facet loadings between the two groups, higher loadings for the white group were found on the Artistic, Creative, Intellect, Knowledgeable, Logical, Self-insight, Competent and Enterprising facets. However, the African group had higher loadings on Concrete Work, Musical, Articulate, Perceptive, Social Intellect and Understanding facets. The variation in the facet loadings might be a reflection of the White individualistic and African collectivistic view on intellect. It is therefore postulated that Intellect, for the white group, represents a capacity to think, reason and create, whereas, for the African group, Intellect represents the capacity to assess, understand and appreciate one's environment and the people that form part of that environment. Firstly, the results confirm research findings which stated that intelligence is the talent to create products or resolve issues that are considered valuable in one's culture, and secondly, the results also confirm the understanding of intellect in African and Asian cultures emphasise social skills more than Western conceptions do (Gardner & Hatch, 1989; Sternberg, 2000).

In conclusion, following the removal of 18 items, the results provided support for valid and reliable items which contribute to the construct validity as well as the internal reliability of the Intellect questionnaire. Furthermore, the findings provided valuable information regarding the factor solution of the Intellect cluster within the South African context. The results illustrated that the 14 facets clustered into two sub-clusters: Intellect and Aesthetics. However, the

explanatory power of the Intellect cluster is greater than that of the two sub-clusters; therefore, computing a total score for the Intellect cluster should be considered. A main finding of this study was the confirmation of a similar factor solution between the white and African groups – although the different groups seem to attribute different meanings to the notion of Intellect.

Limitations and recommendations

Even though this exploratory study showed promising results, it was not without its limitations. Firstly, the participants consisted mainly of university students, which implies that this study was not representative of the South African population. Applicability is therefore restricted. Language may have presented a barrier, as only 4,8% of the individuals indicated English as a first language. In the current study validity was simply determined through content-descriptive procedures and construct-identification procedures, criterion-prediction procedures were not implemented. It is thus still unclear whether the Intellect measure can identify the existing behaviour or status concerning explicit intellectual abilities and characteristics of an individual.

To overcome some of these limitations, certain recommendations are made for future studies. Firstly, seeing as the current research served as a pilot study, it is essential that a second refined version of the measure be administered after item analysis. Secondly, it is recommended that this study be replicated with a more representative sample of the South African population. In future, further analysis of item properties such as the Rasch item analysis could be employed to confirm or further identify weak items that require revision. Another recommendation may be to overcome the language barrier by translating items into the participants' indigenous languages. Future research can explore criterion-prediction validity in order to ensure that the Intellect measure accurately assesses intellectual behaviour as a personality attribute. In conjunction with this structure of the Intellect cluster, the next stage of the SAPI project could embark on the development of the questionnaire as a whole.

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CHAPTER 3

CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

In this chapter, conclusions regarding the study are presented based on the general and specific objectives. The limitations of this research are discussed, followed by recommendations for the project and future research.

3.1 CONCLUSIONS

The aim of this study was to develop valid and reliable items for an Intellect-measuring instrument that will form part of a larger personality inventory. This study also investigated the factor solution of the Intellect cluster and then compared the factor solutions of the white and African race groups respectively.

The word “personality” has numerous meanings, and these meanings vary according to different frameworks of personality (Meyer, Moore & Viljoen, 2003). However, generally, personality theorists attempt to (a) identify the main dimensions in which people differ or can be compared, (b) test that these dimensions remain relatively stable over time, and (c) explain the etiological basis of these universal and stable differences among individuals (Cooper, 1998). According to Kreitner and Kinicki (2004) and Swanepoel, Erasmus, Van Wyk and Schenk (2005), personality can be seen as the sum total of all physical and mental characteristics or traits that give the individual his or her identity and unique nature; these characteristics include how the individual looks, behaves, feels and thinks. These characteristics are also known as traits. Trait theorists suggest that traits can be used to predict an individual’s behaviour, as they offer clear, simple descriptions of people’s behavioural consistencies and allow us to compare individuals (Feldman, 1999; Bergh & Theron, 2003). The need for standardised personality scales emerged to minimise human error in comparing individuals (Boyle, Matthews & Saklofske, 2008). Feldman (1999) explains that just as a physician obtains a blood sample from a person to test it,

psychologists can obtain a sample of behaviour through the utilisation of self-report assessments. A self-report assessment would therefore consist of various questions/items which the individual has to answer concerning his/her own behaviour (Boyle et al., 2008).

The first objective of the study was to develop items for the Intellect cluster that would be valid and reliable for the South African population. In order to reach this objective, qualitative methods (established in the first phase of the SAPI project) were utilised to develop an indigenous personality theory, which formed the foundation for item development of the Intellect questionnaire. Directed by guidelines obtained from Hendriks, Hofstee and De Raad (1999), the item development process entailed considering original responses per facet, extracting content-representative responses and developing definitions for the various facets, developing item stems, and the final item writing phase.

According to the American Psychological Association (APA, 1995), a psychological measure should include demonstrations of content validity, criterion-related validity, construct validity and internal consistency. Psychometric tests usually lack content validity in the item development phase and do not have clear and strong relations with their theoretical fields (Hinkin, 1995). The current study addressed attended to these concerns in a qualitative manner by allocating project members to check each item's capability to tap into the content domain, the wording as well as the gender, cultural and linguistic appropriateness of the items of the Intellect questionnaire. Statistically, a principle component analysis determined each item's internal reliability. The results indicated that only 18 of the original 202 items of the Intellect questionnaire did not prove to be valid and reliable. These results are encouraging, since a greater item pool of reliable items exists that can be used for further analyses and inclusion in the final instrument.

Construct validity refers to the extent to which the test assesses the trait or theoretical construct it is assumed to measure (e.g. intellect) (Foxcroft & Roodt, 2001). According to Murphy and Davidshofer (2005), factor analysis is one technique to determine construct validity, since factor analysis identifies the factorial composition of the measure, thereby highlighting the underlying factors tapped by the measure. Generally, trait psychologists make use of factor analysis to

cluster the number facets into factors or dimensions to determine the construct validity (Foxcroft & Roodt, 2001). This brings us to the second objective of this study, which was to quantitatively investigate the factor solution of the Intellect cluster. Nel (2008) suggests a preliminary structure for the Intellect cluster of the South African Personality Inventory (SAPI), consisting of four sub-clusters and 16 facets. In the current study, first-order as well as second-order factor analysis were used to investigate the factor structure of the Intellect cluster. The results yielded only two sub-clusters with 12 facets in total, as can be seen in figure 3:

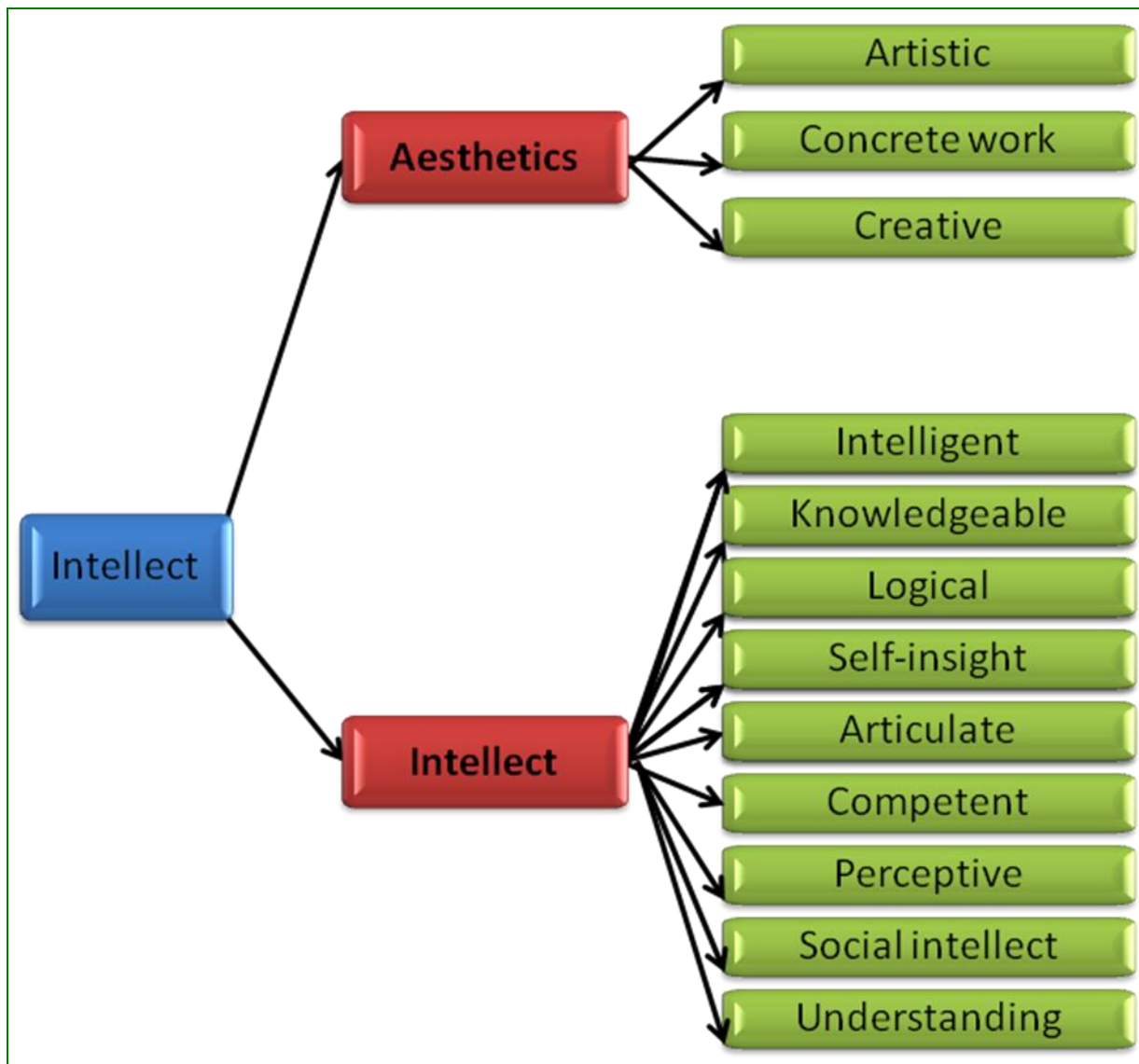


Figure 3. *The revised factor solution of the Intellect cluster*

The second-order factor analysis indicated that it may be justified to compute one total score for the Intellect cluster rather than independently calculating scores for the two sub-clusters. The analysis indicated that the Musical and Enterprising facets do not fit the Intellect cluster. Furthermore, the Talented and Useless facets were also discarded due to too few responses obtained in the qualitative phase. Evaluating the results of the factor analysis, construct validity can be inferred.

According to Bedell, Van Eeden and Van Staden (1999), South Africa is characterised by 11 official languages and highly diverse cultures and races, and an uneven distribution of socio-economic and education levels across groups. Variables such as educational background, race and language are all expected to have an impact on the individual's personality. Yet even though these cultural differences are known, there is still a lack of understanding of the effects thereof on psychometric measurement in South Africa (Meiring, Van de Vijver, Rothmann & Barrick, 2005; Nel, 2008). Acknowledging the culturally diverse setting in South Africa, it is vital to investigate expressions of personality in every language group (Nel, 2008). Hence, the third objective of this study was to compare the factor solutions of the white and African race groups respectively. The participants in this study represented both white and African students. The results obtained indicated a similar factor solution for the white and African groups, with the exception of the Musical facet. The Musical facet loaded on the Aesthetics sub-cluster for the white group and on the Intellect sub-cluster for the African group. It can be assumed that the white group associates music with the arts and with creativity, whereas the African group associates music with mental processes of perception, judgment, and/or reasoning. No literature could be found to explain this phenomenon, therefore it can only be speculated that the Musical personality trait, in an African perspective, is synonymous with cognitive ability processes rather than an aesthetic talent.

In conclusion, this study constitutes an important contribution to personality test development in South Africa, as it gives effect to a statement by Rothmann and Cilliers (2007) that new tests should be developed based on South African circumstances so that these tests could present policy-makers with valid and reliable information for promotion and evaluation of training, decision-making, assist psychologists in the screening and diagnostic course and give

organisations data for employee selection. Personality test development within a South African context is limited and the results in this study contribute to new-found literature regarding an indigenous view of Intellect as a personality trait.

3.2 LIMITATIONS OF THIS RESEARCH

This study had a number of limitations. The first limitation concerned the composition of the sample of selected participants. Psychologists usually rely on convenience sampling to conduct cultural studies. This preference is usually determined by logistical, cost and collaborator accessibility factors (see Church & Ortiz, 2005). Unfortunately, the convenience sampling has led to participants ending up in a uniform group. As Bedell et al. (1999) state, South Africa is a country characterised by 11 official languages, highly diverse cultures and races, and an uneven distribution of socio-economic and education levels across groups. As convenience sampling was utilised, the above-mentioned problem occurred. Although the study included both white and African participants, the sample consisted mainly of university students, which implies that the study was not representative of the South African population. The fact that all participants were from an educational environment may have influenced responses on certain items, for instance item 048: “I like learning new things”. The majority of participants indicated “strongly agree”, seeing as learning new things is fundamental in a student context.

De Bruin, De Bruin, Dercksen and Cilliers-Hartslief (2005) point out that many South Africans have poor English comprehension and reading skills due to the fact that their first language is indigenous African languages (De Bruin et al., 2005). This brings us to another limitation of the study – the language barrier. Only 4.8% of the individuals indicated English as their first language, yet the questionnaires were administered in English. Consequently, some of the items may have been misinterpreted by the participants.

Lastly, validity was only determined through content-descriptive procedures and construct-identification procedures. This may constitute another limitation since American Psychological Association (APA, 1995) guidelines state that an appropriate psychological measure should include demonstrations of content validity, criterion-related validity, construct validity and internal consistency. The current study made no reference to criterion-prediction procedures. It is

thus still indistinct whether the Intellect measure can identify the existing behaviour or status concerning explicit intellectual abilities and characteristics of an individual.

3.3 RECOMMENDATIONS

3.3.1 Recommendations to solve research problems

To overcome some of these limitations, certain recommendations can be made for future studies. Firstly, in order to diversify the sample, the same study could be repeated with participants who are varied in terms of level of education. Due to the cross-cultural nature of the research, optimum sampling procedures that can be used to diversify the sample are: quota sampling for non-probability studies or stratified sampling for probability sampling. Secondly, to overcome the language obstacle, items can be translated back into indigenous languages as original responses were captured in the participants' natural languages, the process of translation will be less complicated. In future, further analysis of item properties such as the Rasch item analysis could be employed to confirm or further identify weak items that require revision. Future research can explore criterion-prediction validity to ensure that the Intellect measure accurately assesses intellectual behaviour as a personality attribute. Another recommendation could be to recruit diverse project members to work on the SAPI to ensure that a valid and reliable instrument is developed. Although students are already being recruited from Universities in Tilburg (the Netherlands), Potchefstroom, Johannesburg, and Stellenbosch, other universities can also be involved (e.g. University of Limpopo) to ensure representation of all cultures. In future, attention should be given to increase recruitment and training of African Industrial Psychologists, as more research is needed in the field of psychometrics. Representation of an indigenous African group could also further cross-cultural studies.

3.3.2 Recommendations for future research of the South African Personality Inventory (SAPI)

It is important to note that the results of this study were obtained for the purposes of a pilot study. More specifically, the objectives of this study were to quantitatively verify the structure of

the Intellect cluster and to determine item functioning within the Intellect cluster. The results of this study can be seen as the foundation of the Intellect questionnaire and will enable the SAPI to further research and refine the Intellect questionnaire and Intellect structure.

In future, SAPI studies can further investigate the current retained items for further elimination of biased items. These studies might be done on cross-cultural and cross-linguistic levels in order to better equivalence.

Future studies can also refine the Intellect structure by compiling a combined questionnaire of the various clusters to determine through factor analysis if the facets and sub-clusters are in the correct cluster. However, this research can only be done once the reliability and validity of the items have been established.

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Appendix A

Response-derived definitions of the 14 facets of the Intellect cluster

Sub-cluster	Facet	Definition
Aesthetics	Artistic	The facet 'artistic' can be described as the inclination, likings or preference for engaging or appreciating arts.
	Concrete work	The facet 'concrete work' can be seen as the inclination towards activities that involve working or repairing things with one's hands.
	Creative	The facet 'creative' is defined as developing, creating or designing original and unique ideas or items.
	Musical	The facet 'musical' relates to being able to interpret and/or present some form of musical activity.
Reasoning	Intellect	The facet 'intellect' refers to being bright, shrewd, informed and generating good ideas. The ability to understand concepts easily and learns quickly. Think in order to have a precise and accurate answer in line with expectations.
	Knowledgeable	The facet 'knowledgeable' can be seen as having up-to-date knowledge, having good general knowledge and the ability to talk about different topics.
	Logical	The facet 'logical' refers to being logical.
	Self-insight	The facet 'self-insight' is to know and understand oneself and to perform introspection in order to learn more about oneself.
Skilfulness	Articulate	The facet 'articulate' can be defined as communicating well, speaking clearly and fluently; being easily understood by others. Expressing oneself clearly through verbal and written communication.
	Competent	The facet 'competent' refers to having the skills, knowledge, resourcefulness, and productive nature to complete a task and know what one is doing.
	Enterprising	The facet 'enterprising' is taking the initiative to exploit new business opportunities, having business knowledge and the creativity to make and sell items.
Social Intellect	Perceptive	The facet 'perceptive' can be defined as being observant, reading the social environments for cues and having insight regarding others.
	Social intellect	The facet 'social intellect' refers to having good people skills and people knowledge.
	Understanding	The facet 'understanding' is to listen to other people's problems and opinions in order to understand how they think. Being empathetic. The ability to know how others feel and to relate to them. Take others into consideration in order to understand life as well as the way people work.