

**A TRANSLATION AND PSYCHOMETRIC INVESTIGATION OF THE SOUTH  
AFRICAN CAREER INTEREST INVENTORY ACROSS GENDER AND RACE  
AMONG SECONDARY SCHOOL LEARNERS**

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## **DECLARATION**

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## ABSTRACT

A major component of the practice of career counselling and assessment is the measurement of vocational interests. Both globally and in South Africa, John Holland's (1997) theory of vocational personalities is one of the most influential career theories, providing a theoretical framework from which practitioners develop and administer vocational interest inventories. However, technological advances in the course of the 21<sup>st</sup> century have resulted in a rapid transformation in the world of work, rendering popular career interest inventories based on Holland's model obsolete, both in terms of content and occupational environments. To address these limitations, Morgan, de Bruin, and de Bruin (2014) employed Holland's typology and constructed an interest inventory, namely the South African Career Interest Inventory (SACII), for a South African university student and young adult sample that yielded reliable and valid scores.

Building on this foundation, the aim of this quantitative study was to further explore the validity of the SACII by investigating gender, racial, and language differences in the psychometric properties and interest structures of female and male, Black, Coloured and White South African Grade 9 learners ( $n = 628$ ), as measured by the SACII. To achieve this aim, the present study also involved translating the SACII into isiXhosa, hereby constructing the first career interest inventory in an indigenous South African language. The study also provided a back-translation of the Afrikaans version of the SACII. Using convenience sampling, all Grade 9 learners from five secondary schools in the Cape Winelands District of South Africa were included as participants for the research sample. Accordingly, the research aimed to investigate whether the SACII can be applied validly, reliably, and indiscriminately on a sample of middle adolescents across different gender, race, and language groups.

The results for the present study provided support for the reliability and validity of the scores on the SACII across different racial and language groups in South Africa, but failed to find support for the equal applicability of the scale across gender. Gender, race and language comparisons demonstrated the best model fit for the respective female, Black and isiXhosa participants. It is recommended that future studies further explore the gender difference on the SACII with sample groups diverse in race, culture, age and language. Moreover, future studies should conduct measurement invariance tests to determine the validity of the different language versions of the SACII. In summary, it appears that practitioners may continue to use Holland's (1997) model in

career assessment and counselling in the South African context when a valid career interest inventory, such as the SACII, is employed.

## OPSOMMING

Die meting van beroepsbelangstellings is 'n belangrike komponent van die praktyk van beroepsvoorligting en -assessering. Regoor die wêreld en in Suid-Afrika word John Holland (1997) se teorie van beroepspersoonlikhede beskou as een van die mees invloedryke beroepsteorieë. Dit verskaf 'n teoretiese raamwerk waarvolgens praktisyns loopbaanbelangstellingsinventarisse ontwikkel en administreer. Nietemin, die tegnologiese vooruitgang deur die loop van die 21<sup>ste</sup> eeu het aanleiding gegee tot 'n transformasie in die wêreld van werk en as gevolg daarvan word gewilde loopbaanbelangstellingsinventarisse beskou as verouderd, beide met betrekking tot inhoud en werksomgewings. Ten einde hierdie tekortkominge aan te spreek, het Morgan (2014) gebruik gemaak van Holland se tipologie om 'n loopbaanbelangstellingsinventaris te ontwikkel wat betroubaar en geldig is vir die Suid-Afrikaanse bevolking, naamlik die Suid-Afrikaanse Loopbaanbelangstellingsinventaris (The South African Career Interest Inventory - SACII).

Binne die bogenoemde konteks was die doel van hierdie kwantitatiewe studie om die geldigheid van die SACII verder te verken deur ondersoek in te stel na die verskille in die psigometriese eienskappe en belangstellingstruktuur van vroulike en manlike Kleurling, Swart en Wit Graad 9-leerders ( $n = 628$ ), soos gemeet deur die SACII. Daarbenewens het die studie die SACII vertaal na isiXhosa, en in die proses die eerste loopbaanbelangstellingsinventaris in 'n inheemse Suid-Afrikaanse taal ontwikkel. Verder sluit die studie 'n terugvertaling van die Afrikaanse weergawe van die SACII in. Deur middel van gerieflikheidsteekproefneming is alle Graad 9-leerders van vyf sekondêre skole in die Kaapse Wynlanddistrik van Suid-Afrika geselekteer as navorsingsdeelnemers. Die navorsing het ondersoek of die SACII met geldigheid, betroubaarheid en voor die voet toegepas kan word op 'n steekproef van middel-adolesente oor verskillende geslags-, etniese- en taalgroepe heen.

Die resultate van hierdie studie ondersteun die betroubaarheid en geldigheid van die SACII oor verskillende ras- en taalgroepe in Suid-Afrika, maar het nie daarin geslaag om ondersteuning vir die gelyke toepasbaarheid van die metingskaal oor geslag te bied nie. Geslags-, ras- en taalvergelykings het daarop gedui dat die model die beste toepassing kon vind op vroulike, Swart, en isiXhosa deelnemers. Toekomstige studies kan die geslagsverskille in die toepassing van die SACII verder bestudeer met steekproewe wat diverse etniese-, kultuur-, ouderdom- en taalgroepe insluit. Verder moet toekomstige studies metingsinvariansietoetse uitvoer om die geldigheid van

die verskeie taalweergawes van die SACII te bepaal. Ter opsomming blyk dit dat praktisyns kan voortgaan om Holland (1997) se model in beroepsvoorligting and -assessering toe te pas indien 'n geldige loopbaanbelangstellingsinventaris soos die SACII gebruik word.

## ISISHWANKATHELO

Indima enkulu xa kusenziwa ingcaciso kwakunye noqwalaselo lokufundiswa ngamakhondo kwaye kugxile kakhulu ekubeni kuqwalaselwa into ethi umntu makabe kanti unomdla kuyo. Kwilizwe ngokubanzi kwakunye naseMzantsi Afrika ingcingane zika John Holland zonyaka ka 1997 ezicacisa ngabantu abethe babonisa umdla kumakhondo zezona zibe negalelo elikhulu kwingcingane zamakhondo. Kwaye zithi zinike isisekelo apho abo basebenza lo msebenzi bathi bakhele khona kwaye bakwazi ukuthi bayisebenze into yezifundo kwakunye nemitsalane. Kodwa kunjalo, ukukhula kobuchwepheshe obuthi bayanyanise nenkulungwane yeminyanka engamashumi amabini ananye (21<sup>st</sup>) yenze ukuba kubekho utshintsho elizweni lomsebenzi, yaza ke lonto yenza ukuba amakhondo amaninzi ebenodumo abe ngawexesha elidlulileyo, lonto ke isekelezwe kumzekelo ka Holland wokugqithelwa lixesha. Ngokubhekiselele kumqolo kwakunye nasemisebenzini. Ukujongana ke nalemiceli mngeni uMorgan ngonyaka ka 2014 uthabathe ezingcingane zika Holland waza wenza eyakhe ethembekileyo kwaye enika umdla i-inventory (into esunguliweyo) eyenzela abantu base Mzantsi Afrika eyibizwa ngokuba yi (SACII).

Ngokubhekiselele apha, injongo zesifundo kukuba kuqwalaselwe kabanzi ukuthembeka nokusebenziseka kwe SACII kwakunye nokuphanda umehluko phakathi kwemidla yabantu ababhinqileyo kwakunye namadoda, abafundi abamnyama nabebala kwakunye nabamhlophe bebanga le thoba njengokuba zimejarishwa yiSACII. Esi sifundo siye sazama ngokunjalo ukuba siguqule iSACII siyise esiXhoseni ngokwenjengalo ke senza ithuba lomdla eMzantsi Afrika okokuqala kwilwimi zesintu. Kwaye senze nenguqulelo yesiBhulu yeSACII. Kuthe ke kwasetyenziswa ukhetho olungenamkhethe apho kuthe kwathatyathwa bonke abantu abantwana bezikolo bebanga lethoba kwizikolo zemfundo ephakamileyo zesithili iCape Winelands eMzantsi Afrika. Basetyenziswa njengababathabathe inxaxheba kwaye bemele namaqumrhu okujongana kwesi sifundo. Esi sifundo siqwalasele ukuba ingaba le SACII ingesetyenziswa ngempumelelo nangokungenamkhethe kubantu abafikisayo kuzo zombini na izini, namasiko kwakunye nabantu abathetha zonke ilwimi.

Iziphumo zesi sifundo ziyakuxhasa ukuthembeka kunye nokusebenziseka kwe SACII kuzo zonke intlanga, kwakunye neelwimi ngelwimi eMzantsi Afrika, kodwa kufumaniswe ithe yoyiswa ukuxhasa ukusetyenziswa ngokulinganayo kwizini ezahlukeneyo. Iye yabonakala iyeyona ikulungeleyo ukusetyenziswa kumabhinqa, kwabamnyama, kwakunye nabo bathetha isiXhosa bathe bathabatha inxaxheba. Kuyacetyiswa into yokokuba izifundo ziqwalasele umahluko



phakathi kwezini nge SACII kunye nabo bakhethiweyo ngokobume, namasiko, neminyaka kwakunye neelwimi. Zingathi ziqwalasele izifundo zeentlukwano ukuze kucaciswe ukusebenziseka kweSACII kwilwimi ezahlukeneyo. Ngokushwankathela kubonakala ngathi ukuba abo benza lomsebenzi bangaqhuba besebenzisa iziseko zengcingane zika Holland (1997) ngethuba besenza 'icounselling' (intetho-ntuthuzelo) ingcaciso nokuqwalasela eli khondo xa besebenzisa i-inventory yemidlalo yekhondo elifana ne SACII.

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**LIST OF ABBREVIATIONS**

<b>AIDS</b>	Acquired Immunodeficiency Syndrome
<b>CC</b>	Congruence Coefficient
<b>CCSM</b>	Circumplex Covariance Structure Modelling
<b>CFI</b>	Comparative Fit Index
<b>CI</b>	Correspondence index
<b>CTT</b>	Classical test theory
<b>CUS</b>	Circular Unidimensional Scaling
<b>DA</b>	Discriminant Analysis
<b>ECVI</b>	Expected Cross Validation Index
<b>EEA</b>	Employment Equity Act
<b>GFI</b>	Goodness-Of-Fit Index
<b>HIV</b>	Human Immunodeficiency Virus
<b>HPCSA</b>	Health Professions Council of South Africa
<b>ITC</b>	International Test Commission
<b>MB-10</b>	Meyer Interest Inventory
<b>MDS</b>	Multidimensional scaling
<b>MGCFA</b>	Multi-Group Confirmatory Factor Analysis
<b>PCA</b>	Principal Component Analysis
<b>P-E</b>	Person-Environment Fit
<b>PEC</b>	Person-Environment-Correspondence
<b><i>p</i>-RMSEA</b>	P-Value for Test of Close Fit
<b>RIASEC</b>	Realistic, Investigative, Artistic, Social, Enterprising and Conventional
<b>RMSEA</b>	Root Mean Square Error of Approximation
<b>RTHOR</b>	Randomisation test of hypothesised order relations

<b>SACII</b>	South African Career Interest Inventory
<b>SACII-X</b>	South African Career Interest Inventory-Xhosa
<b>SAVII</b>	South African Vocational Interest Inventory
<b>SD</b>	Standard Deviation
<b>SDS</b>	Self-Directed Search
<b>SDS-E</b>	Self-Directed Search Form E
<b>SRMR</b>	Standardised Root Mean Square Residual
<b>SSA</b>	Statistics South Africa
<b>TLI</b>	Tucker-Lewis Index
<b>U.S.</b>	United States
<b>VAF</b>	Variance Accounted For
<b>VPI</b>	Vocational Preference Inventory
<b>WCED</b>	Western Cape Education Department
$\Lambda$	Wilk's Lambda
$\chi^2$	Chi-square

## CHAPTER 1

### INTRODUCTION

#### 1.1 Introduction

The assessment of vocational interests is regarded as one of the cornerstones of career counselling. Using interest inventories, practitioners are provided with the necessary information to reveal the individual's interests, competencies, and occupational preferences (Harrington & Long, 2013). Moreover, career counselling and assessment provide individuals with valuable information regarding the world of work and occupational possibilities, and afford them the opportunity to engage in the process of career exploration (Weisgram, Bigler, & Liben, 2010). Considering that interests are one of the most stable psychological constructs over time (Su, Rounds, & Armstrong, 2009), assessing individuals' vocational interests is considered central to the prediction of educational and occupational choices (Hansen, 2005). This ultimately results in positive long-term outcomes in terms of tertiary degree completion and job satisfaction (Hirschi & Läge, 2007). For this reason, adolescents and adults often utilise career assessment to acquire self-knowledge and to establish a career trajectory (Morgan, 2014).

Vocational interests have been a topic of inquiry in psychological research since the early 20<sup>th</sup> century (Watson & Stead, 2013). However, the theoretical developments made by John Holland (1985, 1997) in particular revolutionised the realm of career psychology (Gottfredson, 1999; Nauta, 2010). Holland's (1997) theory of vocational personalities is deemed one of the most influential theories in career psychology and continues to stimulate contemporary research in vocational interest and assessment (Darcy & Tracey, 2007; Gottfredson, 1999; Nauta, 2010; Watson, Foxcroft, & Allen, 2007). Moreover, Holland's (1997) model is frequently used in career counselling and serves as a point of departure for a number of interest inventories, both internationally and in South Africa (de Bruin & de Bruin, 2013a; Foxcroft, Paterson, Le Roux, & Herbst, 2004). In South Africa, the Self-Directed Search (SDS; Gevers, du Toit, & Harilall, 1997) and the South African Vocational Interest Inventory (SAVII; du Toit, Prinsloo, Gevers, & Harilall, 1993) are the two most frequently used career interest inventories based on Holland's (1985; 1997) model (see section 3.3 for a detailed discussion of these interest inventories). However, the indiscriminate use of these vocational inventories has become contentious in non-Western countries (du Toit & de Bruin, 2002; Foxcroft et al., 2004; Watson et al., 2007).

The technological advancements and globalisation associated with 21<sup>st</sup> century have resulted in a transformation in the nature of the world of work (Morgan, 2010). Consequently, the content of popular career interest inventories does not represent the diversity of recent occupational developments and is considered obsolete (Morgan, 2014). Furthermore, studies have found conflicting results for the reliability and validity of Holland's model and instruments across genders, age groups, and different cultural contexts (Darcy & Tracey, 2007; Einarsdóttir, Rounds, & Su, 2010; Rounds & Tracey, 1996; Šverko & Babarović, 2006; Watson & McMahon, 2004). Particularly in the South African context, there has been limited empirical evidence on the validity and reliability of Holland's RIASEC model among diverse demographic groups (du Toit & de Bruin, 2002). If Holland's (1997) model and instruments have not been assessed to be valid across different genders, races and ages, this will have serious implications in terms of not only the vocational assessment and counselling of South African adolescents and adults, but also in terms of South African unemployment and economic stability.

To address the limitations of career interest inventories based on Holland's (1997) model in South Africa, Morgan, de Bruin and de Bruin (2014) recently constructed and assessed a new interest inventory for the South African population, namely the South African Career Interest Inventory (SACII). The SACII was developed to represent Holland's (1997) six vocational personality types: Realistic, Investigative, Artistic, Social, Enterprising and Conventional (RIASEC; Morgan et al., 2014). Through administering the SACII to a sample of late adolescents and adults, Morgan et al. (2014) found Holland's (1997) model to be applicable in the South African context and through the use of valid interest inventories, such as the SACII, career assessment and counselling based on his theory can be meaningfully and ethically applied.

Nonetheless, despite the promising results reported by Morgan et al. (2014) in the confines of their study, it is imperative that these results are reassessed and replicated with different samples in relation to gender, race and age, before any definite conclusions can be drawn regarding the broader applicability of the SACII. Considering the cultural and language diversity of South Africa, it is essential to construct a career interest inventory that is applicable for more South Africans, regardless of race, language or culture (Foxcroft et al., 2004).



## 1.2 Research rationale and problem statement of the study

Vocational assessment instruments have traditionally provided individuals with essential information regarding potential career paths and knowledge of self (de Bruin & de Bruin, 2013b). Savickas (2007) asserts that this information plays an integral part in the facilitation of the career decision-making process. However, it is apparent that only a small proportion of the South African population has access to vocational assessment instruments (Maree, 2010a; Pretorius, 2008, 2012). As a result, many South Africans possibly have to enter the world of work without having received any form of career counselling and assessment, which can have a detrimental impact on their long-term career development (Maree, 2007; Morgan, 2014).

The limited access to career counselling and assessment is further compounded by recent criticisms of popular vocational assessment instruments used in South Africa (Morgan et al., 2014). In particular, concerns have been raised regarding the content validity and cross-cultural applicability of these instruments (Foxcroft et al., 2004; Morgan et al., 2014). For example, the psychometric data of the South African Vocational Interest Inventory (SAVII) was established at the close of the 1980s, using primarily white, English and Afrikaans speaking participants (du Toit et al., 1993). Essentially, the SAVII's psychometric properties are representative of only a small subgroup of South Africans and not the entire South African population. Similarly, the Meyer Interest Inventory (MB-10) has also been found to be limited, as participants from predominantly one tertiary institution and specific geographical locations were used to establish norm groups (Meyer, 2003). In addition, the MB-10 is only available in English and Afrikaans (Meyer, 2003), which, in terms of language, excludes a large proportion of the South African society.

The majority of career assessments used in South Africa are inclined to adopt a Westernised value system, which is not equally applicable to members of different racial and cultural groups (Paterson & Uys, 2005). In turn, applying these inventories universally across all groups in South Africa might lead to practitioners providing inaccurate career information and occupational recommendations (Darcy & Tracey, 2007). This has a major impact on the applicability of career interest inventories in South Africa, as occupational goals, career aspirations and interests are expressed differently across different ethnic and cultural groups.

In developing the SACII, Morgan et al. (2014) employed a constrained emic approach, where items were written to represent the unique world of work in South Africa. Consequently, the items

were developed specifically for the diverse ethnic and cultural context of South Africa, rather than directly importing items from a developed, Westernised country.

The validation of the psychometric properties of the SACII was established using two samples of university students ( $n^1 = 404$ ;  $n^2 = 985$ ) and one sample of working adults ( $n = 188$ ), which produced promising results. However, in South Africa, vocational interest inventories are commonly used with adolescents to guide educational- and occupational choices and related decisions. Therefore, investigating the SACII amongst a sample of young adolescents will have certain practical implications, as it can be utilised to direct subject choices at school and university and ultimately, career choices. Furthermore, accurately uncovering secondary school students' career preferences could potentially improve career satisfaction, career maturity and economic stability in South Africa. In addition, translating the SACII into Afrikaans and isiXhosa, respectively, will grant individuals the opportunity to assess their career interest in their first language, which may have a major impact on the accuracy, validity and interpretability of the assessment scores. Considering the high levels of unemployment in South Africa, identifying the vocational interest structure of secondary school students may provide clarity and direction in terms of their educational- and occupational choices. This will have positive long-term outcomes, such as career decidedness, occupational stability and an enhancement in work performance (Savickas, 2009).

With this context in mind, the purpose of this study was to translate and assess the psychometric properties of the South African Career Interest Inventory across gender and race among Grade 9 secondary school learners. Specifically, differences on the SACII between male and female, Black, Coloured and White Grade 9 learners were investigated. It is crucial to establish whether the SACII is applicable across gender and racial groups, as the scales might be measuring different constructs for the different groups, rendering the scores on the SACII invalid (Morgan et al., 2014, 2015). Furthermore, the current study will aid in the improvement and refinement of the SACII's items, as well as provide an inventory with which individuals can assess their career interests in their first language.

### **1.3 Research aims and objectives**

The aim of the current study is to translate and assess the psychometric properties of the South African Career Interest Inventory across gender and race among Grade 9 secondary school learners in the Cape Winelands district in the Western Cape region of South Africa. Exploring the different

psychometric properties and interest structures of Black, Coloured and White adolescents, as well as males and females on the SACII will provide valuable information on its equal applicability across a variety of gender and racial groups throughout South Africa. This could be of invaluable assistance in providing career guidance and counselling to Grade 9 learners concerning their school subject choices.

The specific objectives of the current study include:

- (1) Translating the items in the South African Career Interest Inventory (SACII; Morgan, 2014) into isiXhosa. Accordingly, this study will develop the SACII-X.
- (2) Providing a back-translation for the items in the SACII in Afrikaans.
- (3) Investigating differences in the psychometric properties and interest structure of male and female Grade 9 secondary school learners (as measured by the SACII). In particular, this study will explore whether male and female Grade 9 learners' scores differ on SACII subscales.
- (4) Investigating differences in the psychometric properties and interest structure of Black, Coloured and White Grade 9 secondary school learners (as measured by the SACII).

## **1.4 Definition of key terms**

### **1.4.1 Interests and interest structure**

The variety of definitions available in vocational literature signifies the complexity and multidimensionality of interests as a construct (de Bruin & de Bruin, 2013b; Lent, Brown, & Hackett, 1994; Spokane, Luchetta, & Richwine, 2002). According to Lowman and Carson (2003), interests refer to unique characteristics that influence an individual's attraction to occupational and recreational activities. Accordingly, interests serve as motivation for an individual to pursue or disregard a certain occupational or leisure activity (Crites, 1999).

Savickas (1999) asserts that interests develop in response to specific environmental stimuli, which ultimately initiate goal-directed behaviour. Similarly, Lent et al. (1994) posit that interests develop as a reflection of an individual's self-efficacy and beliefs regarding career-related outcomes. Furthermore, Savickas (1999) argues that, rather than being stable qualities, interests continuously evolve as individuals are exposed to different environments and situations. However, recent studies have found individual interests to be relatively stable across the lifespan and to be established from a young age (Hirschi & Läge, 2007; Hirschi, Niles, & Akos, 2011; Tracey & Robbins, 2005; Tracey, Robbins, & Hofsess, 2005).

According to Holland (1997), an individual's vocational interests are ultimately an expression of his or her personality. This position implies that interests and personality are two fundamentally identical constructs - through measuring interests, we are also measuring personality (Spokane et al., 2002). Therefore, interests can be considered vocational personality types and serve as a model against which practitioners can measure the true individual (Holland, 1997; Morgan, 2014). The six vocational personality types posited by Holland (1997) represent different compositions of attitudes, interests and preferences exhibited by individuals (Nel, 2013). Hence, an individual is categorised in terms of which personality type she or he has the closest resemblance. However, considering the intricate nature of personality, an individual might have high correspondence with one personality type, but also share characteristics with other personality types. To address this issue, Holland (1997) describes individuals in terms of the three dominant vocational personality types, represented by a three-letter code, with which they have the highest correspondence. By describing an individual in terms of three dominant vocational personality types, the complexity of an individual's personality is captured (Nel, 2013). Consequently, the three dominant vocational personality types represent an individual's vocational interest structure (Nel, 2013).

#### **1.4.2 Differentiating between career counselling, assessment, and psychological testing**

Career counselling broadly refers to a process whereby career counsellors assist individuals in making satisfying and congruent career-related decisions (de Bruin & de Bruin, 2013a). Traditionally, career counselling involves a process in which the career counsellor determines the vocational outcomes the client wants to achieve through counselling and uncovering the motivation behind the client's difficulty with making career-related decisions. More importantly, through establishing the client's occupational strengths and weaknesses, the career counsellor is able to discover the client's career-related preferences (de Bruin & de Bruin, 2013a).

In order to facilitate this process, career counselling has been closely linked to the use of standardised psychological testing and assessment (Dawis, 1992). Despite the difference in meaning, the terms *psychological testing* and *assessment* are frequently and erroneously considered synonymous (de Bruin & de Bruin, 2013b). In the context of career counselling, *psychological testing* broadly refers to the administration and scoring of a variety of aptitude-, interest- and personality tests (de Bruin & de Bruin, 2013b). According to Urbina (2004), a psychological test is a systematic procedure, where specific cognitive or affective behaviour is sampled and evaluated against established standards. Therefore, an interest inventory can be

classified as a psychological test (Harrington & Long, 2013). MacAleese (1984) asserts that interest inventories are utilised to identify the individual interests of which the client is unaware, provide confirmation of the interests specified by the client and identify inconsistencies between the client's abilities and interests. Throughout this dissertation, the terms psychological measure, inventory and questionnaire will be used interchangeably.

In contrast, *career assessment* refers to a much broader practice, where meaning is attached to the information obtained from psychological tests, interviews and observations (de Bruin & de Bruin, 2013a). Consequently, career assessment refers to a process where career-related information is obtained from various sources, and using the client's context, the counsellor integrates and provides meaning to this information (de Bruin & de Bruin, 2013a). In light of the above, career counselling refers to an overarching practice that encompasses the use of psychological tests and the process of career assessment.

Within this context, the present study examined differences in the interest structure of male and female, and Black, Coloured and White Grade 9 secondary school learners on the South African Career Interest Inventory in the Cape Winelands district of South Africa. This study attempted to contribute to the practice of career counselling in South Africa, by providing a psychological measure that is culturally fair and valid, and affords individuals the opportunity to assess their career interests in their first language (that is in Afrikaans and isiXhosa).

### **1.5 Overview of dissertation structure**

This dissertation will employ the following structure: *Chapter 1*, drawing on the context of vocational assessment in the 21<sup>st</sup> century and its associated difficulties, introduces the research rationale and problem statement of the study. Hereafter, the research aims and objectives of the current study were elucidated. Finally, the key concepts related to the study's problem statement were defined and clarified.

*Chapter 2* presents an in-depth discussion of the theoretical perspectives pertinent to the South African Career Interest Inventory. Firstly, a discussion of the trait-and-factor and person-environment approach to vocational counselling and assessment is presented. Secondly, Holland's (1997) theory of vocational personalities is discussed, which includes an outline of Holland's six personality and environmental types and a review of the theory's primary and secondary assumptions.

In *Chapter 3*, literature related to career assessment in South Africa is reviewed. Specifically, the chapter begins with a discussion on the historical developments of psychometric career assessment in South Africa and the use of these instruments to promote racial segregation during the apartheid era. This is followed by a succinct overview of commonly used interest inventories in the South African context. Chapter 3 further includes a discussion on cross-cultural test adaptation and translation, as well as the role of culture in career assessment. The final section of the chapter presents a review of empirical research conducted on Holland's (1997) model across gender, race and age.

*Chapter 4* outlines the research methodology utilised in this study. Specifically, the quantitative, non-experimental, causal-comparative research design of the study is described. This is followed by a discussion of the research aims, objectives, and hypotheses of the study. The research procedure and the demographic characteristics of the sample are also presented. Chapter 4 further includes a detailed discussion of the development of the SACII and its psychometric properties. Hereafter, the procedures utilised in translating the SACII into Afrikaans and isiXhosa, respectively are elucidated. A presentation of the data analyses and ethical considerations concludes the chapter.

*Chapter 5* presents the results of the current study. With emphasis on gender, racial and language differences on the SACII, this discussion includes the various statistical techniques employed to conduct analyses of the data. The results for these analytical techniques include (a) descriptive statistics for the items; (b) descriptive statistics for the RIASEC types; (c) reliability analysis; (d) Classical Test Theory item analysis; (e) principal component analysis; (f) angular location and communality estimates; (g) randomisation test of hypothesised order relations; and, finally (h) discriminant analyses.

The last chapter in the dissertation will conclude with a discussion of the interpretation and discussion of this study's results. Chapter 6 includes a discussion of the implications of the study, recommendations for future studies, the limitations of the current study, followed by conclusions of this study's results.

## CHAPTER 2

# THEORETICAL PERSPECTIVES UNDERPINNING THE SOUTH AFRICAN CAREER INTEREST INVENTORY

### 2.1 Introduction

The application of any psychological theory is contingent on an examination of its origins and current research outcomes (Hergenhahn, 2005). A nuanced understanding of a theory, in relation to vocational psychology, enables researchers and practitioners to investigate and explore the career choices and development of individuals (Brown, 2002). Moreover, this comprehension serves as a guideline for practitioners not only to assist individuals in making career choices, but also to design career counselling programmes and assessment instruments (Brown, 2002).

Within this context, the current chapter will present the theoretical perspectives pertinent to the South African Career Interest Inventory. The first section of this chapter provides a discussion of the trait-and-factor and person-environment approach to vocational counselling and assessment. This is followed by a presentation of Holland's (1997) theory of vocational personalities, which includes an outline of Holland's six personality and environmental types and a review of the theory's primary and secondary assumptions.

### 2.2 The trait-and-factor approach to career counselling

The trait-and-factor approach to vocational counselling is considered one of the most influential career theories (Watson & Stead, 2013; Zunker, 2012). During the first half of the 20<sup>th</sup> century, trait-factor theory dominated career counselling and served as the theoretical foundation for various career theories and psychometric career assessment instruments (Crites, 1981; Watson & Stead, 2013; Zunker, 2012). The central contents of this approach remain critical features of contemporary career theories and are indicative of the pre-eminence of trait-factor theory (Watson & Stead, 2013). Fundamentally, this approach suggests that the career decision-making process is based on the matching of an individual's specific characteristics with the requirements of an occupational environment (Watson & Stead, 2013). A central feature of this theory is the assumption that all individuals have distinctive abilities that can be measured and correlated with the requirements of various occupations (Zunker, 2012). As a result, the importance of individual differences in the career decision-making process has been highlighted by this approach (Crites, 1981).

### **2.2.1 The trait-and-factor model**

There is consensus that the trait-factor model emerged from the pioneering work of Frank Parsons (1909). Parsons postulated that the successful facilitation of a career choice is the product of (a) the individual, (b) the occupational environment, and (c) the interrelations between the individual and the occupational environment (Crites, 1981; Morgan, 2014). On the individual level, career choices require self-knowledge and a clear understanding of one's interests, abilities, ambitions and resources (Watson & Stead, 2013). According to Parsons (1909), this knowledge refers to the *trait* component of the approach. In terms of the occupational environment, knowledge of the prerequisites of success, benefits, disadvantages, and opportunities for different career paths are necessary to make an informed career choice (Watson & Stead, 2013). This differential nature of the work environment denotes the *factor* aspect of the theory (Zunker, 2012). Accordingly, through measuring aptitudes, abilities and personalities, individuals can be assigned to an occupational environment based on their individual differences (Zunker, 2012). Watson and Stead (2013) argue that the quality of the relation between these traits and factors improves the match between the individual and the occupational environment.

Vocational counselling based on the trait-and-factor approach traditionally encompassed three necessary stages (Morgan, 2014). During the first stage, the diagnosis stage, the practitioner elicits important information in relation to the client's presenting career concerns (Crites, 1981). This information, in conjunction with an evaluation of the client's background, provides a basis on which the practitioner selects applicable psychometric assessment instruments that would provide clients with valuable information to resolve their career concerns and indecision (Morgan, 2014). Therefore, the second stage of counselling based on trait-factor theory involves the administration and completion of psychometric assessment instruments. In the final stage, the information acquired from individual interviews and psychometric assessments are interpreted and this information is used to provide occupational recommendations (Crites, 1981). The following section presents a more detailed discussion on the aforementioned stages.

#### **2.2.1.1 The diagnosis**

The cornerstone of the trait-and-factor approach to vocational counselling is differential diagnosis (Crites, 1981). According to Williamson (1939), this process involves procuring information in relation to the client's individual strengths and weaknesses and using this information to predict future occupational adjustments. As a result, a diagnosis is employed to select appropriate career-



related treatment and make future recommendations (Crites, 1981; Morgan, 2014). To assist in the diagnosis of career-related concerns, Williamson (1939) proposed and defined four supporting categories of career problems clients may experience, namely (1) no career choice, (2) uncertain career choice, (3) unwise career choice, and (4) discrepancy between interests and aptitudes.

Firstly, individuals experience the crisis of *no career choice* when they are unable to select a specific career path or have no awareness of their vocational interests. The second problem, *uncertain career choice*, is experienced when individuals have selected an occupation, but are hesitant regarding their choice. Individuals experience the third crisis of *unwise choice* when there is a lack of agreement between the client's interests, capabilities or aptitudes and the requirements of an occupational environment. However, this category usually denotes a career choice for which the individual has deficient aptitude (Crites, 1981). The final problem, *discrepancy between interests and aptitudes*, refers to incongruence between a client's occupational interests, aptitude, abilities and personality (Williamson, 1939). Accordingly, based on the problem presented by the client, the practitioner will select an appropriate approach to career counselling.

Crites (1981), however, critiqued Williamson's (1939) approach to diagnosis and asserted that too much confidence is placed on practitioners' ability to identify and classify the client's career concerns. Furthermore, this approach is unreliable, the four categories are not mutually exclusive and the system of diagnosis is not exhaustive (Crites, 1981). To address these shortcomings, Crites (1969, 1981) formulated a diagnostic system which emphasised congruence between the client's abilities, interest and career choices. Accordingly, three alternative categories related to the client's presenting career concerns were proposed, namely problems of adjustment, problems with career indecision and problems with unrealism (Crites, 1969; Morgan, 2014).

Crites (1969) argued that, when clients selected an occupation congruent with their interests and ability, they are considered to be vocationally *well adjusted*. On the other hand, clients are considered vocationally *maladjusted* when there is incongruence between their aptitude and interests. The second category, problems of career indecision, was divided into three subsections (Morgan, 2014). Firstly, clients experienced *multipotential indecision* when they had multiple career opportunities congruent with their interests and abilities. Secondly, clients were career *undecided* when they had no career aspirations and struggled to select a career path. Finally, clients were *uninterested* in careers when they have the necessary aptitude for an occupation, but there is no agreement with their interests (Crites, 1969; Morgan, 2014). The final category, problems of

*unrealism*, arose when clients selected occupations for which they do not have sufficient aptitude, compromised on an occupation below their ability, or selected an occupation they were pressured into that was incongruent with their interests (Crites, 1969; Morgan, 2014).

According to Zunker (2012), the process of diagnosis played an integral role in the trait-and-factor approach to career counselling. However, the diagnosis was considered a necessary first step of this approach and was used in conjunction with psychometric instruments to assess the client's career concerns (Watson & Stead, 2013; Zunker, 2012). The use of psychometric assessment instruments is presented in the next subsection.

### **2.2.1.2 Psychometric assessment in the trait-and-factor approach**

Through the initial process of diagnosis, the practitioner elucidates pertinent information related to the client's career concerns, which formed the foundation on which to select appropriate psychometric assessments (Zunker, 2012). The practitioner selects a variety of psychometric instruments to measure the client's career interests and values, personality characteristics and aptitude (de Bruin & de Bruin, 2013b; Watson & Stead, 2013). Subsequent to the administration of these assessment instruments, the practitioner scores and interprets the client's results (Morgan, 2014). In conjunction with the information garnered from the individual interview (for example, contextual influences or previous work experience), the counsellor provides the client with possible solutions to their career related problems (Williamson, 1939; Zunker, 2012). These solutions are provided in the form of recommendations, which are discussed below.

### **2.2.1.3 Recommendations**

Crites (1981) avers that counsellors rely on their expertise to interpret psychometric test results in order to make future recommendations. Occupational recommendations, according to trait-factor theory, were traditionally provided in three ways, namely direct advising, persuasion and explanation (Crites, 1981).

During the process of *direct advising*, the counsellor provided the client with his or her opinion regarding the most ideal choice or action to be made and followed by the client. However, Williamson (1939) advised to use this method differentially, depending on the client's problem and personality. *Persuasion* involved a process whereby the counsellor arranges the information in a logical and reasonable manner in which the client will be able to anticipate the outcomes and consequences of alternative career choices. Rather than dominating the client's decision, the counsellor persuades the client to circumvent future problems. Finally, the process of *explanation*

involved a concomitant exploration of the information gathered during the interviews and psychometric testing, interpreting the meaning attached to this information and exploring their implications for the client's occupational choice (Crites, 1981; Williamson, 1939). According to Zunker (2012), recommendations provide clients with possible solutions to their career related concerns and enable them to explore these solutions in the reality of the world of work.

#### **2.2.1.4 Critique against the trait-and-factor approach**

The trait-and-factor approach has received persistent criticism over the past half century and decreased in popularity, primarily due to its reductionist approach to career counselling (Crites, 1981; Watson & Stead, 2013). Zunker (2012) asserts that the scope of the trait-factor approach is too narrow to be considered a dominant career theory. A key critique of this approach is its equivalence to the medical model, where too much emphasis is placed on the practitioner's expertise and ability to diagnose the client's career problems and provide a prognosis for future occupational adjustments (Crites, 1981). Crites (1981) also argues that trait-and-factor career counselling is primarily atheoretical, since the focus tends to be on empirical observations and data collection.

Furthermore, certain assumptions of the trait-and-factor approach to career counselling have raised specific concerns (Zunker, 2012). Firstly, it assumes that the career decision-making process is universally satisfying; that each individual has a single career goal and choice and that there is an occupational choice for every individual (Watson & Stead, 2013; Zunker, 2012). Secondly, this approach assumes that career decision-making is based on measured abilities, which implies that psychometric instruments are sufficiently reliable and constant over time (Watson & Stead, 2013; Zunker, 2012). These assumptions have major restrictive influences on the factors that can be considered influential in the career counselling process. Rounds and Tracey (1990) have counter-argued that the critique against the trait-factor approach has failed to consider its progression and evolution throughout the 20<sup>th</sup> century. However, even the models developed from this progression have received persistent criticism (Watson & Stead, 2013). Moreover, the viability of the trait-and-factor approach has declined in contemporary career psychology, since a more client-centred approach has been employed, where the client is considered to be the expert of his/her own life and it is the role of the counsellor to facilitate career decision-making and solutions, rather than adopting a prescriptive approach (Maree, 2010b).

Despite the criticism against the trait-and-factor approach, it has provided a foundation for the development of several other career theories and remains the cornerstone of most developmental career theories (Brown, 2002; Watson & Stead, 2013). Zunker (2012) asserts that the development of career assessment instruments and the improvement of occupational information are closely related to the influence of the trait-and-factor approach. Furthermore, this approach highlighted the practicality of standardised assessments and occupational analyses, which continue to be employed in contemporary career counselling practices (Zunker, 2012).

### **2.3 The person-environment fit approach to career counselling**

The basic principles of the trait-and-factor approach played an integral role in the development of the person-environment fit model (Dawis, 2002). The central tenet of the person-environment (P-E) fit model is the interaction between two entities – the person and the environment (Dawis, 2002). Both the person and the environment have characteristics that influence their interaction and each interaction will have unique outcomes and consequences. As a result, the interaction between the individual and the environment is active and reactive – the person and environment will act on as well as react to one another (Dawis, 2002). Moreover, the interaction between the person and the environment can be brief or continuous (Dawis, 2002). As a psychological theory, it might appear that more emphasis is placed on the role of the person in P-E theory. However, the person cannot be understood independently of the environment (Dawis, 2002).

There are three specific assumptions underpinning the P-E fit model (Rounds & Tracey, 1990). First, an individual will pursue or create an occupational environment in which she or he can express their personal characteristics. Second, congruence between the person and the environment will have predictable outcomes. Lastly, it is assumed that the relationship between the person and the environment is reciprocal (Rounds & Tracey, 1990). Zunker (2012) asserts that the P-E fit model is an improvement of the trait-and-factor approach, since it includes factors such as social context, occupational values and personality orientation. Consequently, the client plays an active role in the person-environment fit approach to career counselling (Kidd, 2006). One of the major theoretical developments originating from the person-environment fit model is Holland's (1997) theory of vocational personality and environments, which continues to be one of the most influential theories in vocational psychology and assessment (Darcy & Tracey, 2007; Gottfredson, 1999; Nauta, 2010; Watson et al., 2007). A detailed discussion of Holland's theory is presented in section 2.4.

More recently, the P-E fit model has evolved into the Person-Environment-Correspondence (PEC) model (Dawis, 2002; Lofquist & Dawis, 1991; Zunker, 2012). PEC theory emphasises that work includes a variety of psychological variables and goes beyond step-by-step task-orientated procedures (Zunker, 2012). The basic assumption of this approach is that individuals strive toward achieving and maintaining a constructive relationship with their occupational environment (Dawis, 2002; Zunker, 2012). Furthermore, the theory posits that both individuals and work environments have requirements to be fulfilled and the interaction between the two should result in at least some form of fulfilment (Dawis, 2002). The congruence between the person and the environment will ultimately ensure their survival, referred to as *work adjustment* (Lofquist & Dawis, 1991; Zunker, 2012).

There are four key aspects associated with the PEC theory (Zunker, 2012). Firstly, there should be agreement between an individual's work personality and work environment. Secondly, an individual's suitability for a work environment will largely be determined by their individual needs. Thirdly, occupational stability will be dependent on a combination of individual needs and the occupational reinforcements that characterise the work environment. Lastly, suitable occupational placement will best be achieved if there is a match between the individuals' personality characteristics and the requirements of their work environment (Zunker, 2012). In essence, as individuals respond to a specific environment, they are exposed to certain reinforcers, which will either maintain or discontinue their response to the environment (Dawis, 2002). Ultimately, this will result in an occupational choice (Dawis, 2002).

In general, there is good empirical support for both the P-E fit model and PEC theory (Dawis, 2002; Oleski & Subich, 1996). For example, PEC theory is used as a guiding framework in career counselling practices to provide information to individuals to assist in occupational rehabilitation (Dawis, 2002). Furthermore, the P-E fit model is grounded in differential psychology (de Bruin & de Bruin, 2013b), which improves its applicability across different groups of individuals. Similarly, the theoretical structure of the PEC theory can be applied across all cultures. However, despite the theory's applicability in different cultures, it is most frequently the psychometric instruments themselves that do not apply in theory transfer (Dawis, 2002). This is problematic, since theories cannot be validated without the use of psychometric instruments - PEC theory has therefore only been validated in English-speaking, Anglo-American cultures (Dawis, 2002). This

signifies that the validation of any theory, and the instruments based on the theory, is imperative in any cultural context.

John Holland's (1997) theory of vocational personality has been, and continues to be, the main proponent of the person-environment fit model (Spokane et al., 2002). The continuous empirical research conducted on his theory accounts for the unprecedented influence of his model (Savickas, 2009; Spokane et al., 2002). The following section presents a detailed discussion of Holland's (1997) theory and its assumptions.

## **2.4 Holland's theory of vocational personality**

Since its inception in vocational psychology, John Holland's vocational personality theory has transformed career counselling practice and research (Gottfredson, 1999). Holland's (1997) theory is considered to be the most popular and practical approach to career counselling, as the majority of his propositions have been operationally defined and empirically evaluated (Bradley, Brief, & George, 2002; Nauta, 2010; Spokane et al., 2002; Zunker, 2012). Spokane et al. (2002, p. 378) argue that the "research paradigms popularized by Holland is a tribute to the theory's enormous heuristic value" and that work on the theory and instruments will continue to influence contemporary career development and vocational assessment procedures. In the following section, a review of Holland's vocational personality theory is presented. This will begin with a discussion of the background of Holland's theory and is followed by a presentation of the theory's primary and secondary assumptions.

### **2.4.1 Holland's theoretical origins**

Holland's personal experiences as a military personnel clerk and psychological assistant had a major influence on the development of his vocational personality theory (Gottfredson & Johstun, 2009; Savickas & Gottfredson, 1999). During his three and a half years of military service, Holland observed, in contrast with dominant psychological theories of the time, that individuals are not immeasurably complex and can be classified into certain personality types based on their occupational history (Savickas & Gottfredson, 1999). Accordingly, during his tenure at the University of Minnesota, Holland started his research on the different personality types he identified during his military service, and became convinced that college students with different occupational interests had different personality types (Savickas & Gottfredson, 1999).

Following his time at the University of Minnesota, Holland continued his work as a lecturer and career counsellor at Western Reserve University, where he was exposed to a large number of

vocational tests, instruments and manuals – most importantly the Occupational Interest Blank (Gottfredson & Johstun, 2009). His exposure to the Occupational Interest Blank served as the inspiration behind the development of the Vocational Preference Inventory (VPI; Holland, 1999; Morgan, 2014). The six occupational scales of the VPI ultimately became Holland's original occupational classification. Moreover, in conjunction with his experience as a vocational counsellor, Holland came to appreciate the value of parallel taxonomies of individuals and work environments (Gottfredson & Johstun, 2009). He argued that a corresponding taxonomy of persons and work environments would provide a structured way to deliberate occupational possibilities (Gottfredson & Johstun, 2009; Spokane et al., 2002).

During his position as director at the National Merit Scholarship Corporation, a significant series of studies was conducted on large samples to explore his incipient taxonomy of persons and environments (Gottfredson & Johstun, 2009; Spokane et al., 2002). Research on large samples in the general population continued until the early 1970s, where Holland's theory was tested and further developed and became even more representative (Gottfredson & Johstun, 2009). It was during this period that the SDS emerged and Holland's occupational categories were added to the Strong-Campbell Interest Inventory (Spokane et al., 2002). Holland's research revealed that individual responses to items in interest inventories are influenced by their aptitude, personal values, status and sex roles (Morgan, 2014). As a result, Holland's taxonomy of interest structures has made a major advance in our understanding of the nature of individual occupational interests (Spokane et al., 2002).

#### **2.4.2 Holland's theoretical assumptions**

Holland's (1985, 1997) theory of vocational personality is based on four working assumptions (or primary statements) and five secondary assumptions. Nel (2013) avers that in order to understand Holland's (1997) theory and related assumptions, it is imperative to delineate the theory's foundational principles. Accordingly, the following section presents a discussion of the assumptions pertinent to Holland's vocational personality theory. Firstly, the theory's foundational principles are discussed. Thereafter, a discussion of the theory's primary and secondary assumptions is presented.

#### **2.4.3 Foundational principles of Holland's theory**

Holland's (1997) vocational personality theory was developed on the basis of six foundational principles (Nel, 2013). The six principles are the assumptions on which the theory rests and a clear

explanation of these principles results in an improved understanding of the main body of the theory (Nel, 2013).

Firstly, Holland (1997) believed that an individual's choice of career is ultimately an expression of his or her personality and through acquiring information regarding the occupational lives of individuals, personality theories can be constructed (Nel, 2013). The second foundational principle of Holland's (1997) theory was his belief that interest inventories can be regarded as personality inventories. This principle has become evident through the validation and interpretation of the scores on personality inventories (Nel, 2013). Thirdly, Holland (1997) argued that the stereotypes attached to certain occupations have important psychological and sociological implications. Accordingly, the validation of the scores on interest inventories is based on popular connotations and perceptions of various occupations (Nel, 2013).

Since people with corresponding personality types find the same occupations appealing and form groups of similar members, the fourth foundational principle is the expectation that members of the same groups of career will have similar histories in terms of personal development (Nel, 2013). This gave rise to the fifth principle – the belief that members with similar personalities in specific career groups will respond to situations and problems similarly. These groups of individuals will then create environments characterising their personalities (Holland, 1997). Finally, Holland (1997) believed that an individual's career satisfaction, -stability and achievement would largely be determined by the degree of *congruence* between their personality and their environment (see section 2.5.4 for a detailed discussion of congruence). An individual will perform better in an occupational environment to which she or he is psychologically best suited (Holland, 1997; Nel, 2013).

#### **2.4.4 Primary assumptions**

The four primary statements proposed by Holland (1997) constitute the nucleus of his theory, as it explains personalities, environments, the interaction between the personality and the environment, and the resulting behaviour from this interaction (Holland, 1973, 1997). The following section presents a discussion of the aforementioned assumptions.

#### **2.4.5 The vocational personality type**

Holland (1997) postulated the existence of six theoretical personality types against which an individual can be examined, namely: Realistic, Investigative, Artistic, Social, Enterprising and Conventional – collectively referred to as the RIASEC model. He argued that the more individuals



resemble these personality types, the more likely they will exhibit the behaviour and beliefs associated with the types (Holland, 1997). Each personality type has a characteristic pattern of behaviour and is associated with specific values (Spokane et al., 2002). Hence, an individual is categorised in terms of which personality type they resemble most.

According to Holland (1997), the development of these vocational personality types is the result of the interaction between the individual's physical environment, parental interaction, hereditary and personal factors, and cultural influences. For example, Holland (1997) argued that parental attitudes shape different environments that will lead to the development or repression of certain personality types. Furthermore, the demands parents place on their children, in conjunction with hereditary and personal factors, influence the development of different personality types (Holland, 1997). Accordingly, children begin to exhibit their preference for, or aversion to, certain activities and interests and, in the process, crystallise their competencies (Holland, 1997). However, various critics have questioned the lack of empirical evidence involved in the development of Holland's personality types (Low & Rounds, 2007; Nel, 2013). Furthermore, Holland (1997) has also been criticised for the number of personality types included in his model, as well as the definitions provided for the types (Nauta, 2010; Watson et al., 2007). For example, some studies have provided evidence that the six personality types do not provide a clear representation of the underlying interest domain and that the types are not equidistant (Armstrong & Rounds, 2008; Darcy & Tracey, 2007; Nauta, 2010). These findings imply that there might be certain personality types unaccounted for by the RIASEC model.

#### **2.4.6 Holland's six vocational personality types**

The six personality types posited by Holland (1997) represent different compositions of attitudes, interests and preferences exhibited by individuals and each type represents the purest form of personality (Nel, 2013; Scharf, 2006). In the following section, each of Holland's (1997) personality types is discussed in turn.

##### **2.4.6.1 The Realistic personality type**

Holland (1997) postulated that individuals are categorised as a realistic personality type when they exhibit a preference for activities involving animals or the manipulation of mechanical objects, while also displaying an aversion to social activities, such as education or therapy. These preferences will ultimately result in competencies in manual, mechanical, agricultural or technical activities (Holland, 1997). Accordingly, individuals scoring higher on the realistic type will have

a greater disposition to engage in realistic type occupations, such as a mechanic, electrician or carpenter. Furthermore, realistic personalities have a proclivity to function according to a value-system that can be described as conservative, practical and rigid (Holland, 1997).

#### **2.4.6.2 The Investigative personality type**

The investigative personality type refers to individuals who exhibit a preference to engage in scientific activities, in order to execute their intellectual and analytical abilities (Holland, 1997). Investigative personalities tend to examine biological, physical or cultural phenomena in order to acquire the skills to understand and control these factors (Holland, 1997). As a result, these individuals have a greater tendency to work in occupational environments where investigative activities are pursued. Investigative personalities are usually associated with mathematical and scientific occupations. In terms of their value-system, investigative individuals are more inclined to be self-determined, logical, ambitious and theoretical (Holland, 1997). The acquisition of knowledge and skills is frequently valued over social activities among investigative personalities (Holland, 1997).

#### **2.4.6.3 The Artistic personality type**

The artistic personality type relates to individuals who prefer activities and environments that enable self-expression through the arts (Holland, 1997; Nel, 2013). Furthermore, artistic individuals have a penchant for liberating, ambiguous and unsystematic activities performed in aesthetic environments (Holland, 1997; Nel, 2013). This personality type can best be described as introspective, unconventional, intuitive and idealistic (Holland, 1997; Spokane et al., 2002). Accordingly, these individuals have a proclivity for creative, musical and literary occupations, while simultaneously exhibiting an aversion to conventional occupations, such as clerical work (Holland, 1997). Artistic individuals value self-expression and equality, and employ their creative competencies to solve problems (Holland, 1997).

#### **2.4.6.4 The Social personality type**

Individual personalities categorised as social have a preference for social and interpersonal interaction and competencies in human relations (Holland, 1997). The social personality type is characterised by its enthusiasm, generosity, sincerity and persuasive nature (Spokane et al., 2002). Social individuals prefer to engage in activities that allow for the manipulation of other individuals, to provide information, training, development and rehabilitation (Holland, 1997; Zunker, 2012). Individuals scoring higher on the social personality type have a greater tendency to engage in

social occupations, such as teaching or nursing, and show disinclination towards realistic occupations, such as manual labour (Holland, 1997). These individuals are concerned with social issues and are orientated towards providing community service (Zunker, 2012). Social personality types function according to a value-system driven by empathy, patience, equality and service to others (Holland, 1997; Spokane et al., 2002).

#### **2.4.6.5 The Enterprising personality type**

Enterprising personality types have a tendency to acquire persuasive and interpersonal skills in order to achieve certain organisational and/or economic objectives (Holland, 1997). These individuals are often found in leadership positions (Nel, 2013). Spokane et al. (2002) argue that enterprising individuals are characterised as extroverted, sociable, self-confident, optimistic and ambitious. Individuals scoring higher in the enterprising scale have a tendency to be materialistically inclined, and value social status and the control of others (Holland, 1997). Conversely, these individuals show a deficiency in scientific and analytical abilities (Holland, 1997).

#### **2.4.6.6 The Conventional personality type**

The conventional personality type can be described as practical, well-controlled and conservative (Zunker, 2012). Holland (1997) postulated that conventional individuals prefer activities involving the categorical, systematic and ordered manipulation of data, while simultaneously showing an aversion to liberating, ambiguous and unsystematic activities. Accordingly, these preferences lead to competencies in clerical, computing and business system activities (Holland, 1997). Conventional individuals have a proclivity to establish and maintain order, and demonstrate materialistic tendencies towards obtaining financial wealth (Holland, 1997). These individuals value structure, obedience, docility and precision in their lives, and often thrive in a business environment (Spokane et al., 2002).

#### **2.4.7 Holland's Environment types**

In his second primary assumption, Holland (1997) postulated the existence of six corresponding environmental types: Realistic, Investigative, Artistic, Social, Enterprising and Conventional. Each environmental model is shaped by the personalities, values and attitudes of the individuals who dominate that specific environment (Holland, 1997). Consequently, the environmental models exist in parallel to the personality types and reflect the characteristics of that particular environment's members (Nel, 2013). For example, a realistic environment, such as a mechanical

workshop, will be largely dominated by realistic personality types, which will lead to the classification of the mechanical workshop as a realistic environment. According to Nel (2013), each career environment exerts a certain primary influence on its members. Firstly, it stimulates its members to execute activities related to their interests and preferences. Secondly, it encourages the development of the competencies characterising its members. Thirdly, it shapes its members' self-perceptions and world-views. Finally, it rewards its members with values closely related to their personality types (Holland, 1985). Accordingly, the environmental classification provides practitioners with the ability to understand work related behaviour and analyse the person-environment fit (Reardon & Lenz, 1998). Furthermore, individual behaviour is determined by both the personality and environment type – knowledge of each environment type is therefore crucial in the understanding and prediction of behaviour (Holland, 1997). The following section presents a discussion of Holland's (1997) six environment types.

#### **2.4.7.1 The Realistic career environment**

The realistic environment is characterised by opportunities involving the systematic and ordered manipulation of objects and working with animals or mechanical instruments (Holland, 1997). In addition, realistic career environments reinforce practical, rigid, persistent and materialistic qualities. This environment encourages individuals to employ their mechanical and manual abilities and in the process, foster technical competencies (Holland, 1997). Individuals functioning within realistic environments usually have a tangible and traditional perspective on life (Holland, 1997). Typical careers associated with this environment include engineers, farmers, motor mechanics and nature conservationists (Nel, 2013).

#### **2.4.7.2 The Investigative career environment**

The investigative environment offers individuals with opportunities for the observation and examination of physical, biological and cultural phenomena (Holland, 1997). This environment reinforces scientific and analytical abilities. Individuals functioning within this environment often view themselves as academically proficient and scholarly, while simultaneously lacking in leadership abilities (Holland, 1997; Nel, 2013). Furthermore, investigative environments encourage people to have unique, abstract and independent worldviews (Holland, 1997). Typical careers related to the investigative environment include geologists, scientists or pilots (Nel, 2013).

### **2.4.7.3 The Artistic career environment**

The artistic career environment pertains to activities that are ambiguous, aesthetic and unsystematic (Holland, 1997). These individuals are characterised as self-expressive, imaginative, independent and innovative, yet also emotional and nonconforming (Holland, 1997; Nel, 2013). These environments enable individuals to develop aesthetic competencies that result in the production of creative and artistic products (Holland, 1997). Typical careers related to artistic environments include musicians, writers, artists and photographers (Nel, 2013).

### **2.4.7.4 The Social career environment**

The social environment provides individuals with the opportunity to train, develop, enlighten, care and inform other individuals (Holland, 1997). This environment encourages people to be empathetic and to help and/or understand other individuals. Holland (1997) argued that individuals functioning within the social environment are characterised as warm and friendly, idealistic, responsible and generous. Typical careers associated with this environment include social workers, teachers or therapists (Nel, 2013).

### **2.4.7.5 The Enterprising career environment**

The enterprising environment provides opportunities that involve the manipulation of other people in order to achieve organisational and/or economic objectives (Holland, 1997). According to Holland (1997), people in this environment are characterised as energetic, popular, optimistic, resourceful, and are driven by the value of social status. Typical careers associated with the enterprising environment include corporate administrators, office managers or sales consultants (Nel, 2013).

### **2.4.7.6 The Conventional career environment**

The conventional environment provides individuals with opportunities involving the organised and systematic manipulation of numerical and written data (Holland, 1997). Individuals in this environment are characterised as conforming, practical, methodical and unimaginative (Holland, 1997). Typical careers associated with the conventional environment include transcribers, accountants and office clerks (Nel, 2013).

## **2.4.8 Personality and environment interaction**

The third primary statement posited by Holland (1997) is the assumption that people seek out environments that permit the implementation of their skills and competencies, as well as the expression of their values and attitudes. Considering that each environment is associated with

certain competencies and values, individuals strive toward selecting an environment that is congruent with their personality (Holland, 1997). For example, an individual categorised as Artistic will search for and select an Artistic environment, since there is correspondence between their values and competencies.

Holland (1997) also argued that environment types search for and attract certain personality types through social connections and recruitment programmes. However, the matching between a person and an environment is not an abrupt event – individuals search for and select congruent environments over sustained periods of time, and develop corresponding values and skills through interaction and reinforcement from different environments (Holland, 1997). When there is congruence between person-environment values and competencies, these competencies typically result in certain achievements (Nel, 2013). For example, an artistic environment places demands on its members to perform artistic activities, such as writing or playing a musical instruments, and will then reward the members for valuing aesthetic and liberating goals. The rewards experienced by members of different career environments serve as the motivation behind the search for congruence between the personality and environment (Holland, 1985).

#### **2.4.9 Behaviour determined by person-environment interaction**

Holland's (1997) fourth primary assumption is that individual behaviour is determined by the nature of the interaction between the person and the environment. Congruence between the personality and the environment results in stability in behaviour, which can lead to predictable outcomes, such as career choice, occupational achievement and personal competence (Holland, 1997). Conversely, incongruence between the individual's personality type and environment can stimulate behavioural change and result in personal and social instability (Spokane et al., 2002). In order to resolve this incongruence and instability, individuals seek out environments that are more congruent, or alter personal behaviour (Spokane et al., 2002). Moreover, Holland (1997) asserts that both career and non-career behaviour is a result of the interaction between an individual's functional environment and personality pattern.

Reardon and Lenz (1998) identified certain behaviours that can be observed when there is a high degree of correspondence between a personality type and the environment. They identified that with instances of high congruence, individuals will have similar occupational and leisure interests, experience lower levels of work-related anxiety, and exhibit improved occupational performance and greater employment stability (Reardon & Lenz, 1998). However, the

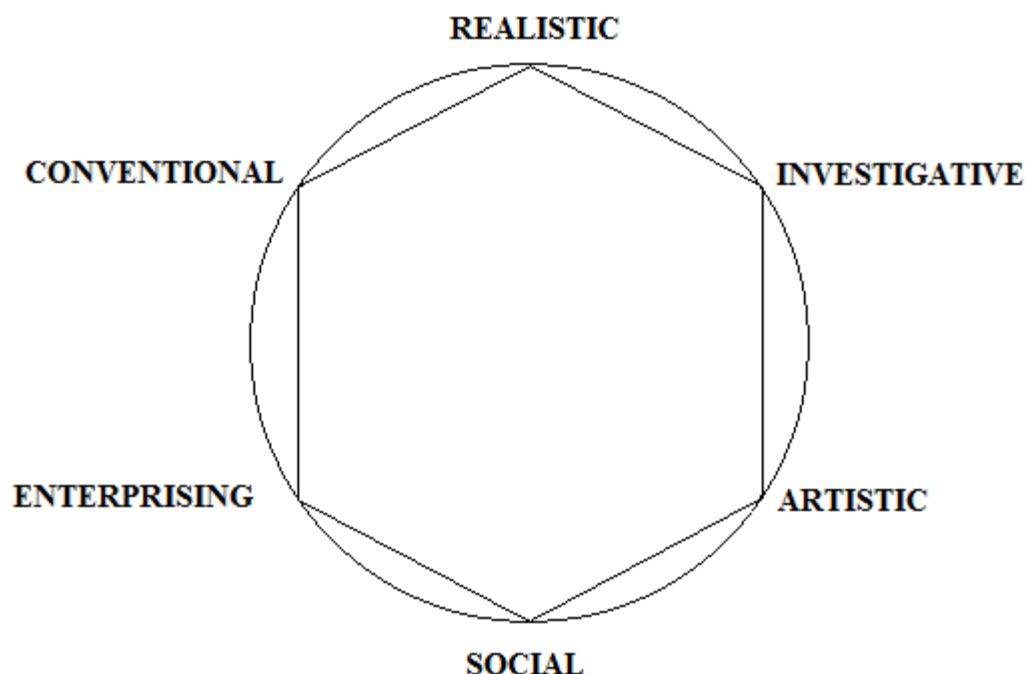
predictability of behaviour is influenced by several secondary assumptions pertinent to Holland's (1997) theory. The secondary assumptions are presented in the ensuing section.

## **2.5 Holland's secondary assumptions**

Holland (1997) postulated five secondary assumptions to supplement his four primary statements. Reardon and Lenz (1998) assert that these assumptions enhance the explanation of Holland's (1997) primary statements and can be applied to both the individual and the environment. Furthermore, Holland (1997) argued that the purpose of the secondary assumptions is to moderate the predictions gleaned from the theory's main concepts (Nel, 2013). The five secondary assumptions postulated by Holland (1997) are calculus, consistency, differentiation, congruence and identity. The following section provides a discussion of the aforementioned assumptions.

### **2.5.1 The calculus assumption**

The calculus assumption is a central component to Holland's theory, as it describes the hexagonal arrangement of the six personality and environmental types (Holland, 1997). Accordingly, this assumption proposes that the distance between the RIASEC types is relative to the theoretical relationship between them (Holland, 1997). It is proposed that adjacent types, such as the Realistic and Investigative, will have more in common than non-adjacent or opposite types (see Figure 2.1 for a visual representation of the calculus assumption). Furthermore, it is posited that the distance between the types should be relatively constant (Nel, 2013). The calculus model also signifies the degree of congruence (see section 2.5.4) and consistency (see section 2.5.2) of an individual's personality profile (Holland, 1997).



*Figure 2.1: Visual representation of Holland's (1997) calculus assumption*

The calculus assumption has been the topic of inquiry for a myriad of research studies (Nauta, 2010). Generally, findings have supported the hexagonal arrangement of the RIASEC types among individuals, with adjacent types strongly related to one another in comparison to non-adjacent types (Armstrong & Rounds, 2008; Darcy & Tracey, 2007). However, there has been less support for the specification of equal distances between each personality and environment type. As a result, contemporary scholars have replaced the terminology of Holland's (1997) hexagonal model with the *circumplex* model (Armstrong & Rounds, 2008; Darcy & Tracey, 2007; Morgan et al., 2014; Nauta, 2010). Considering that the six types are not equidistant, the model can also be referred to as a misshapen polygon (Holland, 1997). As a result, Holland's model is often described as a circular ordering model rather than a hexagonal model (Morgan et al., 2014).

### **2.5.2 The assumption of consistency**

Considering the intricate nature of personality, an individual might have high correspondence with one personality type, but also share characteristics with other personality types. Therefore, it would be an oversimplification to categorise an individual in terms of only one personality type. To address this issue, Holland (1997) describes individuals in terms of the three dominant personality



types, represented by a three-letter code, with which they have the highest correspondence (for example, Realistic-Investigative-Artistic). By describing an individual in terms of three dominant personality types, the complexity of an individual's personality can be captured (Nel, 2013). Moreover, in order to avoid an oversimplification of the occupational environment, Holland (1997) also created a three-letter code to represent environments where individuals can express their preferences and competencies, where environments influence members' self-perception and world-views, and reward members with values related to their personality type (Holland, 1985). Accordingly, this assumption suggests that the consistency of an individual's personality or environment code will determine its predictive ability – the more consistent an individual's three-letter RIASEC profile is, the more predictable her or his ultimate career choice will be (Holland, 1997; Nel, 2013). The consistency assumption is ultimately an expression of the degree of correspondence between the personality and environment types. This consistency will influence and determine the ease or difficulty of selecting a future career path.

Research on the consistency assumption has produced mixed findings. For example, in support of this assumption, O'Neill, Magoon and Tracey (1978) assessed the predictability of Holland's personality types in a sample of U.S. male college students ( $n = 95$ ) over a seven-year period, and found that between four and seven years after initial vocational assessment, consistency has a strong ability to predict occupational choices. Furthermore, Pesier and Meir (1978), in their Israeli sample of male and female working adults ( $n = 360$ ) found that consistency, in conjunction with congruence, are key influencing components to an individual's satisfaction in career choice. South African studies on the consistency assumption have also found that consistency is related to career satisfaction (van der Walt, 1994). More recently, however, Hirschi and Läge (2007) found that the consistency assumption is not related to Swiss secondary school students' ( $n = 266$ ) career choice preparedness. The majority of the research conducted in high-income countries on the consistency assumption included high school and university students as participants, rather than working adults, which may also influence the reliability and generalisability of the findings.

### **2.5.3 The assumption of differentiation**

Holland (1997) proposed the concept of differentiation, which refers to the degree of correspondence between a personality or environment type and the “pure” RIASEC types. When an individual or environment has a close resemblance to one specific RIASEC type, they can be

regarded as well differentiated. For example, when an individual obtains a higher score on the Investigative scale and a lower score on the Conventional scale, he or she possesses a highly differentiated personality type. Similarly, when an individual or environment corresponds with all six RIASEC types, they will be considered undifferentiated (Holland, 1997). Differentiation, therefore, is theorised to have an impact on an individual's ability to ultimately decide on a career path, and also to thrive in that career environment.

Even though research has produced weak evidence for the assumption of differentiation, Frantz and Walsh (1972) found that, when used in conjunction with the assumptions of congruence and consistency, differentiation was related to positive career achievement and satisfaction. Similarly, Holland (1997) found that differentiation was associated with occupational satisfaction in males, whereas in their recent study, Hirschi and Läge (2007), in their Swiss secondary school sample ( $n = 358$ ), found that the assumption of differentiation was linked to attitudes of career choice preparedness in adolescents. Accordingly, it appears that occupational choice could be understood and predicted within the context of the interaction between the assumptions of consistency, differentiation, and congruence.

#### **2.5.4 The assumption of congruence**

According to Holland (1997), individuals will thrive in a career environment to which they are psychologically best suited, since these environments provide them with ideal opportunities to exercise their competencies and fulfil their needs. He termed this correspondence between the personality and the environment type as *congruence*. Practically, a congruent environment will enhance the positive characteristics of an individual's personality. For this reason, individuals must decide on a career where their environment will correspond with their personality (Holland, 1997). For example, an individual categorised as an Investigative-Artistic-Social personality will prosper in an Investigative-Artistic-Social environment. According to Gottfredson and Johnstun (2009), individuals are attracted to, and prefer to work in environments that are congruent with their personalities.

Research conducted on the notion of congruence has produce relatively positive results. For example, Hirschi and Läge (2007) found that congruence was linked to attitudes of career choice preparedness in secondary school students. Furthermore, Su (2012) found that the assumption of congruence has the predictive ability to determine persistence and academic performance in U.S. college students. Conversely, Ishitani (2010) noted that congruence did not provide an explanation

for extrinsic occupational satisfaction in a large U.S. sample male and female college students ( $n = 2742$ ), but only explained intrinsic occupational satisfaction. Accordingly, practitioners should be cautioned against the use of congruence to predict career satisfaction (Nauta, 2010).

### **2.5.5 Identity**

Holland (1997) further posits that deciding on a career path is influenced by *identity*. For individuals, identity refers to a clear perception of their interests, ambitions and talents (Holland, 1997). Similarly, for a career environment, an identity refers to lucidity, integration and consistency of environmental goals over time (Nel, 2013). A career environment with a clear identity will result in individuals with consistent career aspirations and achievements. In addition, individuals with crystallised identities will have less difficulty in deciding on a career path and will be competent in their career. Holland (1997) argued that an understanding of identity provides an explanation of career stability or instability, and those individuals with strong vocational identities will in all probability find an occupational environment that is congruent with their personality.

Within the framework of Holland's (1997) theory of vocational personality, there is limited research on the assumption of identity. Hirschi and Läge (2007) found, in comparison to all other secondary assumptions, that individual vocational identity was strongly related to career choice preparedness. Moreover, Nauta and Khan (2007) reported that adolescent identity status was associated with self-efficacy in career decision-making and interest differentiation. Therefore, vocational identity should be employed as a measure of career choice preparedness, rather than a measure of interest development (Nauta & Khan, 2007). In contrast to the aforementioned studies, Hirschi (2011) found support for the relationship between vocational identity and differentiation in a sample of Swiss secondary school learners ( $n = 341$ ). According to Holland (1985, 1997), the assumptions of consistency, differentiation and identity are often clustered together since they are related to the lucidity of an individual's personality and career interests. Rather than being viewed as mutually exclusive constructs, the secondary assumptions should be viewed as interconnected, exerting an influence over the development of career interests and occupational choices of individuals.

## **2.6 Chapter summary**

The current chapter presented a discussion of the dominant theoretical perspective pertinent to the South African Career Interest Inventory. This chapter began with a discussion of the trait-and-

factor and person-environment approach to vocational counselling and assessment. Thereafter, Holland's (1997) theory of vocational personality was discussed. This included a discussion of the theory's theoretical origins, which was followed by a presentation of the theory's primary and secondary assumptions. In the chapter that follows, frequently used interest inventories in South Africa are examined. Hereafter, literature on the applicability of Holland's (1997) model across gender, ethnicity and age is reviewed.

## CHAPTER 3

### LITERATURE REVIEW

#### **3.1 Introduction**

The digital revolution associated with the 21<sup>st</sup> century has brought about a paradigm shift in career counselling, with more emphasis being placed on individual and cultural factors (Maree & Morgan, 2012; Savickas, 2012). Despite this emphasis, psychology as a discipline continues to be criticised for its integration of Western values into different cultural contexts (Chiu & Hong, 2006; Pretorius, 2012). Accordingly, there has been call for all psychometric instruments to be reliable, produce valid scores and be invariable across various cultural groups. The current chapter presents a review of career assessment in South Africa and the applicability of Holland's model across gender, ethnicity and age. The chapter begins with a discussion of the historical developments of psychometric career assessment in South Africa and is followed by a succinct overview of commonly used interest inventories in the South African context. Hereafter, the role of culture in career assessment and cross-cultural test adaptation and translation is discussed. The final section of this chapter entails a discussion of the applicability of Holland's (1997) model across gender, ethnicity and age.

#### **3.2 Historical developments of psychometric career assessment in South Africa**

The history of career psychology in South Africa is contentious (Naidoo, Pretorius, & Nicholas 2016). Prior to 1994, the majority of the South African population was restricted from access to career opportunities based on extensive social engineering under the guise of Apartheid (Naidoo et al., 2016). Accordingly, the use of psychometric assessment instruments is embedded in South Africa's racialised history (Pretorius, 2008, 2012). During the country's apartheid regime, the profession of psychology was criticised for advocating discrimination and promoting racial oppression (Mayekiso, Strydom, Jithoo, & Katz, 2004; Pretorius, 2008, 2012). Moreover, psychology contributed to the unequal stratification of individuals through categorising them as either superior or inferior in terms of intelligence, development and productivity (Pretorius, 2008).

The initial development of psychometric instruments in the discipline was mainly informed by Western values, with theories from Europe or the United States directly imported into the South African context. However, these theories were imported without considering cultural differences and its influence on measures' reliability and validity (Pretorius, 2008). Furthermore, the majority of psychometric assessments were standardised and normed using samples of White, English and

Afrikaans speaking university students (Foxcroft & Davies, 2008). According to Dovey (1983), the career guidance and counselling available to non-white individuals during this period was implemented to support and maintain the interests of the apartheid regime. Within this context, concerns regarding the reliability and validity of psychometric instruments across different cultures were raised (Pretorius, 2008).

To address the disproportionate and imbalanced labour market created by the apartheid system, the new democratic government promulgated various legislations and policies (Naidoo et al., 2016). One of the new legislations with important implications for psychometric career assessment is the Employment Equity Act (EEA), No. 55 of 1998 (Dekker, 2004). The main purpose of this act is to rectify discrimination and imbalances in the work place against previously disadvantaged individuals (Naidoo et al., 2016). Morgan (2014) asserts that the appropriate use of psychometric assessments is included to address these imbalances. According to the EEA, psychometric instruments may not be used if they are found to be biased, unfair or fail to provide evidence of validity and/or reliability across different cultural groups. It is therefore the responsibility of publishers and test developers to ensure that all psychometric instruments are equivalent across all South African groups (Jooste, 2006). Despite the implementation of new legislation and policies, the practice of equivalent psychometric assessment is not upheld throughout South Africa (Foxcroft et al., 2004; Pretorius, 2008; 2012). Consequently, Foxcroft et al. (2004) have called for the development of new psychometric instruments with sufficient reliability, validity and cultural invariance. Similarly, Pretorius (2012) argues that new psychometric instruments should be developed in accordance with new legislation, policies and best practice in South Africa.

### **3.3 Commonly used interest inventories in South Africa**

Holland's (1997) model of vocational personality has served as a theoretical foundation for numerous interests inventories (de Bruin & de Bruin, 2013b; Foxcroft et al., 2004). In South Africa, the two most frequently used interest inventories based on his model are the Self-Directed Search (SDS; Gevers et al., 1997) and the South African Vocational Interest Inventory (SAVII; du Toit et al., 1993). Several other interest inventories have been developed in South Africa, with one of the more popular measures being the Meyer Interest Questionnaire (MB-10; de Bruin & de Bruin, 2013b; Meyer, 2003). The following section presents a discussion of the aforementioned psychometric instruments.

### 3.3.1 The Self-Directed Search

The SDS is the most popular and widely used interest inventory, both internationally and in South Africa (de Bruin & de Bruin, 2013b; Nel, 2013; Sharf, 2006). The SDS was developed based on Holland's (1997) vocational personality theory and measures six broad interest domains: Realistic, Investigative, Artistic, Social, Enterprising and Conventional (de Bruin & de Bruin, 2013b). The SDS is a self-administered, convenient measure for students and adults to find the best fitting occupation to match their interests (de Bruin & de Bruin, 2013b; Nel, 2013). Several editions of the SDS have been published internationally and are available in a variety of different languages in different countries (Gottfredson, 1999; Holland, 1997; Nel, 2013). However, most of these editions have not been standardised in the South African context. Consequently, the SDS currently used in South Africa is based on the 1994 U.S. edition and was standardised in South Africa by Gevers et al. (1997). The standardisation of the South African SDS was conducted on different ethnic and languages groups in 1985, 1987 and 1988. However, the majority of the participants sampled were of White ethnicity, with English or Afrikaans as their home language (Morgan, 2014). In South Africa, there are 11 officially recognised languages, with the combination of Afrikaans and English representing only 23.10% of the population (Statistics South Africa, 2011). Considering the diverse nature of the South African population, the standardisation conducted by Gevers et al. (1997) is not representative of all South Africans.

Nonetheless, through the standardisation conducted by Gevers et al. (1997), six inappropriate items were identified on the SDS and were adapted to be more applicable in the South African context. Furthermore, Gevers et al. (1997) reported the general Cronbach alphas for the six interest domains were: Realistic = 0.88, Investigative = 0.85, Artistic = 0.87, Social = 0.85, Enterprising = 0.77 and Conventional = 0.82, respectively. Similarly, Bloye (2008), using the SDS as an interest measure, investigated vocational interests as predictors of academic performance on a sample of 285 Grade 10 high school students. In his investigation of the reliability of the SDS, he found Cronbach alphas of Realistic = 0.91, Investigative = 0.83, Artistic = 0.89, Social = 0.90, Enterprising = 0.86 and Conventional = 0.87 for the entire sample (Bloye, 2008). Accordingly, the findings reported by the studies above signify that, in general, there is support for the reliability of the SDS in South Africa. However, the reliability coefficients reported in these studies are sample specific and cannot be generalised across different population groups (Netemeyer, Bearden, & Sharma, 2003).

The SDS also employs Holland's (1997) hexagonal ordering assumption to identify the consistency of an individual's vocational interests (de Bruin & de Bruin, 2013b). Even though this can be useful, it assumes that the hexagonal ordering of the interest domains is valid across all groups (de Bruin & de Bruin, 2013b). To date, only three studies have conducted an investigation on the circular ordering hypothesis of the SDS (Morgan, 2014). In their standardisation of the South African SDS, du Toit (1998) and Gevers et al. (1997) employed unconstrained multidimensional scaling (MDS) and found support for the circular ordering model. However, a study conducted by du Toit and de Bruin (2002) investigated the validity of Holland's hexagonal interest structure with a group of young Black South African men and women from the North West ( $n^1 = 1032$ ) and Eastern Cape ( $n^2 = 386$ ) provinces. Using unconstrained MDS, they found the six interest domains to be disarranged. Moreover, the analysis of the randomisation test of hypothesised order relations (RTHOR) indicated a poor fit for both samples ( $n^1$ : CI = .35 for males; CI = .32 for females,  $p < .05$ ;  $n^2$ : CI = .49 for males; CI = .48 for females,  $p > .05$ ) between the observed data and the hypothesised hexagonal ordering. These findings signify that Holland's (1997) model cannot be applied indiscriminately in non-Western cultures, particularly in a diverse cultural context such as South Africa. Possible explanations for the poor fit of Holland's model among this particular sample included differences between Western and South African cultures, language barriers (an English version of the SDS was administered to non-first language English-speakers) and socio-economic status (du Toit & de Bruin, 2002).

The limited studies conducted on the psychometric properties of the South African SDS raise concerns regarding its reliability and validity. Despite these concerns, the SDS remains one of the most popular and widely used interest inventories in South Africa (de Bruin & de Bruin, 2013b; Foxcroft et al., 2004; Nel, 2013).

### **3.3.2 The South African Vocational Interest Inventory**

The South African Vocational Interest Inventory (SAVII) was developed based on Holland's (1997) hexagonal model. In order to improve the interest differentiation during the interpretation of results, the SAVII redistributes each vocational personality type into three sub-fields (du Toit et al., 1993). The three sub-fields for each interest scale are: (1) Practical (Realistic), divided into crafts, construction/manual labour, and nature; (2) Scientific (Investigative), divided into physics, biology and mathematics, medical, and legal services; (3) Artistic, divided into linguistics, creative expression and entertainment; (4) Social, divided into education, caring/nursing, and law



enforcement; (5) Business (Enterprising), divided into commerce, management, and persuasion; (6) Administrative (Conventional), divided into clerical services, numerical routines and office machine operators (du Toit et al., 1993).

The standardisation of the SAVII was conducted during the late 1980s. A variety of participants from diverse backgrounds was sampled, however, as with the SDS, the majority of the sample was comprised of English and Afrikaans speaking participants (du Toit et al., 1993). Using the Kuder-Richardson-8 method of reliability testing, du Toit et al. (1993) found the scales to be relatively reliable for research purposes, reporting a mean alpha coefficient greater than .70 for all the scales. However, Nunally and Bernstein (1994) argue that these high alpha coefficients might not be suitable for decision-making purposes. Furthermore, the validity of the scores on the SAVII was determined through conducting a factor analysis with equimax rotation (du Toit et al., 1993). The results indicated that the majority of the scales and sub-scales loaded onto one factor. However, some sub-scales did have significant loadings on more than one factor (du Toit et al., 1993). Morgan (2014) asserts that considering the circumplex nature of Holland's model, the cross-loadings between the sub-scales is unsurprising.

### **3.3.3 The Meyer Interest Questionnaire**

The Meyer Interest Questionnaire (MB-10) is one of the most popular interest measures in South Africa (de Bruin & de Bruin, 2013b). Developed from the disused Kodus Interest Questionnaire, the MB-10 is an ipsative and normative interest inventory, and interprets raw scores in comparison to a norm group (Morgan, 2014; Meyer, 2003). The MB-10 measures ten different occupational fields, namely working with people on an individual level, working with people in groups, commerce, working with numbers, linguistics, arts, science, crafts and manual labour, animals and plants (Meyer, 2003).

The MB-10 was standardised for Grade 9 and 11 high school learners representative of the total Western Cape population, and first year university students from the Southern and Western Cape (de Bruin & de Bruin, 2013b; Meyer, 1998). The majority of the interest fields indicated sufficient reliability, with the alpha coefficients ranging from 0.67 to .95 and most of the interest scales demonstrating coefficients between 0.80 and 0.90 (Meyer, 1998). The standardisation sample provided a basis from which to develop norm groups for male and female high school learners and male and female first year university students. Within this context, the MB-10 is suitable for Grade 9 and 11 high school learners and first year university students (Meyer, 2003).

Similarly, Wium (2001) investigated the applicability of the MB-10 on a sample of 710 Grade 7 learners from urban and rural primary schools in the Western Cape. The reliability coefficients for the scales were largely acceptable for white learners, however, unacceptable alphas were reported for the Black and Coloured participants. Wium (2001) provided possible reasons for the unacceptable reliability coefficients, including lack of language comprehension (the MB-10 is only available in Afrikaans or English), lack of occupational exposure and cultural unfamiliarity. Similar to the original standardisation of the MB-10, Wium (2001) provided evidence of the validity of the instrument by exploring the simultaneous congruence between the MB-10 scores and current major subjects. Accordingly, Wium (2001) argued that the original standardisation of the MB-10 could be applied to Grade 7 learners. Rabie (2005) more recently standardised the MB-10 on a sample of 233 adults between the ages of 22 and 55 ( $\bar{x} = 34.5$ ). The study reported reliability coefficients ranging between 0.86 and 0.92, while the item analysis indicated that the majority of the item correlations were acceptable, with only a few items not making a positive contribution to the relevant interest field (Rabie, 2005). She argued that the items suitable for Grade 7 learners, being too simplistic for adults, could explain the low item correlations. Rabie (2005) concluded that the same form of the MB-10 used for Grade 7-, 9-, and 11 high school students, as well as first year university students, could be used as a reliable and valid measure of vocational interests for adults. Furthermore, this investigation resulted in the construction of a separate norm table for adult males and females.

There are two major differences between the SDS and MB-10 (de Bruin & de Bruin, 2013b). The first difference between the two measures lies in their item format. The SDS requires the test-taker to answer YES or NO as an indication of their preference for or disliking of certain activities and occupations. For the MB-10, the test-taker is presented with three activities simultaneously and is required to select the most preferred option between the three activities (de Bruin & de Bruin, 2013b). The second difference between the two measures lies in manner in which the scores are used. For the SDS, the six scores obtained represent the individual's interests in each of different occupational fields. The three highest scores obtained in each domain represent an individual's career interests. Conversely, the MB-10 employs an ipsative interpretation, where, rather than being compared to a norm group, the test-taker is compared to herself or himself (de Bruin & de Bruin, 2013b).

### **3.4 Career maturity and career development**

The concept of career maturity, particularly in terms of adolescent career development, is a viable manner in which to understand the school-work transition and subsequent career decision-making. Career maturity refers to an individual's ability to make informed, age-appropriate career decisions that ultimately aid in the navigation of a variety of career development tasks (Savickas, 1999). Since its introduction as a construct pertinent to career development (Super, 1957), career maturity has been the subject of enquiry in a number of studies (Patton & Creed, 2001, Savickas, Briddick, & Watkins, 2002; Savickas & Porfeli, 2011), and is a central component to the practice of career counselling (Savickas & Porfeli, 2011).

A variety of factors have both direct and indirect influences on adolescents' career maturity. In general, these factors can be classified into two broad categories: internal and external determinants of career maturity (Super, 1990). In terms of internal determinants, factors include age, school grade, race, ethnicity, and gender. For instance, cross-sectional studies have found older high school learners to demonstrate greater levels of career maturity when compared to younger students (Creed & Patton, 2003). Yet, some studies have reported contradicting results on the influence of age on career maturity, with Fouad (1988), for example, failing to find any differences in career maturity for a U.S and Israeli sample between Grade 9 and Grade 12 learners.

As such, seminal research has demonstrated school grade to be a more accurate determinant of career maturity (Crites, 1974; Hall, 1963; Patton & Creed, 2001). The influence of school grade on career maturity is primarily due to older, higher-grade learners being exposed to more career-related information, and learners having to make grade-related career decisions (Gottfredson, 1981). These findings lend support for the developmental nature of career maturity – individuals mature as they are increasingly exposed to different environments and career-related information. However, in the South African context, the correlates between age, school grade, and career maturity may not be monotonic. Particularly, in disadvantaged school environments in South Africa, there is much greater heterogeneity in terms of the age-school grade composition, with some learners starting school at a younger age, or more commonly, older learners repeating lower school grades (Spaull, 2015). These are important factors to bear cognisance of considering the diversity of the sample of the current study.

Gender is another important internal correlate to career maturity, particularly in relation to Holland's RIASEC model (see section 3.7.1). Research investigating the association between

career maturity and gender have been inconsistent; yet, the majority of studies have found females across several age groups to obtain higher scores on career maturity measures in comparison to males (Patton & Creed, 2001). The greater career maturity found among females is often attributed to their earlier cognitive development (Watson, 2008). Indeed, coping with the various career-related challenges individuals are faced with during the life course requires appropriate cognitive abilities, and empirical evidence suggest that female adolescents appear to have this early developmental advantage (cf. Halperm, 2013 for a thorough review).

In terms of external determinants of career maturity, factors include socio-economic status, family involvement, geographic location, and culture. In socio-economically deprived environments, many adolescents lack sufficient knowledge of the world of work, and therefore have limited opportunities to attach positive meaning to the value of work (Miller, 2006). In addition, parents in these environments are often absent due to long work hours, and may also lack the information required to guide their children in making career decisions (Albien, 2013). For this reason, children and adolescents seldom have positive role models that may aid in career development (Miller, 2006).

Within the diversity of the South African population, career maturity may also be fundamentally determined by cultural values. Watson and Stead (2002), for example, emphasise the need for greater recognition of human diversity and marginalised groups in vocational psychology. More specifically, they argue that the construct of career maturity is inherently individualistic, and therefore more based on Western values. As such, career maturity, and its influence on career development, is only meaningful if understood within greater context in which individuals live and work (Watson & Stead, 2002).

### **3.5 The role of culture in career assessment**

Culture is a concept that is difficult to define and there are a myriad of definitions available (Stead, 2004; Stead & Watson, 2013). For example, in the context of career psychology, Marsella and Leong (1995, pp. 204-205) suggest that culture is “shared learned behaviour that is transmitted from one generation to another for purposes of social and individual adjustment, growth and development.” More recently, Stead (2004, p. 392) defined culture as “a social system of shared symbols, meanings, perspectives, and social actions that are mutually negotiated by people in their relationships with others.” The variety of definitions available for this concept signifies the complex nature of culture. Accordingly, culture is not homogenous, particularly in the context of

the modern global community (Stead & Watson, 2013). Moreover, culture is not a fixed phenomenon and continues to change and transform over time in response to increasing interaction with people from diverse backgrounds (Stead, 2004).

Individuals internalise meaning from their cultural contexts and cannot be separated from their development, behaviour, cognitions and emotions (Stambulova & Alfermann, 2009). This implies that individual career behaviour is context-specific and should be explored within their culture, rather than being compared cross-culturally (Stambulova & Alfermann, 2009). It is generally acknowledged that South African career psychology has relied on the importation of international theories, models and measures – the applicability of which continues to be challenged (Watson, 2009). These traditional approaches have resulted in a marginalisation of the life perspectives of the majority of the disadvantaged South African population (Mkhize & Frizelle, 2000). In spite of an increased awareness that Euro-American psychological principles are not readily applicable in the South African context, insufficient attention has been paid to multicultural, socio-political and economic influences on career behaviour (Watson, 2009). Moreover, Watson (2009) asserts that the discipline of career psychology has drifted away from a social justice perspective. Social justice refers to activities affording individuals with equal access in a particular society and is best understood within a cultural context, which suggests that career development cannot be successfully understood without recognising broader societal influences (Watson, 2010). This perspective therefore calls for contextual and cultural sensitivity on the part of career counsellors, practitioners and researchers (Watson, 2010).

The most distinct difference between Western and Afrocentric cultures lies in the individualism-collectivism perspective (Chiu & Hong, 2006; Stead, 2004). Individualism, often associated with Western cultures, refers to individuals who value independence, the attainment of personal goals, autonomy, freedom and a unique identity (Stead, 2004; Triandis, 1994). Collectivism, in contrast, is often associated with Afrocentric cultures and refers to individuals who value interdependence, the attainment of group goals, group solidarity, duty and sharing (Stead, 2004; Triandis, 1994). In theory, individualism is defined by the actions of the individual, whereas collectivism is defined by the actions of the group (Hartung, Fouad, Leong, & Hardin, 2010). Accordingly, it is assumed that these different cultural perspectives will influence career planning and decision-making, as well as the occupational values individuals aspire towards (Hartung et al., 2010). In terms of vocational behaviour, research suggests that collectivists are

inclined to base their occupational decisions on the expectations and norms of the in-group (e.g., the family), whereas individualists place more emphasis on their own personal goals and attitudes (Hartung et al., 2010; Oyserman & Lee, 2008). Sharf (2010) emphasises the importance of considering cultural identities during career counselling, as it may influence the timing and commencement of adolescent career development. For example, Albien and Naidoo (2016) explored the career influences of peri-urban, isiXhosa adolescents and found that, in terms of career identity development, the participants experienced the integration of their cultural identities with their westernised career aspirations particularly challenging. These are important factors to consider in the post-modern context of career assessment.

Inadvertently, importing psychometric assessment measures directly from Western countries might not be applicable across the entire South African population, as the difference in cultures might influence the results and inferences made from the measures (Grieve, 2005; Morgan, 2014; Triandis, 1989). Stead and Watson (2013) argue that in spite of some similarities between Western and Afrocentric vocational behaviour, career counselling and research conducted in Western countries might not be an accurate depiction of career phenomena in the South African context.

Furthermore, many cultures in South Africa rely on the oral tradition (Stead & Watson, 2013). According to Maree and du Toit (2011), the term oral tradition refers to a full range of narrative traditions, including fables, folktales, folklore, fairy tales, myths, legends, orality and orature. Traditionally, the oral tradition was employed as an educational aid for children and adolescents, while in contemporary Africa, oral traditions, and folktales in particular, are used to address complex social issues, such as abuse or HIV/AIDS (Maree & du Toit, 2011). In the South African context of career counselling, clients may prefer to engage in interviews or group discussion (Albien, 2013), based on their culture of oral tradition, rather than completing questionnaires with which they might be unfamiliar (Stead & Watson, 2013). The onus therefore rests on practitioners to be cognisant of the fact that career behaviour can vary considerably within a specific cultural context (Stead & Watson, 2013). Similarly, counsellors should be cautious not to generalise the values and beliefs of cultural or ethnic groups. It would be simplistic to assume that all isiXhosa-speaking individuals adhere to the altruistic concept of *Ubuntu*, while all English-speaking individuals pursue their personal goals (Stead & Watson, 2013). Moreover, the technological advancements associated with the 21<sup>st</sup> century have resulted in a global community, with exposure to multiple cultures influencing individual identities.

In addition to considering the impact of cultural factors on the practice of career counselling and assessment, there are several other factors that career counsellors should take cognisance of (Morgan, 2014). These factors include socioeconomic status, education, gender, location/environment, religion and family background (Miles & Naidoo, 2017). For example, in their study on the occupational aspirations of low socioeconomic Black South African adolescents in the Eastern Cape, Watson, McMahon, Foxcroft and Els (2010) found that the majority of the participants aspired to Social and Investigative type, higher status occupations (i.e., social workers, teachers, nurses, doctors and lawyers). However, considering that only 7.88% of the Eastern Province population is employed in professional careers, these career aspirations were considered unrealistic when compared to the South African labour market composition (Watson et al., 2010). Furthermore, these findings resonate with other South African studies that found that most Black South African adolescents aspire to the helping professions (Stead, 1996; Waston, Foxcroft, Horn, & Stead, 1997). Scholars (Albien & Naidoo, 2016; Munro, 1984) argue that the collectivist nature of African cultures and the associated cultural values of altruism and sharing have influenced Black adolescents' career aspirations.

Considering South Africa's diverse nature, the necessity of incorporating cultural variables into the practice of career assessment is unquestionable (Hartung et al., 2010). An individual's culture serves as a moderator through which certain occupational interests are expressed or avoided. For example, in an urban corporate community, an individual might be more inclined to pursue a white-collar profession through which she or he can attain personal goals, rather than selecting an occupation based on the expectations or norms of their reference groups (Meir & Tizner, 2001). Albien (2013) also found that Xhosa adolescents might experience particular difficulty in resolving the collectivist expectations of their cultural identity and that of their school system in exercising their career decision-making.

The initial theoretical advancements made in career counselling and assessments are largely associated with developments in the United States of America. Subsequently, many Western values and assumptions were globally transferred into career theories, practices and measures (Maree & Morgan, 2012; Naidoo et al., 2016). However, considering the variety of factors affecting individual career development, the values derived from Euro-American countries cannot be applied as a nomothetic truth (Hartung et al., 2010; Maree & Morgan, 2012). In order to address these cultural differences, the adaptation and translation of career assessments in a multicultural

and multilingual society such as South Africa, is essential (de Kock, Kanjee, & Foxcroft, 2013). Cross-cultural test adaptation and translation are necessitated if the test results are to be reliable, valid and applicable for all test-takers (de Kock et al., 2013).

### **3.6 Cross-cultural test adaptation and translation in South Africa**

Watson (2010) argues that the practice of career psychology in South Africa has historically placed emphasis on decontextualised, Westernised career counselling models. The discipline's failure to adapt these models for the South African context has largely contributed towards social exclusion (Watson, 2010). This has led to a call for a contextually and culturally sensitive, indigenised career approach (Stead & Watson, 2013; Watson, 2010). Practically, this implies that individuals from diverse cultural, language and socioeconomic environments should be given equal opportunity to complete or respond to any career measure (de Kock et al., 2013). The following section will present a discussion of the adaptation and translation of career measures. This includes a discussion of the reasons for and the process of adapting and translating measures. In addition, the challenges related to adapting and translating measures in a diverse society such as South Africa, are presented.

#### **3.6.1 Adapting career measures**

According to de Kock et al. (2013), test adaptation involves a process whereby a measure is modified to ensure its applicability in a specific context, while still retaining the original meaning of the measure. In adapted measures, the language is unchanged, but the words, content and examples are changed to ensure it is applicable for a specific national, cultural or language group (de Kock et al., 2013). For example, in a South African adaptation of a measure developed in the United States, words such as *ketchup* will be changed to *tomato sauce*, or sports references to American Football will be changed to rugby to make it more applicable for the South African population (de Kock et al., 2013).

De Kock et al. (2013) emphasise three important reasons for adapting assessment measures. Firstly, assessment measures should be adapted in order to facilitate comparative studies between different groups (de Kock et al., 2013). This is particularly relevant in the context of the growing global community, where there is an increased necessity for multinational corporations to assess individuals for vacant positions from diverse language and cultural backgrounds (de Kock et al., 2013). Secondly, assessment measures should be adapted to compare newly developed measures



to existing norms and interpretations of established and respected measures (Brislin, 1986; de Kock et al., 2013). Comparing newly developed measures to established measures provides practitioners with a sense of security regarding the validity and reliability of their instruments (de Kock et al., 2013). Finally, in a context where there is a lack of resources or expertise, it might be the only available option to adapt a measure to ensure a valid and reliable instrument (de Kock et al., 2013).

Traditionally, an etic approach to career assessment was employed within the discipline of psychology, both internationally (Einarsdóttir, Eyjólfsdóttir, & Rounds, 2013; Einarsdóttir, Rounds, & Su, 2010; Leong, Leung, & Chong, 2010; van der Vijver, 2013) and in South Africa (Pretorius, 2012). An etic approach entails the direct importation of theoretical constructs and assumptions from one context to another (Morgan, 2014). This approach subscribes to the universalistic assumption that all theories or instruments originating from one context are equally applicable in another context, and in the process, disregards cultural and indigenous differences (Pretorius, 2012). However, this universalistic assumption is untenable across different cultural contexts (Cheung, van der Vijver, & Leong, 2011) and as a result, has received increased criticism for paying insufficient attention to cultural differences (Einarsdóttir et al., 2013; Helfrich, 1999). Moreover, Cheung et al. (2011) argue that there is a lack of consideration of cultural variance at the item and scale level of the measures developed to operationalise a theory.

In contrast to the universalistic nature of the etic approach, the emic approach places emphasis on psychological practices that are culturally relevant (Grossman & Na, 2014). This is often achieved by means of a detailed analysis of theoretical constructs within a particular context (Cheung et al., 2011). More recently, researchers have argued that combining the strengths of both the etic and emic approach could be beneficial in terms of multicultural test adaptation (Cheung, 2012; van de Vijver, 2013). A combined approach would entail importing theoretical constructs from a particular context, while investigating whether these constructs are universal in different contexts or whether it should be adapted (Cheung et al., 2011). For example, in their development of the South African Personality Inventory, Hill et al. (2013) recently illustrated the utility of employing a combined etic-emic approach in the South African context.

Vocational interest measures employing Holland's (1997) RIASEC model as a theoretical foundation have typically adopted an etic approach, where Holland's theory and instruments are directly imported from the United States into other countries (Einarsdóttir et al., 2013; Einarsdóttir

et al., 2010). There are two major problems with adopting this approach. Firstly, it is problematic to assume that a career interest inventory or theory, such as Holland's, is equally applicable across different cultural contexts (Cheung et al., 2011). Secondly, it is inaccurate to assume that the labour market of one specific country (such as the United States) is similar and relevant to that of another country. Accordingly, if there are discrepancies between the original country and target country's culture and labour market, the items used to measure vocational interests might not be valid indicators of Holland's six vocational personality types (Einarsdóttir et al., 2013).

To address the issues associated with the etic approach to career assessment, Einarsdóttir et al. (2010, 2013) propose employing a constrained emic approach in the development of career interest inventories based on Holland's (1997) theory. This approach entails the direct importation of Holland's theoretical constructs into a specific context, but also developing items unique to the context within which it is used (Einarsdóttir et al., 2013; Einarsdóttir et al., 2010; van de Vijver & Tazner, 2004). Morgan (2014, p. 98) defines the constrained emic approach as a process whereby a theoretical framework with strong empirical support is "tailored to another context through the development of indigenous content." Similarly, in the development of the South African Career Interest Inventory (SACII), Morgan (2014) adopted a constrained emic approach. The items in the SACII were written to reflect Holland's (1997) RIASEC model, but also the characteristics of the South African labour context, language barriers and the population's access to different occupations (Morgan et al., 2014). Moreover, job profiles and descriptions obtained from various online sources, such as the O\*Net database, that were relevant for South Africans were also included (Morgan, 2014). For a detailed discussion on the SACII, see section 4.6.

### **3.6.2 Translating career measures**

In contrast to test adaptation, the translation of assessment measures involves a process of converting a measure from one language to another language, while retaining the meaning of the original measure (de Kock et al., 2013). There are two important reasons for translating assessment measures. Firstly, a measure should be translated to improve fairness in assessment and to afford test-takers with the opportunity to complete a measure in the language of their choice (de Kock et al., 2013). Accurately translating a measure provides practitioners and researchers with an advantage, as the bias associated with assessing individuals in an unfamiliar language is controlled for and the validity of the results are enhanced (de Kock et al., 2013). Secondly, translating a measure saves time and reduces costs. De Kock et al. (2013) argue that it is often less time

consuming and more cost effective to translate an existing measure into a second language than to develop a new measure.

There are two common designs used in the translation of assessment measures, namely forward-translation designs and back-translation designs (de Kock et al., 2013). The forward-translation design refers to a process whereby an individual or a group of individuals (de Kock et al., 2013) translates the source version of a measure into the target language. The main objective of this design is to ensure that the interpretation of each item in the target language is similar to the interpretations in the source language (de Kock et al., 2013). The back-translation design involves a process whereby the source version of a measure is translated into the target language by an individual or set of translators and then translated back to the original language by another individual or set of translators (de Kock et al., 2013). Considering that there are two versions of the source language available with this design, theoretically the researcher will have a better indication of the quality of the translation (Brislin, 1986; de Kock et al., 2013). The back-translation design is one of the most popular models used by cross-cultural researchers and there is a consensus that the back-translation of a measure is essential to determine its validity (Cha, Kim, & Erlen, 2007; John, Hirsch, Reiber, & Dworkin, 2006).

Various research studies have indicated the success of employing a back-translation design in the adaptation of career assessment measures (Glidden-Tracey & Greenwood, 1997; Zhang & Fan, 2007; Tang, 2009). For example, Tang (2009) investigated the applicability of Holland's (1997) model on a sample of 165 Chinese college students ( $n = 165$ ). In order to assess the participants' vocational interests, two sections of the English version of the SDS, the Activities and Occupational Preferences sections (Holland, 1994), were translated into Chinese and back-translated into English (Tang, 2009). The translated version was approved by the Psychological Assessment Resources to be used in the study. Accordingly, Tang (2009) found sufficient support for Holland's (1997) circular ordering hypothesis among Chinese college students and emphasised the necessity of measuring and interpreting vocational interest within a specific language and cultural context. Similarly, Glidden-Tracey and Greenwood (1997), using back-translation procedures, examined the sufficiency of the Spanish translation of Self-Directed Search Form E (SDS-E; Holland, 1990). Analyses derived from the RTHOR indicated that the back-translated version of the SDS-E was an adequate fit for Holland's model (Glidden-Tracey & Greenwood, 1997). From the above discussion, it is apparent that employing a constrained emic approach and

a back-translation procedure to adapt a career assessment in the multilingual and multicultural context of South Africa will afford individuals with equal opportunity to assess their vocational interests.

### **3.6.3 Adaptation and translation: Challenges and solutions related to South Africa**

Multilingual test adaptation in South Africa has received insufficient attention, largely because English is the language of instruction in the workplace and in the majority of educational institutions (de Kock et al., 2013). This has led to an assumption that assessing all South Africans in English is acceptable (Foxcroft & Aston, 2006). However, various South African researchers have challenged this assumption (Koch, 2005; Meiring, 2007; Saunders, 2002). Watson, Davies and Foxcroft (2006), for instance, found that being educated in the medium of English is not a guarantee of students' language proficiency and that the majority of the learners are not proficient in English as a second language at the end of their school career. Accordingly, assessing individuals in a language in which they are not proficient infringes on the standards set for the fair and ethical practice of assessment (de Kock et al., 2013). A number of studies have illustrated language proficiency as a potential source of bias on assessment measures in South Africa (Foxcroft & Aston, 2006; Joseph & van Lill, 2008; Meiring, van der Vijver, & Rothmann, 2006). For example, de Kock et al. (2013) assert that assessing second-language English speaking individuals on a measure developed for first-language speakers will negatively impact their test performance on the construct being assessed (for example, vocational interests or career self-efficacy).

To address this, two suggestions have been proposed. Firstly, de Kock et al. (2013) propose that the English proficiency level of a measure should be determined (for example, Grade 7 level proficiency) and the test-taker should complete an English proficiency test to determine whether she or he meets the desired level of language proficiency. The results of the English proficiency test will determine whether the test can be administered in English or whether the results will be a biased assessment of the construct (de Kock et al., 2013). The second solution lies in the administration of an English proficiency test and then assessing the competency of the language in which the test-taker is most proficient (de Kock et al., 2013). These solutions implicate the need for multi-language versions of career measures to ensure fair assessment in the South African context (de Kock et al., 2013).

The process of adapting and translating assessment measures into multiple languages presents South African researchers with a variety of challenges (de Kock et al., 2013). According to van Eeden and Mantsha (2007), paying insufficient attention to these challenges could lead to inaccuracies in the test items, which could change their meaning and test-takers' comprehension of the items. Considering the diversity of South Africa's eleven official languages, some issues might occur when translating an assessment measure. For instance, there might not be a corresponding term for the concept in the target language. Van Eeden and Mantsha (2007), for example, reported that there is no corresponding Tshivenda term for the concept of depression, which made the translation of certain items in the 16 Personality Factor Questionnaires problematic. Similarly, Horn (2000) found the isiXhosa vocabulary to be limited in terms of certain English personality descriptors. In addition, colloquial English expressions cannot be translated verbatim and the translated version of the negative form items (for example, I do not like talking to strangers) often confuses individuals completing the translated measure (van Eeden & Mantsha, 2007). Furthermore, the expressions and vernacular used within a specific language group might differ between sub-groups (Steele & Edwards, 2008). For example, there might be different expressions used by rural isiXhosa-speaking people and urban isiXhosa-speaking people. Accordingly, if translators are not representative of the essential sub-groups, the test translations might be inaccurate (de Kock et al., 2013). Van Eeden and Mantsha (2007) assert that in addition to language, problems at the item level are also related to a cultural component. The content of certain test items could be related to cultural constructs, which might be interpreted differently by different groups (de Kock et al., 2013). Accordingly, researchers and practitioners should also place emphasis on the development of indigenous measures (de Kock et al., 2013).

### **3.7 Empirical research on Holland's theory**

Holland's (1985, 1997) theory of vocational personality has been subjected to more empirical research than any other theory of career development (Spokane & Cruza-Guet, 2005). The literature available on Holland's theory is the most diverse and voluminous of all theories in vocational psychology, with over 500 studies conducted on his typology (Spokane & Cruza-Guet, 2005; Spokane et al., 2002; Zunker, 2012). In general, the majority of studies have found support for the theorised six personality and environment types, the underlying circular (hexagonal) ordering structure and the instruments designed to measure the personality types (Spokane &

Cruza-Guet, 2005). Moreover, the theory's practical utility has resulted in the development of several assessment measures adopted in schools, tertiary institutions, industry and private practice (Spokane et al., 2002). The practical utility and empirical support for the theory accounts for its popularity among the general population and professionals.

Despite its popularity, there are certain issues to consider when applying Holland's (1997) theory, particularly when assessing vocational interests (Nel, 2013; Scharf, 2006). For instance, there has been conflicting results regarding the equal applicability of Holland's (1997) theory across gender (Nel, 2013). In addition, results regarding the validity of Holland's (1997) theory for different age groups are contentious, particularly among young adolescents (Hansen, 2005; Šverko & Babarovic, 2006). Furthermore, there has been much debate in recent times regarding whether the shape of Holland's (1997) RIASEC model is constant in differing cultural contexts and whether the theory can be applied cross-culturally (Scharf, 2006).

The following section presents a discussion of the aforementioned issues. The section begins with a discussion of the applicability of Holland's (1997) model across gender. Hereafter, the theory's cross-cultural applicability is presented. This section will conclude with a discussion on the applicability of Holland's theory across different age groups.

### **3.7.1 The applicability of Holland's RIASEC model across gender**

Gender differences in career interests are widely acknowledged within the field of vocational psychology (Su et al., 2009). In general, women are more likely to show interest in working with people, whereas men are prone to be interested in working with things (Su et al., 2009). Research conducted on Holland's (1997) theory has reported mixed findings on the differences in interests between men and women, with some studies reporting invariance and other studies reporting significant differences (Armstrong, Su, & Rounds, 2011; Einarsdóttir, Rounds, Agisdóttir, & Gerstein, 2002; Roberti, Fox, & Tunick, 2003; Scharf, 2006). If Holland's (1997) theory and the instruments it is based on are not equally applicable across genders, the RIASEC types might be measuring completely different constructs for men and women (Morgan, de Bruin, & de Bruin, 2015). Within this context, vocational counselling and interest inventories based on his model will not be useful.

Darcy and Tracey (2007) investigated the fit of Holland's (1997) model across males and females in three different age groups - Grade 8, Grade 10 and Grade 12 secondary school students. They found relatively few differences across gender in terms of the RIASEC types, reporting a

correspondence index (CI) value, an indication of the fit of the model to the data, of .81 for the combined sample (Darcy & Tracey, 2007). This CI value surpassed Rounds and Tracey's (1993) standard CI value of .65 for U.S. samples and indicated that the model fitted the data well. More importantly, they argued that their findings provided support for the equal applicability of the RIASEC types across genders (Darcy & Tracey, 2007). Similarly, Armstrong et al. (2011) assert that, barring minor differences, the circular ordering of the RIASEC model is similar across genders.

However, other studies have reported variance in the interest structure across genders (Day & Rounds, 1997; Su et al., 2009). For example, Holland (1997) illustrated certain gender differences on the six RIASEC types. He reported that men are prone to achieve higher scores on the Realistic or Investigative scales (working with things), whereas women are more likely to score higher on the Social or Artistic scales (working with people). More recently, Iliescu, Ispas, Ilie and Ion (2013) reported similar findings, with males scoring higher on Realistic types and females scoring higher on Social types. Similarly, Einarsdóttir and Rounds (2009) found males and females to differ consistently on the Investigative and Artistic scale. Findings on differences in the interest structure of males and females have also been reported in the South African context. For example, Schonegevel (1997) found South African males to score higher on the Realistic scale and South African females obtained higher scores on the Social and Conventional scales. Allen (2005) also found males to score higher on the Realistic types, however, also reported that males to achieve higher scores on the Conventional scale. These findings have resulted in Holland's (1997) theory being criticised for demonstrating a bias in terms of gender (Creager, 2011; Nel, 2013; Scharf, 2006).

In defence of this, Holland (1997) argued that these results reflect realistic cultural and societal gender expectations and that men and women tend to choose different professions (Nel, 2013; Scharf, 2006). In addition, Weisgram et al. (2010) argue that men and women develop vocational interests to fulfil certain occupational values. For example, they argue that females have a greater endorsement for altruistic occupational values, which are associated with weak predictability to pursue Realistic and Investigative career fields. Consequently, individual values combine with individual perceptions of occupational value affordances to produce gender difference in occupational interests (Weisgram et al., 2010).

Furthermore, Su et al. (2009) argue that each RIASEC type is multidimensional and is likely to include several facets that encompass different components of the entire content domain. For example, mechanic and outdoor activities are two facets clustered on the Realistic type that are completely different in nature. Women might score high on outdoor activities, but when combined with mechanical activities, their average score on the Realistic type is influenced, providing a distorted depiction of their interests (Su et al., 2009). Moreover, Nagy, Trautwein and Lüdtke (2010) argue that there might be a lack of adequate distinction between Realistic and Investigative occupations among women, which may lead to them clustering the two scales into one personality or environment type. As a result, women score higher on the Social and Artistic scales, since there is a lower endorsement for the Realistic and Investigative types (Nagy et al., 2010). Therefore, examining sex differences on the facet level might provide more clarity on the difference in interests between men and women.

According to Morgan (2014), differences in the interest structure between males and females can also be explained by bias at the item level. For instance, Einarsdóttir and Rounds (2009) employed item response theory to investigate gender bias at the item level on the Strong Interest Inventory. They found that men and women with the same level of interest were inclined to respond differently to items that were stereotyped in terms of gender (Einarsdóttir & Rounds, 2009). Furthermore, they argue that gender differences on the Realistic scale can be explained by item bias, mainly because the items encompassing the Realistic type were sampled from domains typically dominated by men (Einarsdóttir & Rounds, 2009). The items in the Social and Artistic scales, by comparison, were more balanced in terms of sex-typed content (Einarsdóttir & Rounds, 2009).

In South Africa, Morgan et al. (2015), through the use of the SACII, investigated the structural validity of Holland's (1997) RIASEC model across genders in a combined sample of adolescents, young adults and working adults ( $\bar{x}$  age = 22.90). Employing a randomisation test of hypothesised order relations (RTHOR), they found satisfactory fit for Holland's (1997) circular model for both men and women, reporting CI values of .71 for men and .97 for women respectively. Even though the RTHOR fit was better for females, this difference was statistically non-significant ( $p = .93$ ). Overall, Morgan et al. (2015) found that the structural fit of Holland's (1997) model is similar across genders, which implies the equal applicability of the model for both men and women when



using the SACII. However, before any definitive conclusion can be made regarding the fit of Holland's model across genders, these results need to be replicated.

Differences in the interest structure across gender have important implications for career assessment. Researchers and practitioners should take note of these differences in the assessment of vocational interests, as not only will it impact test-takers' results and the interpretation thereof, but may also promote occupational restriction in terms of sex and limit access to gender-stereotypical occupations (Betz, 2002; McWhirter, 1997; Meinster & Rose, 2001). Accordingly, some theorists have called for the removal of gender difference from interest measurement (Prediger & Cole, 1975). However, other scholars contend this and argue that gender difference should be included in measurement, as it improves predictive validity (Armstrong et al., 2011; Einarsdóttir & Rounds, 2009; Gottfredson & Holland, 1978; Su et al., 2009).

### **3.7.2 The cross-cultural applicability of Holland's RIASEC model**

Holland's (1997) theory of vocational personality and the instruments based on his theory have been researched internationally and with culturally diverse populations (Scharf, 2006). Spokane and Cruza-Guet (2005) argue that cross-cultural studies on his theory have mainly addressed three questions: (1) do the six types and circular/hexagonal ordering exist across cultures; (2) does culture influence the person-environment interaction, and (3) do career assessments based on Holland's model have cross-cultural utility. The empirical research conducted to address these questions, however, have produced conflicting results for the cross-cultural applicability of Holland's typological model (Nauta, 2010; Nel, 2013; Scharf, 2006).

In general, cross-cultural studies investigating Holland's typology have traditionally employed an etic approach (see section 3.5.1), where Holland's theory and instruments were directly imported from the United States into another country (Morgan, 2014). For example, Rounds and Tracey (1996) conducted a structural meta-analysis to evaluate the cross-cultural fit of the RIASEC model. Using 76 international correlation matrices, which represented 18 countries, they found inadequate support for Holland's (1985) hexagonal model outside the U.S. They reported a mean CI value for the U.S. sample of .78 and a mean CI value of .48 for the non-U.S. sample, where -1 indicates no fit and 1 indicates a perfect fit (Rounds & Tracey, 1996). Accordingly, Rounds and Tracey (1996) argue that the cross-cultural applicability of Holland's (1985) model is limited and cautioned researchers and practitioners against applying the model indiscriminately in diverse cultural contexts. In South Africa, du Toit and de Bruin (2002) conducted a similar study on the

applicability of Holland's (1997) model in a non-Western country (see section 3.3.1). They found Holland's (1997) model to be a poor fit for the South African sample and concluded that cultural and language differences impede the model's equal applicability (du Toit & de Bruin, 2002).

Nonetheless, studies that are more recent have found increasing support for Holland's (1997) structure across diverse cultural contexts. For example, Einarsdóttir et al. (2002) investigated Holland's (1997) circular ordering hypothesis with two samples of male and female university students and young adults in Iceland ( $n^1 = 449$ ;  $n^2 = 438$ ). They found adequate fit for Holland's model and reported mean CI values of .72 for females and .62 for males ( $p < .05$ ). Moreover, with unconstrained multidimensional scaling (MDS), the correct theoretical ordering of the types was demonstrated, providing further support for the model's cross-cultural applicability (Einarsdóttir et al., 2002). Similarly, Šverko and Babarović (2006) examined the validity of Holland's RIASEC structure among a sample of adolescent Croatian males and females ( $n = 1866$ ). Administering the Croatian version of the Self-Directed Search (SDS), they found significant correspondence indices for the different age groups in their sample ( $p < .05$ ). For participants at the age of 15 years, no circular ordering emerged from the data (Šverko & Babarović, 2006). However, between the ages of 16 and 17, CI values of .57 and .67 were reported, and for participants between the ages of 18 and 19, they reported CI values of .72 and .86 (Šverko & Babarović, 2006). In comparison with Rounds and Tracey's (1996) standard CI value of .48 for acceptable fit, Šverko and Babarović (2006) concluded that the fit to the data was adequate and could be applied to describe and explain the interest structure of Croatians adolescents.

In their psychometric assessment of the Greek SDS, Sidiropoulou-Dimakakou, Mylonas and Argyropoulou (2008) found support for Holland's (1997) model outside the U.S. Their findings demonstrated the vocational interest structure of a sample of Greek university students ( $n = 156$ ) to be similar to the structure found in the U.S. population (Sidiropoulou-Dimakakou et al., 2008). However, Sidiropoulou-Dimakakou et al. (2008) did report some inconsistencies in the hexagonal circular ordering for the Greek sample. For example, the Realistic and Investigative types were closely associated, where it is theorised that there should be equal distances between the types for the U.S. sample. These differences were ascribed to differences in the Greek economic and cultural environment (Sidiropoulou-Dimakakou et al., 2008). Accordingly, their findings support the assumption that the hexagonal model often resembles a "misshapen polygon" (Holland, 1992, p. 119; Sidiropoulou-Dimakakou et al., 2008).

Various research studies conducted in Asia have also found support for Holland's model outside the U.S. For example, Tak (2004) investigated the fit of Holland's model on a sample of male and female Korean university students ( $n = 829$ ). Tak (2004) reported the model to fit the data sufficiently (all  $p$ -values  $< .05$ ), with CI values of .82 for both male and female participants. Similarly, Tien (2009) explored the vocational interest structure of a sample of 572 ( $n = 572$ ) Taiwanese high school and college students. Tien (2009) employed unconstrained MDS and found the theoretical ordering of the types to be accurate. Moreover, RTHOR analyses indicated the circular ordering model to fit the data adequately (CI = .69,  $p < .05$ ). In another study, Zhang, Kube, Wang and Tracey (2013) examined the fit of the RIASEC structure on a sample of Chinese high school and university students ( $n = 2567$ ). They found the RIASEC structure of the Chinese participants to fit the circular model sufficiently and reported CI values of .83 for the high school sample and CI values of .81 for the university sample (Zhang et al., 2013).

Research investigating Holland's model in South Africa has also produced mixed results. In their standardisation of the South African SDS, Gevers et al. (1997) employed unconstrained MDS to examine the circular ordering model and found support for the types arranged in the correct RIASEC order. However, Schonegevel (1997) investigated the validity of Holland's model on a sample of Black isiXhosa-speaking secondary school students and found the types to be disarranged and demonstrated inadequate fit for the RIASEC model. Possible explanations for these findings include cultural differences (individualism versus collectivism), differences in socioeconomic status, and language barriers (the assessment measures were often unavailable in the participants' first language). More recently, Morgan et al. (2014) investigated the validity of Holland's circular/hexagonal structure. Employing RTHOR and covariance structure modelling, Morgan et al. (2014) found satisfactory fit for Holland's (1997) circular/hexagonal structure with their two multi-ethnic samples ( $n^1 = 985$ ;  $n^2 = 175$ ). To indicate the fit of the model to the data, Morgan et al. (2014) reported a Root Mean Square Error of Approximation (RMSEA) = .08, a Standardised Root Mean Square Residual (SRMR) = .05, a Comparative Fit Index (CFI) = .98 and a Goodness-Of-Fit Index (GFI) = .99. According to Morgan et al. (2014), RMSEA and SRMR values  $\leq .08$  and CFI and GFI values  $\geq .90$  are indicative of acceptable fit. Importantly, their results contradict du Toit and de Bruin's (2002) findings that Holland's (1997) typological structure is invalid among diverse South African cultures. Contrary to previous research, Morgan et al. (2014)

suggest that Holland's (1997) RIASEC structure is applicable in the South African context and using valid interest inventories, career assessment based on the model can be supported.

The conflicting results regarding the cross-cultural applicability of Holland's (1997) theory might be attributed to whether these studies employed an etic or emic approach (Morgan et al., 2014). The majority of cross-cultural studies examining vocational interest have employed an etic approach, where Holland's (1997) theory and associated instruments are directly imported from the U. S. into the target population (Einarsdóttir et al., 2010; Einarsdóttir et al., 2013). However, the content of these instruments might not reflect the vocational environment of that specific country, which will influence the instrument's validity (Einarsdóttir et al., 2013). Consequently, the promising results reported by Morgan et al. (2014) can be ascribed to adopting a constrained emic approach. In developing the SACII, Holland's (1997) RIASEC structure was imported into the South African context, while also developing content that reflect the world of work South Africans are exposed to (Morgan et al., 2014). Therefore, the items in the SACII have been deemed applicable for all South Africans, regardless of culture and ethnicity, and measure their actual interests and the occupations they will be exposed to. As a result, the SACII might answer the questions surrounding the validity of interest inventories based on Holland's theory used outside of the United States.

### **3.7.3 The applicability of Holland's RIASEC model across different age groups**

Holland's (1997) theory and constructs have predominantly been investigated among samples of late adolescents and young adults (Morgan et al., 2014). According to Iliescu et al. (2013), the use of these age group samples might have a detrimental effect on the equal applicability of the RIASEC model, since an individual's career interests are likely to be more stable during adulthood than in adolescence or young adulthood. Furthermore, since adults have more exposure to the world of work, they tend to have a more differentiated perception of their vocational interest (Morgan et al., 2014).

A few studies have reported discrepancies in terms of the applicability of Holland's (1997) model across different age groups. As discussed previously, Darcy and Tracey (2007) investigated Holland's model with a sample of males and females in Grades 8, 10 and 12. Despite concluding that the circumplex model is equally applicable across genders, they did report variation in terms of the three age groups. In testing four different circumplex models, Darcy and Tracey (2007) reported that for each model, the Grade 8 participants obtained lower CI values in comparison to

the Grade 10 and 12 participants. However, the difference between the sample groups was statistically non-significant ( $p = .017$ ). In response to these results, Darcy and Tracey (2007) argued that as the participants' age increased, the fit of Holland's (1997) model improved, signifying an improvement in the differentiation of their interest structures. Similarly, Watson and McMahon (2004) using Holland's model, explored the personality characteristics and career aspirations of 11-14 year old Australian and South African adolescents. Even though the participants were able to match their personality with a specific occupation, Holland's (1997) model could not provide an explanation for how this matching occurs – the data did not provide support for the concept of congruence (Watson & McMahon, 2004). These results lend support for claims that the RIASEC model is perhaps not equally applicable across all developmental levels (Tracey, 2001; Watson & McMahon, 2004).

However, in contrast to the assertion made by Iliescu et al. (2013), there is increasing research that suggests that career development starts at a young age and occurs across the life span (Super, 1990). For example, Low, Yoon, Roberts and Rounds (2005) conducted a meta-analysis investigating the stability of interest from early adolescence to middle adulthood. Contrary to previous findings, Low and colleagues (2005) assert that vocational interests are stable dispositional attributes; this is supported by their findings that interests remain relatively stable between the ages of 12 and 40 ( $\rho = .55 - .83$ ), reaching a plateau between the ages of 18 and 22 ( $\rho = .66 - .68$ ). Furthermore, Low et al. (2005) affirm that the stability of adolescents' vocational interest has important implications for career counselling, since the assessment of interest can assist individuals in acquiring knowledge of the world of work from a relatively young age. Parents, educators and career counsellors, therefore, have an important role to play in the assessment of vocational interests early on in life (Su et al., 2009). Hirschi et al. (2011) support this argument and theorise that family, and parents in particular, play an integral role in the development of occupational interest, as they shape their children's understanding of the functions and meaning of work.

Similarly, Tracey and Robbins' (2005) longitudinal study from Grade 8 through Grade 12 ( $n = 6688$ ) that investigated the stability of vocational interests across gender and ethnicity found the circular ordering model to fit the data significantly for each group ( $\bar{x}$  CI = .58,  $p < .05$ ). Moreover, they found the development of vocational interests to be identical from Grade 8 through Grade 12 across gender and ethnicity. They argue that the similarity of interests across age, gender and

ethnicity signifies that Holland's (1997) model can be applied to all developmental levels and that early adolescence may be a crucial developmental period to establish vocational interests (Tracey & Robbins, 2005). In another study, Tracey et al. (2005) reported similar stability in vocational interests from Grade 8 through Grade 12, however, found Grade 12 to be a possible time for change in interests. In terms of the Things/People dimension, Tracey et al. (2005) argue that Grade 12 students' interest become less people based, which may lead to incongruence between their interests and career choices. Accordingly, counsellors and practitioners should take cognisance of Grade 12 as a possible period of change (Tracey et al., 2005).

The stability of vocational interests demonstrated by these studies justifies the assessment of career interests during middle adolescence. In particular, career preparation at a young age is an important antecedent for career development across the life span (Super, 1990). The occupational choices made in adulthood are rooted in early career interaction and experiences in adolescence (Gottfredson, 1981; Messersmith, Garrett, Davis-Kean, Malanchuk, & Eccles, 2008; Savickas, 2005; Whiston & Keller, 2004). Similarly, Hirschi et al. (2011) argue that if individuals engage in career preparation from a young age, the development of career choices and interests will be promoted. Considering that adolescents are active agents in the career decision-making process and not mere passive recipients of environmental factors, affording them with the opportunity of early career engagement could exert a positive impact on their career development (Hirschi et al., 2011).

Within this context, adolescence appears to be a crucial career developmental period, both in terms academic and vocational success (Low et al., 2005). In South Africa, Grade 9 learners are required to select their subjects for the remainder of their school career. Students with access to the necessary resources use career counselling and vocational assessments to guide their educational and occupational choices. As a result, subject choices at school are ultimately a reflection of an individual's vocational interests (Low et al., 2005). Therefore, investigating the applicability of the SACII among Grade 9 learners will emphasise the practical utility of vocational interest inventories for South Africans. Furthermore, early engagement in career preparation may have important implications for students' long-term career development and could address the high unemployment rate currently rife in the South African society.

### **3.8 Chapter summary**

This chapter presented a review of career assessment in South Africa and the applicability of Holland's model across gender, ethnicity and age. The chapter commenced with a historical overview of career assessment in South Africa and was followed by a succinct overview of commonly used interest inventories in the South African context. Thereafter, the role of culture in career assessment and cross-cultural test adaptation and translation was discussed. The final section of this chapter concluded with a discussion of the applicability of Holland's (1997) model across gender, ethnicity and age.

Within this context, notwithstanding its wide usage, there is the need to provide South Africans with a career measure based on Holland's vocational personality theory that measures career interests reliably and validly, regardless of gender, race, age or language. Moreover, frequently used interest inventories in South Africa are obsolete, in terms of both content and the world of work. As result, locally developed career interest inventories that reflect contemporary occupations and labour contexts are required.

## CHAPTER 4

### METHODOLOGY

#### **4.1 Introduction**

Quantitative research methods are employed in psychology to gather statistical data in order to generalise findings to larger populations or to explain particular phenomena (Mertens, 2015). The quantitative research design utilised in this study will need to investigate and compare differences in the average scores of Black, Coloured and White, male and female Grade 9 learners obtained on the South African Career Interest Inventory (SACII). Ultimately, the research design will need to enable the researcher to make conclusions regarding the equal applicability of the SACII across different groups in South Africa. Accordingly, the current chapter presents the research design and methodological process of this investigation and the statistical techniques employed to analyse and interpret the data. The chapter begins with a presentation of the study's research aims, objectives and hypotheses, as well as the research design employed in this study. Hereafter, a detailed overview of the research procedure, participants and sampling method is presented. This is followed by a discussion of the development and validation of the SACII and the procedures employed in translating the SACII. Lastly, the data analysis procedures and ethical consideration pertinent to the current study are discussed.

#### **4.2 Research aims, objectives and hypotheses**

The aim of the current study was to translate and assess the psychometric properties of the South African Career Interest Inventory across gender and race among Grade 9 secondary school learners in the Cape Winelands district in the Western Cape region of South Africa. Exploring differences in the psychometric properties and interest structures of Black, Coloured and White, males and females on the SACII will provide valuable information on its equal applicability across a variety of gender and ethnic groups throughout South Africa.

The specific objectives of the current study included:

- (1) Translating the items in the South African Career Interest Inventory (SACII) into isiXhosa.
- (2) Providing a back-translation for the items in the SACII in Afrikaans.
- (3) Investigating differences in the psychometric properties and interest structure of male and female Grade 9 secondary school learners (as measured by the SACII). In particular, this study will explore whether male and female Grade 9 learners' scores differ on SACII subscales.



- (4) Investigating differences in the psychometric properties and interest structure of Black, Coloured and White Grade 9 secondary school learners (as measured by the SACII).

During the course of the current study, two hypotheses were tested. Each of these hypotheses was formulated based on a thorough review of recent relevant literature:

H1: The interest structure of male Grade 9 learners will differ significantly from female Grade 9 learners. Specifically, it is hypothesised that male Grade 9 learners will obtain higher scores on the Realistic and Investigative scales, whereas female Grade 9 learners will obtain higher scores on the Social and Artistic scales.

H2: There will be no statistically significant difference in the psychometric properties and interest structure of Black, Coloured, and White Grade 9 learners. It is hypothesised that, in the development of the SACII, the adoption of a constrained emic approach will produce items that are representative of the interest of different groups in the present study.

### **4.3 Research design**

The current study employed a quantitative epistemology (Mertens, 2015) to explore differences in the psychometric properties across gender and race on the SACII. Considering the hypotheses to be tested in the present study, a non-experimental, causal-comparative research design was deemed appropriate. Causal-comparative designs are utilised to conduct comparisons between groups and usually involves variables that cannot be manipulated, such as gender, race or age (Lodico, Spaulding, & Voegtle, 2010; Mertens, 2015). Even though causal-comparative studies attempt to control for a variety of extraneous variables, the main objective of this research design is to explore differences between groups (Lodico et al., 2010).

### **4.4 Research procedure**

Prior to the commencement of data collection, permission to conduct research at five secondary schools in the Cape Winelands district was obtained from the Western Cape Education Department (WCED; see Appendix A). In addition, permission was obtained from the principals and/or governing bodies of each school to administer the SACII to the participants (see Appendix B).

In accordance with the stipulations provided by the WCED and Stellenbosch University's Research Ethics Committee, the staff at the respective schools distributed formal letters of invitation, which contained all relevant details of the study, and passive informed consent forms to the participants' guardians one week prior to the collection of the data (see Appendix C for the

formal letter of invitation and Appendix D for the passive informed consent form, respectively). Additionally, the participants were required to complete a biographical questionnaire and assent form on the day of the data collection (see Appendix E and Appendix F, respectively). The biographical questionnaire obtained information regarding the participants' age, gender, ethnicity, home language, guardians' level of education and guardians' employment. Although the use of passive informed consent forms is a contentious issue in social research, it was deemed appropriate due to the minimal risk involved in participating in the present study, the written assent obtained from the participants, and the approval obtained from school principals and/or governing bodies

The researcher's arrangements for the administration of the SACII varied at each school, based on the availability of venues and the learners' academic responsibilities during the week of data collection. The translated items in the SACII were administered during a single, 45-minute session at the respective schools over a course of three weeks during the second school term of 2016. Griessel, Jansen, and Stroud (2013) argue that assessment periods for secondary school students should not exceed 90 minutes, as this will detrimentally influence their attentiveness during the assessment period. Accordingly, an assessment period of 45 minutes was deemed sufficient. Considering that all Grade 9 learners were recruited as participants, the SACII was administered in the classrooms of the respective Grade 9 classes.

In an attempt to control for experimenter and measurement bias, the following procedures were employed. Firstly, prior to the assessment session, the researcher prepared and trained 11 assessment assistants to ensure that they were thoroughly familiar with the assessment instructions, format, structure and purpose of the SACII. The assessment assistants (who were all university students) were employed to ensure that for each assessment session, a practitioner familiar with the SACII was present to instruct the participants on the assessment procedure. Accordingly, different numbers of assistants were employed depending on the number of Grade 9 classes at each school. For example, at Cloeteville High School, a total of seven assistants were employed, as there are seven Grade 9 classes. In addition, to ensure that all participants had equal opportunity to complete the SACII, the assistants were trained to adopt a professional, scientific, and impartial attitude during the course of the assessment session (Griessel et al., 2013). Considering that the SACII was administered in Afrikaans, English and isiXhosa, the researcher ensured that the selected assessment assistants were proficient in the language medium of the respective schools. For example, in schools where the home language of the majority of the students is isiXhosa,

assessment assistants who are proficiently bilingual in English and isiXhosa were employed. In certain circumstances, teachers and members of staff assisted in instructing the students.

The second procedure employed to control for experimenter and researcher bias involved ensuring that the assessment conditions were sufficient. In terms of the administration of the SACII, the researcher requested the class lists of each Grade 9 class to guarantee that each participant received an assent form and the SACII questionnaire booklet. Moreover, in an attempt to control for fatigue, the SACII was administered during the second school period (08:45-09:30). The rationale behind this administration was based on three arguments. Firstly, if the first school period (08:00-08:45) were to be used, some students might have arrived late for school or be somnolent. Secondly, the first break takes place directly after the third school period (09:30-10:15). Accordingly, it was argued that some participants might rush to complete their questionnaires, which will result in invalid responses. Lastly, if the SACII was to be administered at the end of the school day, the students might have been fatigued from their daily activities, which would have also influenced their responses. In view of the above, the SACII was uniformly administered during the second school period to the majority of the students. However, due to schedule constraints, the SACII was administered to one group of participants during the sixth school period (13:15-14:00).

Furthermore, the researcher selected specific classrooms to ensure that the assessment rooms complied with certain necessary assessment requirements (Griessel et al., 2013). Considering that the SACII was administered during a school period, the classrooms were relatively quiet, well-lit and sufficiently ventilated (Griessel et al., 2013). Each participant completed the SACII at their own desk, where there was sufficient space for the participants to complete the questionnaire comfortably and for the assessment assistants to move around freely to attend to the participants' questions. In certain circumstance, the researcher provided the necessary stationery required by the participants to complete the SACII.

Lastly, the researcher took cognisance of the fact that there are certain pre-existing conditions that could not be controlled for. For example, Hoyland, Dye and Lowton (2009) found that missing breakfast could majorly influence an individual's performance on a psychological measurement. Even though the test conditions were sufficient for the assessment session, the lack of adequate nutrition for certain students could possibly influence their test responses. Similarly, the researcher could not control whether the participants were well rested before completing the questionnaire.

#### 4.5 Research participants

A total of 655 ( $n = 655$ ) participants were sampled in the current study. The participants were primarily recruited from five secondary schools in the Cape Winelands district of South Africa (a summary of the participating schools is presented in section 4.5.1). All Grade 9 secondary school learners in the respective schools who provided assent and informed consent were recruited as participants and represent the unit of analysis of the current study. In South Africa, at Grade 9 level learners are required to decide on the subjects they will study for the remainder of their secondary school career. As Low et al. (2005) argue, subject choices at school are ultimately a reflection of an individual's vocational choices, Grade 9 can be considered a crucial period to assess vocational interests and expose students to the variety of career options available to them.

Convenience sampling, a non-probability sampling technique, was employed to recruit participants. Sink and Mvududu (2010) assert that, due to the lack of randomisation, all non-probability sampling techniques lack the assurance of a representative sample, which influences the internal validity and generalisability of the results. However, employing random sampling in a school environment is often not possible, due to logistical constraints and the compact nature of modern school curricula (Miles, 2015). Considering that the SACII was administered to the entire Grade 9 population of each participating school, the random assignment of all participants was unrealistic. Moreover, the participants were solely recruited based on the logistical expediency of their Grade 9 classes and the availability of the participating schools. In an attempt to address the shortcomings of non-probability sampling techniques, secondary schools from various socio-economic and cultural backgrounds were sampled in an attempt to obtain participants that are diverse in gender, race, and language.

Table 4.1 presents a summary of the demographic characteristics of the sample, including gender, race, and home language, guardians' level of education and guardian's occupation. The mean age of the sample was 15 years ( $SD = 1.02$ ) with the age of the participants ranging from 13 years to 20 years. The sample comprised of 388 females ( $n = 388$ ; 59.2 %) and 266 males ( $n = 266$ ; 40.8 %). For the majority of the sample, 48.5 % of the participants ( $n = 318$ ) indicated their race as Coloured.

Table 4.1

*Summary of demographic characteristics of sample*

Measures		Sample ( <i>n</i> = 655) f	%
Gender	Male	266	40.8
	Female	388	59.2
Race	Black	270	41.2
	Coloured	318	48.5
	Indian/Asian	5	0.8
	White	62	9.5
Language	Afrikaans	357	54.5
	English	25	3.8
	isiXhosa	273	41.7
Guardian education	No education	15	3.2
	Primary school	32	4.9
	Secondary school	171	26.1
	Grade 12	230	35.1
	Diploma	34	5.2
	Degree	108	16.5
Guardian occupation	Unemployed	76	12.1
	Unskilled	298	45.5
	Semi-skilled	67	10.4
	Skilled	86	13.2

For the remaining participants, 270 (41.2 %) were Black, 62 (9.5 %) were White and five (0.8 %) were Indian/Asian. The existing racial classifications are used to illustrate the sample diversity and do not imply endorsement of these categories.

The home language of the majority of the participants was Afrikaans ( $n = 357$ ; 54.5 %); 273 (41.7 %) of the participants indicated their home language as isiXhosa and 25 (3.8 %) of the participants were English-speaking. The participants reported a variety of educational levels and

occupations for their respective guardians. In terms of educational level, the highest level of education achieved by majority of the participants' guardians was Grade 12 ( $n = 230$ ; 35.1 %). For the remainder of the sample, 15 (2.3 %) of the guardians had no formal education, and 32 (4.9 %) of the guardians completed primary school but did not continue with their secondary education. There were 171 (26.1 %) of the participants' guardians who enrolled for, but did not complete their secondary education. Finally, 34 (5.2 %) of the guardians obtained a diploma, while 108 (16.5 %) of the guardians obtained a tertiary degree. The variety of occupations reported ranged from unemployed, domestic worker, construction worker, security guard, teacher, nurse, banker, entrepreneur, attorney and doctor. A large proportion of the participants' guardians were unskilled workers ( $n = 298$ ; 45.5 %) or unemployed ( $n = 76$ ; 12.1 %). In contrast, 86 (13.2 %) of the participants' guardians were employed in skilled occupations. The reported educational levels and occupations correspond with the diversity of the sample's socio-economic status. However, the reader should interpret these descriptive statistics with caution, as a large proportion ( $n = 128$ ; 19.5 %) of the sample did not complete the self-report measures due to uncertainty regarding their guardians' levels of education and/or occupation.

#### **4.5.1 Description of participating schools**

The present study's participants were drawn from five secondary schools from the Cape Winelands district. A summary of each school is presented below.

***Cloetesville Secondary School.*** Cloetesville Secondary School is based in Cloetesville, a low- to middle-income community situated on the outskirts of Stellenbosch. Cloetesville Secondary School is the only high school in the community, and subsequently, it is a relatively large school, educating an approximate 1700 learners between Grades 8 and 12. The primary language of instruction in the school is Afrikaans, with the home language of the majority of the learners also Afrikaans. However, a small proportion of learners are English or isiXhosa first-language speaking. In terms of racial composition, the large majority of learners are Coloured, with a small proportion Black and Indian/Asian learners.

***Kayamandi High School.*** Kayamandi High School is one of two secondary schools in Kayamandi, an impoverished peri-urban settlement situated on the outskirts of Stellenbosch. Kayamandi High School was constructed in 2007 to address overcrowding in Makupula High School (see next paragraph) – which, at the time, was the only secondary school in the community. Kayamandi High School is relatively large, with approximately 1600 learners being educated

between Grades 8 and 12. Of particular importance, the curriculum at Kayamandi High School is exclusively science-focused, where physical and life sciences are taught to accommodate the interests of learners in the community. The primary language of instruction at the school is isiXhosa, with almost all learners being exclusively isiXhosa first-language speaking. Accordingly, the majority of learners attending Kayamandi High School identify as Black South African.

***Makupula High School.*** Makupula High School is the first secondary school constructed in Kayamandi. However, due to limited school grounds and insufficient school facilities, Makupula continues to struggle to accommodate its estimated 1500 students from Grades 8 to 12. In contrast to Kayamandi High School, the curriculum at Makupula High School is exclusively business-orientated, where learners can select subjects with a business focus, such as tourism, technical drawing, economics, accounting, and business studies. Similar to Kayamandi High School, the primary language of instruction is isiXhosa, with all learners being isiXhosa first-language speaking, Black South Africans.

***Kylemore High School.*** Kylemore High School is the only secondary school in Kylemore, a low- to middle-income community situated on the periphery of Stellenbosch. The school educates an estimated 800 learners between Grades 8 and 12. Similar to Cloeteville High School, the home language of the majority of the learners is Afrikaans, with some English-speaking learners, and a small number of isiXhosa-speaking learners. As such, Afrikaans is the primary language of instruction at Kylemore High School. In terms of racial composition, the majority of learners are Coloured, with a small number of Indian/Asian learners.

***Stellenbosch High School.*** Stellenbosch High School is situated in Stellenbosch. Learners attending this high school come from middle- to high-income families. During Apartheid, Stellenbosch High School was a whites-only school. As such, the school is classified as previously advantaged. Stellenbosch High School is a medium-sized school, with over 600 learners between Grades 8 and 12. The school's language of instruction is Afrikaans, and the majority of learners' first language is Afrikaans. However, a number of learners are Afrikaans-English bilingual. In terms of racial composition, the majority of learners are White, with a smaller proportion being Coloured learners.

#### **4.6 Instrument: The South African Career Interest Inventory (SACII)**

The SACII (Morgan, 2014) was designed based on the stages of questionnaire development proposed by Netemeyer et al. (2003). Accordingly, three steps were employed in constructing the SACII (Morgan, 2014). The first step entailed defining the construct and the content domain of the constructs. According to Morgan (2014), the underlying content domain of the SACII is Holland's (1997) six personality or interest types – collectively referred to as the RIASEC model.

The SACII initially included 12 scales to provide a detailed analysis of an individual's interest domain, where Holland's (1997) RIASEC scales were redistributed into six primary scales and six secondary scales (Morgan, 2014; Rounds & Tracey, 1993). The six secondary types serve as transitional scales between the six primary RIASEC scales (Morgan, 2014). For example, the secondary scale between the primary scales of Investigative and Artistic is the Investigative-Artistic (IA) scale (see Figure 4.1). Accordingly, the secondary scales represent a combination of the characteristics of two primary scales (Morgan, 2014).

For example, Investigative-Artistic personality types prefer to engage in activities that involve creative investigation and the personality type is characterised as unsystematised and ambiguous (Morgan, 2014). Activities associated with the IA personality types include examining “ancient artefacts or writing a scientific article” (Morgan, 2014, p. 106).

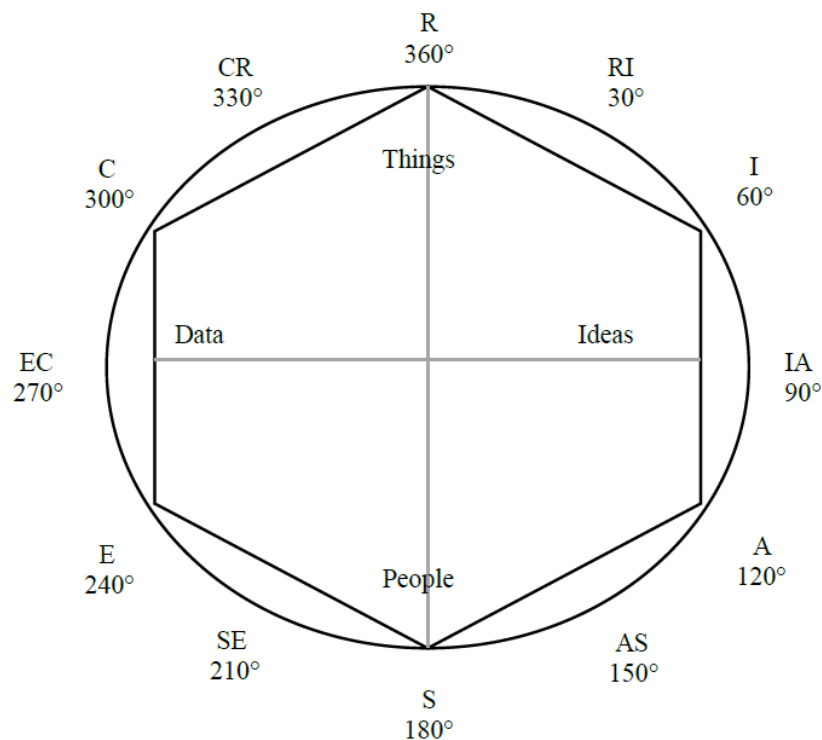
The second step employed in constructing the SACII was generating measurement items and determining the suitability of the items. In writing the items for the 12 scales on the SACII, Morgan (2014) employed a constrained emic approach, which involves writing indigenous items informed by a theoretical perspective (Einarsdóttir et al., 2010). This approach was employed to generate items that are representative of the world of work in South Africa (Morgan, 2014). Accordingly, occupational profiles and descriptions obtained from a variety of online sources (such as the O\*Net database) provided a foundation from which to generate items that are appropriate in the South African context (Morgan, 2014).

Moreover, the items in the SACII are presented as statements to which the participants will indicate their agreement or disagreement on a 5-point Likert-type scale, ranging from (1) *strongly disagree* to (5) *strongly agree* (Morgan, 2014). As a result, 415 items across the 12 scales were generated and were then subjected to expert review (Morgan, 2014).

The expert review panel included six psychometrists/psychologists, with comprehensive knowledge of Holland's (1997) theory of vocational personality, who specialise in psychometric



testing and/or career counselling. In order to determine the suitability of the items, the review panel was provided with definitions of the 12 scales and asked to indicate which of the 12 interest domains each item represented (Morgan, 2014). The scoring key of the SACII was developed using Holland's (1997) calculus assumption, and subsequently, item deletion was guided by the expert panel's ability to correctly classify items as part of Holland's hexagon (Morgan, 2014). Based on the above, 61 of the initial 415 items across the 12 scales were eliminated from the SACII and the item pool was reduced to a total of 354 items.



*Figure 4.1.* The 12 interest domains of the SACII. Directly sourced from Morgan, B. (2014). *Toward the development and evaluation of the South African Career Interest Inventory.* (Unpublished Doctorate thesis). University of Johannesburg, South Africa.

The third and final step employed in designing the scale included conducting three studies to develop and refine the SACII. The 354 items were tested in a pilot study on a sample of 404 university students. Even though the reliability coefficients of all 12 scales were acceptable ( $>.90$ ), the normality plots and linear regression lines revealed that several of scales had a non-linear relationship and were not normally distributed (Morgan, 2014). In addition, the correlation

matrices indicated a strong positive correlation between the primary and secondary scales. For example, a correlation of .87 was found between the Realistic and Realistic-Investigative scale (Morgan, 2014). Moreover, MDS revealed the items in the SACII did not approximate Holland's theorised circular order and the angular placement of the items did not approximate Morgan's (2014) theorised 30° displacement, signifying no equal spacing between the scales (Morgan, 2014). Accordingly, based on the large correlations between the scales, the MDS approximation and limited support for Holland's theorised circular ordering, the 12 scales on the SACII were collapsed into six primary scales (Morgan, 2014). According to Morgan (2014), each scale is populated with approximately 40 items. Through the use of arc-tangent transformation, items for each of the six primary scales were selected based on their angular location, the items' communalities and the content associated with each respective type. After the completion of the above process, a total of 237 items remained (Morgan, 2014).

Morgan (2014) conducted a second study on a sample of 985 university students to investigate the remaining 237 items included in the concept questionnaire. Through the use of exploratory factor analysis, the structure of the six RIASEC scales at the item level was explored (Morgan, 2014). As theoretically predicted, the oblique target rotation found the six RIASEC factors within the data and the factor loadings on the majority of the items were  $\geq .30$  on a single factor (Morgan, 2014). Items with cross-loadings equal to or greater than .30 on non-adjacent RIASEC types were flagged for possible removal. Accordingly, nine items were flagged for possible removal (Morgan, 2014). To further identify possible weak items, the reliability coefficients, inter-item correlation matrices, item variances and standard error values were investigated (Morgan, 2014). Item total correlations smaller than .50 were considered weak items. Accordingly, 18 items across the six RIASEC scales with coefficients  $< .50$  and/or low standard deviations relative to the others were identified and flagged for potential removal (Morgan, 2014). In order to examine the fit of the data to the tight circular ordering structure, Morgan (2014) conducted a randomisation test of hypothesised order relations (RTHOR). The null hypothesis of the RTHOR states that the order of the RIASEC scales is not circular (i.e., random). The test of hypothesised order relations for the concept questionnaire found all probability values to be significant ( $p = .0167$ ) signifying a tight circular ordering across the entire sample (Morgan, 2014). Moreover, no significant statistical difference ( $p < .05$ ) was found in the fit of the ordering structure across gender, ethnicity, language or demographic location (Morgan, 2014).

Unsatisfactory items flagged for potential removal were removed from the concept questionnaire as part of a three-stage process. Firstly, the items' angular locations were determined through arc-tangent transformation. The decision to remove certain items was based on their shared content and angular location, whether the items had low communalities and/or whether the items were theoretically inconsistent with the respective RIASEC types (Morgan, 2014). As a result, 54 unsatisfactory items across the six RIASEC scales were removed from the concept questionnaire. During the second stage of item reduction, the remaining items were subjected to a Rasch analysis to identify potential misfitting items (Morgan, 2014). Particularly, items that demonstrated underfit were flagged for potential removal, as they are indicative of invalid and/or erratic responses. Based on the item location and fit statistics, 19 underfit items were flagged for potential removal (Morgan, 2014). The final stage of item reduction involved comparing the misfitting items from the Rasch analysis to the items flagged for potential removal throughout the studies conducted on the pilot and concept questionnaires. Items were considered for removal if they were previously flagged as potentially weak and demonstrated misfit in the Rasch analysis (Morgan, 2014). Accordingly, 14 unsatisfactory items were identified through the above process and subsequently removed from the scale.

Morgan (2014) conducted a third study on a sample of 188 students and working adults to investigate the circular/circumplex structure of the final version of the SACII. In order to examine the fit of the data to a tight circular ordering structure, Morgan (2014) conducted a randomisation test of hypothesised order relations (RTHOR). As with the second study, a tight circular order emerged in the data, with all probability values reported as significant ( $p = .0167$ ). Furthermore, four circumplex models (unconstrained, equal communality, equal spacing and circulant) were investigated to determine the data's circular structure (Morgan, 2014). For the equal spacing and circulant models, reasonably acceptable RMSEA values of .07 and .08 were reported, respectively ( $p \leq .08$ ). However, unacceptable RMSEA values of .09 and .10 were reported for the unconstrained and equal communality models, respectively ( $p \leq .08$ ; Morgan, 2014). Since the RMSEA is in favour of models with small degrees of freedom, it must be noted that models that fit the data well might be rejected (Kenny, Kaniskan, & McCoach, 2011).

The quality of remaining items in the final version of the SACII was examined through subjecting the items to the Rasch polytomous items response model (Andrich, 1978; Morgan, 2014). The dimensionality of the six RIASEC scales was also determined using this method of

analysis. Even though certain items were identified as either underfit or overfit, inspection of the correlation matrices indicated that the majority of the items are dependent ( $r > .80$ ). Furthermore, Morgan (2014) conducted further analysis on the combined sample group to identify possible weak and/or redundant items. As a result, the final version of the SACII was reduced to 143 items across the six RIASEC scales (Morgan, 2014).

#### **4.7 Translating the South African Career Interest Inventory**

For the current study, the translation of the SACII involved two separate processes - the development of the South African Career Interest Inventory isiXhosa version (SACII-X) and conducting a back-translation on the Afrikaans version of the SACII.

##### **4.7.1 Developing the South African Career Interest Inventory-Xhosa (SACII-X)**

The SACII-X was developed as part of a three-step process. Firstly, two complimentary translation techniques were employed to translate the original source language (English) of the SACII into isiXhosa, namely a judgemental, committee forward-translation design and a back-translation design (de Kock et al., 2013). Accordingly, a bilingual, home-language isiXhosa-speaking Masters Psychology student with expertise in career psychology (Translator 1) and a bilingual, home-language isiXhosa-speaking Masters African Languages student (Translator 2), collaboratively translated the 143 items in the SACII. The employment of the translators above was deemed appropriate, since Translator 1 ensured that the nuanced career content was not lost in the translation process, while Translator 2 ensured that the translations were linguistically and grammatically correct.

Bearing in mind the various dialects existing within the isiXhosa language, the translators made a conscious attempt to include language that is appropriate for the diversity of the isiXhosa-speaking population in South Africa. The translations included language that accommodates individuals of different ages, educational backgrounds and geographical locations. Moreover, using a committee forward-translation design, the researcher facilitated numerous meetings with the translators to discuss and compare the isiXhosa translations to ultimately create composite translations that best reflect the semantic and conceptual meaning of the original items.

Through this process, certain challenges related to the translation process were identified. The major challenge the translators were confronted with was the non-equivalence of certain isiXhosa and English terminology used on the SACII. As a result, the two languages are not directly transferable. To address these challenges, two approaches were adopted: (1) the English concepts

were directly imported and adapted into isiXhosa; or (2) a description of the meaning behind the English concepts was provided in isiXhosa. For example, there is no direct isiXhosa translation for the word “*computer*” and the term was adapted to “*ikhompyutha*”. Similarly, there is no isiXhosa equivalent for the concept “*managerial skills*” and the meaning behind the concept was described as “*izakhono zabo zokuphatha abantu*” which literally translates to “*skills on managing people*.” In total, the terminology of eight items in the scale was directly imported and adapted into isiXhosa (presented in Table 4.2) and 13 items were described to provide the isiXhosa meaning behind the respective items (presented in Table 4.3). In addition, two items in the biographical questionnaire were directly imported and adapted (presented in Table 4.2). Considering that the two languages are not directly transferable, certain items were rephrased and restructured to present the isiXhosa translations in the active voice.

The second step in developing the SACII-X involved employing an independent bilingual, home-language isiXhosa-speaking Masters African Languages student, blinded to the original version of the SACII, to conduct a back-translation into English. In order to assess the equivalence and quality of the translation, the original source language and back-translated versions were compared (de Kock et al., 2013). It was assumed that if the item content of the two English translations were similar or near-identical, the isiXhosa translation was accurate. Conversely, if there is a low degree of accuracy between the two English versions, the isiXhosa translation was deemed inaccurate and required to be re-translated. In these circumstances, this process was repeated until all items reflected a high degree of accuracy between the two English versions.

Table 4.2

*Concepts imported and adapted on the SACII-X*

Item	Source Language (English)	Adapted Target Language (isiXhosa)
I08	Workshop	Kwiworkshop
I93	computers (plural)	Ikhompyutha
I102	Tiles	ii-tiles
I105	Laser	be-laser
I132	computer (singular)	Ekhompyutha
I133	Auction	kwi-auction
Q9	Faculty	i-Faculty

The final step in the development of the SACII-X involved submitting the scale to professional language editing. This step was employed to achieve two objectives: (1) ensuring that the correct spelling, punctuation, grammar, sentence structure and technical terminology are maintained throughout the scale; and (2) ensuring that the translations are accurate.

Table 4.3

*Concepts described for meaning in isiXhosa*

Item	Source language (English)	Target language (isiXhosa)	Literal translation (English)
I10	managerial skills	izakhono zabo zokuphatha abantu	skills on managing people
I12	credit scores	amanqaku mtyala	points of credit
I35	Aquarium	kwisakhiwo seentlanzi	fish building
I58	power plant	yombane kwimveliso	electrical warehouse
I68	Fossils	ngamathambo amadala	bones that are old
I70	art therapy	ukusebenzisa ukuzoba ukunceda abantu abadinga ukuveza indlela abaziva ngayo	to use drawings to help people who need to express how they feel
I71	petty cash	nemali encinci	money that is small
I117	Art	ukuzoba nokusebenza ngezandla	draw and work with your hands
I124	emotional development	uphuhliso lwendlela abantwana abaziva ngayo	development that is based on how people feel
I129	feeding programme	iprogram yokondla abantu	programme of feeding people
I136	Counsel	ukumamela nokuthetha	to listen and speak
I138	Charity	itheko lonikelo kumahlwempu	event of donating to poverty

I139	history of art	ngenvelaphi yemizobo nemisebenzi yezandla	history of drawings and hand work
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Accordingly, a bilingual professor in the African Languages Department of Stellenbosch University edited the SACII-X. In addition, both the original source language and back-translated version were provided to the language editor to determine the accuracy of the translations. Feedback from the language editor indicated that the translations were accurate and, as a result, the SACII-X was deemed appropriate to be employed as the primary research instrument for the current study.

#### **4.7.2 Back-translating the SACII into Afrikaans**

The SACII was originally developed in English and subsequently translated into Afrikaans. However, the Afrikaans version was translated using only a forward-translation design (Morgan, 2014). Accordingly, the current study employed a committee, back-translation design to establish the equivalence of the original translation. The SACII was collectively back-translated from Afrikaans to English by a bilingual, home-language Afrikaans-speaking Masters Psychology student with expertise in career psychology and a bilingual, home-language Afrikaans-speaking Masters Translation student.

As with the development of the SACII-X, the respective translators were employed to ensure that firstly, the career content was not lost in the translation process and secondly, that the translations were linguistically and grammatically correct. Moreover, the researcher facilitated numerous meetings with the translators to discuss and compare the Afrikaans back-translations to ultimately create composite translations that best reflect the semantic and conceptual meaning of the original items. Similar to the SACII-X, it was assumed that if the item content of the two English back-translations were similar or near-identical, the Afrikaans translation was accurate. Conversely, if there is a low degree of accuracy between the two English versions, the Afrikaans translation was deemed inaccurate and required to be re-translated. Considering that English and Afrikaans are both West Germanic languages (Harbert, 2007), the back-translation process was less complex in comparison to the development of the SACII-X. However, certain challenges were identified and addressed during this process. Even though the content of the items remained unchanged, the sentence structures of the majority of the items were adjusted, in order to be

presented in the active voice, which in turn improved the items' readability. Table 4.4 presents all items that were changed significantly during the back-translation.

Table 4.4

*SACII Afrikaans back-translation*

Item	Source language (Afrikaans)	Back-translation (English)	Source language (English)	Adapted item (Afrikaans)
I39	doen wetenskaplike navorsing	do scientific research	conduct scientific research	wetenskaplike eksperimente uitvoer
I82	werk met oumense	work with old people	work with elderly people	met bejaardes werk
I89	pas kinders op	look after children	look after children	na kinders omsien
I104	voer onderhoude met werksaansoekers	conduct interviews with work applicants	interview people applying for new jobs	Onderhoude met werkaansoekers voer
I107	help kinders wat leerprobleme het	help children with learning problems	help children who have a learning difficulty	kinders met leerprobleme help
I117	gee kunslesse	give art lessons	teach art to people	kunslesse aanbied
I126	doen instandhouding van masjienonderdele	do maintenance on machinery	service parts in a machine	die onderdele van 'n masjien diens
I136	gee berading aan mense oor hoe om hul probleme te hanteer	give counselling to people on how to deal with their problems	counsel people to help them deal with their problems	berading bied aan mense oor hoe om hul probleme te hanteer
I138	speel gasheer/vrou vir 'n liefdadigheids- geleentheid	to be a host/hostess for a charity event	host a charity event	'n Liefdadigheids- geleentheid aanbied



Upon completion of the back-translations, the items were compared and combined to create a composite translation that is equivalent to the original version and submitted for professional language editing. Accordingly, a professionally qualified, bilingual, home-language Afrikaans-speaking language editor edited the back-translated version to ensure that the correct spelling, punctuation, grammar, sentence structure and technical terminology were maintained throughout the scale.

Feedback from the language editor indicated that the translations were accurate and, as a result, the back-translated Afrikaans SACII was deemed appropriate to be employed as the primary research instrument for the current study. To further ensure the validity of the scores and equivalence of the translated versions of the SACII, the researcher, translators and language editors adhered to the International Test Commission's (ITC) Guidelines for Test Adaptation (Hambleton & Zenisky, 2011).

In particular, this study employed the ITC's Item Translation and Adaptation Review Form. The review form consists of 25 questions related to the assessment of each item on a questionnaire. Example questions include: "Is the language of the translated item of comparable difficulty and commonality with respect to the words in the item in the source language version?" or "Are there differences between the target and source language versions of the item related to the use of metaphors, idioms, or colloquialisms?" (Hambleton & Zenisky, 2011). The researcher, translators and language editors used the review form to evaluate each item comprehensively to identify and revise problematic items. Hambleton and Zenisky (2011) state that employing this process will ultimately enhance the validity of the data analysis procedure.

#### **4.8 Data analysis**

The statistical analyses employed in this study involved four processes. Firstly, measurement invariance on the SACII was investigated to ensure that the scale was unbiased across the respective language groups. Moreover, this statistical technique was employed to ensure that if differences exist in terms of gender and race, these differences could not be attributed to construct bias. Secondly, the construction of the RIASEC scales, as measured by the SACII, was investigated. To achieve this, the main foci of the analyses were on reliability analysis, item analysis, principal component analysis and angular location and communality estimates. Thirdly, the hypothesised circular ordering of Holland's (1997) RIASEC model was investigated by means of a circumplex analysis. This analysis focused on a randomisation test of hypothesised order

relations, multidimensional scaling, and circumplex covariance structure modelling. Finally, a discriminant analysis was conducted to investigate the differences in scale scores between male and female, Black, Coloured and White, and Afrikaans, English, isiXhosa Grade 9 learners.

#### **4.8.1 Measurement invariance**

Measurement invariance (MI) was examined in the present study using multi-group confirmatory factor analysis (MGCFAs). The LISREL 9.20 for Windows (Jöreskog & Sörbom, 2015) programme was used to conduct the analysis. For the purpose of this study, MI was conducted to establish equivalence across the Afrikaans and isiXhosa versions of the SACII. If equivalence is established, it provides the researcher with relative certainty that differences in the psychometric properties and interest structures of male and female, Black, Coloured, and White Grade 9 learners is not due to some form of measurement bias (Vandenberg, 2002). Considering the large number of items in the SACII, and therefore the inadvertent number of parameters, it was practically not possible to establish measurement invariance on the entire SACII scale. In addition, interests do not form simple structure (Tracey, 2000), and, therefore, it would be inappropriate to concurrently test for invariance across all items. To address this, MGCFAs were conducted for each of the six RIASEC scales on the SACII to determine three measures of invariance, namely configural invariance, metric invariance and scalar invariance (Vandenberg, 2002).

For the present study, configural invariance indicates that participants from different groups employ the same conceptual framework in response to the items in the SACII and that the items are being measured by the same latent variable (Theron, 2011). Configural invariance was established by an inspection of chi-square ( $\chi^2$ ), Root Mean Square Error of Approximation (RMSEA), P-Value for Test of Close Fit ( $p$ -RMSEA < .05), Standardised Root Mean Square Residual (SRMR) and Goodness of Fit Index (GFI). Cheung and Rensvold (2002) argue that  $\chi^2$  is particularly sensitive to sample size, which exerts an influence over its statistical significance. Specifically, sample sizes larger than 200 tend to produce significant  $\chi^2$  values, whereas samples smaller than 100 tend to indicate non-significant  $\chi^2$  values (Cheung & Rensvold, 2002). As a result, Kline (2011) proposes the use of a relative  $\chi^2$ , where the  $\chi^2$  value is divided by the degrees of freedom. A relative  $\chi^2 < 3$  has been suggested to be a reasonable fit to the data (Kline, 2011). Considering the sample size of the current study, relative  $\chi^2$  was employed. Moreover, RMSEA and SRMR values  $\leq .05$  were desirable, while values  $\leq .08$  were deemed acceptable and values  $\geq .80$  but  $\leq .10$  were deemed reasonable (Milfont & Fischer, 2010). These values were used as a

frame of reference, since RMSEA is sensitive to complex models, such as the SACII (Boker et al., 2011). Lastly, GFI values  $\geq .90$  were desirable and indicated acceptable fit. The establishment of configural invariance is imperative for subsequent invariances tests to be meaningful, as it is often considered a baseline-model (Cheung & Rensvold, 2002; Vandenberg, 2002). The lack of configural invariance renders the employment of other invariance tests meaningless, as it indicates that different groups interpret the measurement constructs differently (Davis, 2014).

Once configural invariance was established, metric invariance of the SACII was investigated. Metric invariance tests the equivalence of the relationship between the factors and the items, and if this invariance is established, it indicates that the male and female, Black, Coloured and White participants interpret the items similarly (Campbell, Barry, Joe, & Finney, 2008). Conversely, a lack of metric invariance indicates that some items are more ambiguous or salient for one group (Campbell et al., 2008). Finally, after establishing metric invariance, the scalar invariance of the SACII was established. Scalar invariance was assessed to test whether participants from different groups interpret the SACII scales similarly (Campbell et al., 2008). Both metric and scalar invariance was established by an inspection of the respective  $p$ -values ( $p < .05$ ). A statistically non-significant  $p$ -value indicated that there were no differences detected between the groups, i.e., measurement invariance was established. Conversely, statistically significant  $p$ -values indicated differences between the groups (Campbell et al., 2008).

#### **4.8.2 Reliability analysis**

The current study employed two measures of reliability. Considering that Cronbach's alpha (Cronbach, 1951) is a lower-bound estimate of reliability (Tavakol & Dennick, 2011), Guttman's Lambda 6 (Guttman, 1945) was used as an additional measure of reliability. These two measures were utilised to assess the internal consistency of the items for each of the RIASEC scales. Reliability coefficients  $\geq .90$  were desired, however, coefficients  $\geq .70$  are deemed acceptable (Nunnally & Bernstein, 1994). In order to investigate Cronbach's alpha and Guttman's Lambda 6, the IBM SPSS Statistics for Windows (Version 23.0, 2015) programme was used.

#### **4.8.3 Classical Test Theory item analysis**

Classical test theory (CTT) analysis was applied to the data to identify potentially weak items. Classical test theory proposes that an individual's obtained score on a measure is the function of the true score plus error (Tracey, 2012). Since it is not possible to know an individual's true score or the source of error, the quality of the items in the SACII was investigated through an

examination of the descriptive statistics, inter-item correlations, corrected item-total correlation and reliability coefficients (Morgan, 2014; Pallant, 2007). Items indicating low mean, median and/or variance values were identified for possible removal from the scale. According to DeVellis (2013), item means that approximate the centre of scale's range is desirable. In terms of the SACII's range (1 to 5), item means approximating three were desired. In addition, negative inter-item coefficients were also flagged for possible removal (Nunnally & Bernstein, 1994; Morgan, 2014). CTT analysis was conducted to not only investigate the quality of the items, but also in an attempt to identify potential item bias. The establishment of item invariance is imperative in order to investigate the differences between male and female, Black, Coloured and White Grade 9 learners on the SACII. The IBM SPSS Statistics for Windows (Version 23.0, 2015) programme was used to conduct the Classical Test Theory item analysis.

#### **4.8.4 Principal component analysis**

In order to examine the latent variables in the data, three-factor principal component analysis (PCA) with unrotated extraction was applied to the data (Field, 2013). Prediger (1982) demonstrated that unrotated principal component analysis of data based on the RIASEC model reveals three distinct factors. The first factor, commonly referred to as the general factor (Rounds & Tracey, 1996; Tracey, 2012), accounts for the most variance and is indicated by consistently high loadings on the this factor (Tracey, 2012). Moreover, the general factor represents individual response patterns to each RIASEC scale that are unrelated to item content (Tracey, 2012). However, when these factors are rotated, the variance associated with the general factor are confounded with substantive variance (Tracey, 2012), which produces factors that are not representative the RIASEC structure. As a result, the general factor is commonly excluded from vocational assessment analyses, due to the presence of error variance (Tracey, 2012).

The general factor is followed by two substantive factors underlying the six RIASEC types – commonly assumed to be the people-things and data-ideas components (Prediger, 1982; Rounds & Tracey, 1993; Tracey, 2012). The RIASEC types are distributed evenly across these two dimensions and resemble Holland's circumplex structure (Tracey, 2012). Considering that there is no simple structure underlying Holland's RIASEC model (Morgan, 2017; Tracey, 2012), unrotated principal component analysis was deemed appropriate for the current study. Stevens (2002) asserts that the significance of component loadings is contingent on a study's sample size. Typically, researchers consider factor loadings  $\geq .30$  to be statistically significant. However, for a sample size

of 600, a factor loading  $\geq .21$  can be considered statistically significant (Stevens, 2002). Considering the sample size of the current study ( $n = 655$ ), component loadings  $\geq .30$  were considered to be *practically* significant (Field, 2013; Stevens, 2002)..

#### **4.8.5 Angular and communality estimates of items and scales**

The angular locations of the items and/or scales on the SACII were investigated using arc-tangent transformation (Tracey, 2000). This approach explores the angular estimates of the items and/or scales in a two-dimensional space using the components obtained from either exploratory factor analysis or principal component analysis (Tracey, 2000). Revelle (2014) asserts that the majority of the uses of factor analyses assume that there is a simple structure when there is only one large loading on a factor. However, certain domains, such as personality or interests, demonstrate complex structures, where there are high loadings on two factors (Revelle, 2014). Accordingly, in order to improve the interpretability of this complex structure, the factor loadings are expressed as polar coordinates (Revelle, 2014). This is achieved by transforming the items loadings on each pair of factors into an angle and a vector length (i.e., communality estimate). The vector length corresponds with the amount of variance that is shared between the item and the pair of factors (Revelle, 2014). For the current study, the components obtained from the three-factor unrotated principal component analysis were used to obtain the angular and communality estimates. Rounds and Tracey (1996) argue that, when employing this method, the first extracted component is commonly excluded from vocational interest analyses, as discussed in section 4.8.3 (Tracey, 2012). Rather, the second and third components are used, as it is illustrative of Prediger's (1982) data-ideas and people-things dimensions underlying Holland's RIASEC model (Morgan, 2014).

In order to obtain the angular locations of the items, the items' loadings on the components are submitted to an arc-tangent transformation. The resultant transformation arranges the items in a circular order, where similar items have similar locations on the circular arrangement (Morgan, 2014). Furthermore, to calculate the items' communalities (i.e., the length of the respective radii), the loadings on the two components are squared and summed. Tracey (2002) argues that items with higher communality values provide an explanation for supplementary variance between the separate factors. It is imperative to note that arc-tangent transformation is not an inferential statistical tool, but rather an exploratory technique employed to examine the angular location of the items and scales on a circular arrangement (Morgan, 2014). Accordingly, arc-tangent transformation is used in this study to examine whether the items and scales on the SACII

correspond with Holland's (1997) theoretically specified circular ordering. The arc-tangent transformation and communality estimates were conducted using the *psych* package (Revelle, 2014) in *R* (R Core Team, 2013).

#### **4.8.6 Circumplex analysis**

Holland (1997) theorised that the six RIASEC types can be geometrically organised in a hexagonal model, where the six types are arranged in a specific format (see section 2.5.1 for a detailed discussion of the calculus assumption). However, in contemporary vocational research, Holland's model can be considered a circumplex model, where there is equal spacing constraints and communality between six personality and environment types (Armstrong & Rounds, 2008; Darcy & Tracey, 2007; Morgan et al., 2014; Nauta, 2010; Rounds & Tracey, 1996). The most widely used statistical technique to investigate Holland's circumplex model is the randomisation test of hypothesised order relations (RTHOR), multidimensional scaling (MDS), and circumplex covariance structure modelling (CCSM), which are discussed below.

##### **4.8.6.1 Randomisation test of hypothesised order relations**

According to Tracey (2000), the randomisation test of hypothesised order relations (RTHOR; Hubert & Arabie, 1987) is used as a confirmatory method to examine circumplex models. The RTHOR is used to test a circular ordering model that is consistent with Holland's (1997) calculus assumption (Tracey, 2000). To achieve this, the fit of a correlation matrix to the circular ordering model is investigated (Darcy & Tracey, 2007). Darcy and Tracey (2007) assert that the focus of this method is on the magnitude of the relations, rather than applying equality constraints to the correlation matrix. In particular, the correlations between adjacent types are hypothesised to be greater than the correlations between non-adjacent or opposite types (Darcy & Tracey, 2007). Accordingly, to examine the relations between the respective scales, unique order predictions are made among the six RIASEC types (Darcy & Tracey, 2007). For example, there should be greater correlations between the Realistic and Investigative types and smaller correlations between the Realistic and Social types. In the context of Holland's RIASEC types, 72 unique order predications are made among Holland's types (Darcy & Tracey, 2007). Specifically, 720 permutations are made and equated to the correlation matrix (Tracey, Rounds, & Hubert, 1992). The fit of the data to the circular ordering model is determined by examining the correlation matrix and comparing whether the number predication is met in the data set (Tracey et al., 1992).

Inferences regarding the fit of the data to the circular ordering model are made through inspecting the  $p$ -value and Correspondence Index (CI) produced by the RTHOR (Hubert & Arabie, 1987). Vocational psychology literature argues that a  $p$ -value  $< .05$  is not necessarily indicative that the correlation matrix is consistent with the circular ordering model (Hubert & Arabie, 1987; Morgan, 2014; Tracey, 2000). Rather, a significant  $p$ -value signifies that the result was unlikely to occur due to chance. Moreover, Hubert and Arabie (1987) proposed that the CI is an interpretational aid to the model-data fit. The CI represents the number of predications met in the correlation matrix and ranges from 1.0 (indicating perfect fit to the order predictions) to -1.0 (indicating zero fit to the order predictions). In addition, a CI value of zero is indicative that 50% of the order predications were met in the data (Rounds & Tracey, 1996). Although there are no absolute values that represent acceptable model-data fit, CI values closer to +1.0 are preferable (du Toit & de Bruin, 2002; Hubert & Arabie, 1987; Morgan, 2014; Tracey, 2000). Rounds and Tracey (1996) conducted a structural meta-analysis to investigate the cross-cultural applicability of Holland's circumplex model (see section 3.6.2 for detailed discussion). This study produced benchmark CI values for both international (CI = .48) and U.S. (CI = .70) samples. Accordingly, Rounds and Tracey (1996) argue that the cross-cultural applicability of Holland's (1985) model is limited and cautioned researchers and practitioners against applying the model indiscriminately in diverse cultural contexts. These values are important comparison values for the current study to determine the applicability of the Holland's model on non-Western samples. The RTHOR was conducted using the RANDALL software for Windows (Tracey, 1997).

The RTHOR was also employed to examine the fit of circular ordering model across the different gender, racial and language groups in the current study (Hubert & Arabie, 1997). As with the RTHOR analysis discussed above, comparison of the model-data fit across the different groups produces a  $p$  and CI value. However, to make inferences regarding the model-data fit across groups, these values are interpreted differently. A significant  $p$ -value (i.e.,  $p < .05$ ) is indicative that the circular ordering is variant across the different groups (Hubert & Arabie, 1987; Morgan 2014). Moreover, a positive CI values represents a better model-data fit for the control group, whereas a negative CI values represent a better model-data fit for the comparison group (Hubert & Arabie, 1987; Morgan 2014). In order to compare the circular ordering across the different groups, the *psych* package (Revelle, 2014) in *R* (R Core Team, 2013) was used.

#### 4.8.6.2 Multidimensional scaling

Multidimensional scaling (MDS) is a cluster of statistical techniques employed to examine and model the spatial distances between data points in a low-dimensional space – visually representing the empirical relationships among objects in the dataset (Borg, Groenen, & Mair, 2013; Coxon, 1982; Mair, Borg, & Rusch, 2016).

To investigate the structural arrangement underpinning the RIASEC types, non-metric multidimensional scaling, with a Torgenson optimal starting configuration was applied to the dataset (Borg et al., 2013; Coxon, 1982). This method was employed based on Darcy and Tracey's (2007) recommendation, who assert that non-metric MDS is the ideal method for analysing correlational data for circumplex structure. In order to run this analysis, the correlation matrices of the RIASEC types were converted into dissimilarity data using the  $I^2 - r$  formula (Mair, de Leeuw, & Groenen, 2015). Furthermore, to achieve global optima, multiple random starts configured to 100 was utilised (Mair et al., 2016). The current study employed constrained MDS to investigate the underlying RIASEC structure in the data.

For the constrained method, fixed coordinates and the MDS solution were calculated prior to running the analysis (Borg et al., 2013). On dimension one, the fixed weights were 1.0, 0.5, -0.5, -1.0, -0.5, 0.5; on dimension two, the fixed weights were 0.0, 0.86, 0.86, 0.0, -0.86, -0.86 (Borg et al., 2013; Gupta, 2008). The fit of the dimensions to the data (i.e. the calculated MDS solution) was investigated through interpreting Kruskal's stress-1 test value, the dispersion accounted for (DAF) coefficient, and Tucker's coefficient of congruence (Borg et al., 2013). A stress-1 coefficient  $\leq .10$  was indicative of acceptable fit, while values that approached 1.00 (i.e., values closer to 1.00) signified acceptable fit for both the DAF and Tucker's congruence coefficient (Borg et al., 2013; Kruskal & Wish, 1978). Furthermore, the variance accounted for (VAF) coefficient was calculated, and represents the amount of variability in the proximity data accounted for by the calculated distances between objects in the dataset (i.e., the RIASEC types; Hair, Black, Babin, Anderson, & Tatham, 2006). Acceptable fit is demonstrated by VAF coefficients  $\geq .68$  (Darcy & Tracey, 2007).

In addition to the constrained method, the current study conducted a Procrustes' rotation to determine configuration similarity between two configurations (Mair et al., 2015). That is, Procrustes' rotation was applied to the dataset to compare the RIASEC circular structure of male and female, Black, Coloured, and White, and Afrikaans English and isiXhosa Grade 9 learners.



The Procrustes' rotation produces Tucker's congruence coefficient (CC) which indicates the similarity of configurations (Mair et al., 2016). Even though there is no established cut-off score, a  $CC \geq .95$  demonstrates acceptable similarity between two configurations (Brokken, 1983). The Proxscal package in SPSS Statistics for Windows (Statistical Package for the Social Science, Inc., Version 23.0, 2015) was used to conduct the MDS analyses, while the SMACOF package (Mair et al., 2016) in *R* (R Core Team, 2014) was used to conduct the Procrustes' rotation.

#### **4.8.6.3 Circumplex Covariance Structure Modelling**

The current study further employed circumplex covariance structure modelling (CCSM) to determine the fit of the data to a circumplex model. Browne (1992, 1995) proposed a confirmatory statistical technique for testing circumplex structures. This approach is centered on a *circular stochastic process* using a Fourier (trigonometric) series to model the relationship between angles of common score variables and common score correlations (Tracey, 2000). Ultimately, this technique is considered a covariance structure model. Browne's (1992) approach posits that the nature of the relationship between common score correlations is often contingent on the angle of separation in a circumplex model. Subsequently, this approach assumes that common score variables can be represented as angles on the circumference of a circle, demonstrating the fit of the data to a circumplex model (Browne, 1992; Tracey, 2000). For this reason, CCSM was applied to the dataset in the current study.

CCSM utilises maximum likelihood estimates to obtain parameters of four unique, intricate circumplex models, namely: (a) unconstrained model, (b) quasi-circumplex equal spacing model, (c) quasi-circumplex equal communality model, and (d) equal spacing, equal communality (circulant) model (Browne, 1992; Tracey, 2000). An unconstrained model, the model with least complexity, refers to no restrictions being placed on the spacing or communality values of the six RIASEC scales – this model can be equated to a loose circular ordering model (Browne, 1992). A quasi-circumplex equal spacing model refers to a circular ordering model where equal spacing constraints have been placed on the six RIASEC types. There are, however, no restrictions placed on the communality values of the six types. Conversely, for a quasi-circumplex equal communality model, equal communality constraints are placed on the six RIASEC types, while the spacing of the types remains unconstrained. In other words, the RIASEC types are constrained in terms of their respective distances from the centre of a circle (communality), but can freely estimate their distances on the circumference of a circle. Lastly, the circulant model, the most complex and

restrictive model, constrains the RIASEC types to be equal in terms of spacing and communality. That is, the RIASEC types are forced to be equally spaced on the circumference of a circle, as well as equally distant from the centre of a circle (Browne, 1992).

The CircE package (Grassi, Lucio, & Di Blas, 2010) in *R* (R Core Team, 2014) was used to conduct the analysis. The CircE package uses correlation matrices as input data, where the correlation coefficients are reparametrised using the Fourier series (Browne, 1992; Tracey, 2000). Darcy and Tracey (2007) recommend investigating  $m$  values of one, two, and three in a Fourier series – an  $m$  value refers to the number of components in a Fourier series. However, to avoid beta coefficients ( $\beta$ ) approaching 1.00, only one component was investigated in the Fourier series (i.e.,  $m = 1$ ). In addition to model fit, the CircE package produces a visual representation of the angular locations of the six RIASEC scales on the circumference of a circle. A number of fit statistics were interpreted to determine the fit of the data to a circumplex model, including the chi-square ( $\chi^2$ ) fit statistic, RMSEA, SRMR, Tucker-Lewis Index (TLI; Tucker & Lewis, 1973), Comparative Fit Index (CFI; Bentler, 1990), GFI, and lastly, the Expected Cross Validation Index (ECVI; Browne & Cudek, 1993). RMSEA and SRMR values  $\leq .08$  (Browne & Cudek, 1993), and TFI, CFI, and GFI coefficients  $\geq .90$  indicated acceptable fit (Browne, 2006). Even though a RMSEA  $\leq .08$  is commonly used as a cut-off score, this value is relative to other RMSEA's obtained in the same field of study. As such, the cut-off score of  $\leq .80$  was used as a point of departure, while also comparing the current study's results to extant results.

#### **4.8.7 Discriminant analysis**

In addition to the examination of the differences in the circular structure across the different gender, racial and language groups, discriminant analyses (Betz, 1987; Huberty & Olejnik, 2006) were applied to the dataset. When employed for expounding purposes, discriminant analysis is particularly useful to explain, summarise and comprehend differences between groups (Betz, 1987) or to describe the extent of group differences (Betz, 1987; Huberty & Olejnik, 2006). Accordingly, discriminant analyses were employed in the current study to investigate significant differences in the interest structure of male and female, and Black, Coloured and White Grade 9 learners (as measured by the SACII). Inferences regarding the differences between the groups were made based on the interpretation of the following coefficients. Firstly, a statistically significant ( $p < .05$ ) Wilk's Lambda coefficient is indicative of significant group differences (Field, 2013). Secondly, the Standardised Canonical Discriminant Function Coefficients indicate the

contribution of the predictor variables to the differences between the groups (Field, 2013). High coefficients indicate that a criterion variable is important for a variate, while positive and negative scores contribute to the variate in opposing ways (Field, 2013). Lastly, the Functions at Group Centroids table represent the mean weighted discriminant scores for the respective groups (Field, 2013). For each respective scale, groups with values opposite in sign (i.e., positive or negative) are being discriminated by that item (Field, 2013). IBM SPSS Statistics for Windows (Version 23.0, 2015) was used to conduct the discriminant analyses.

#### **4.9 Ethical considerations**

Prior to the process of data collection, permission was obtained from Stellenbosch University's Research Ethics Committee (SU-HSD-000640; see Appendix G). This study received approval to collect data, in writing, from the WCED (Reference: 20150930-3811) and the principals and/or governing bodies of participating high schools (see Appendix A and Appendix B, respectively). The WCED will be presented with a report of the current study's findings and recommendations. As discussed in section 4.4, the participants were required to complete assent forms, while passive informed consent forms were distributed to each participant's guardian (see Appendix F and Appendix D for assent and consent forms, respectively). With the passive informed consent forms, the participants' guardians were informed of the study and were considered to agree to their child's participation unless they explicitly decline to participate (Range, Embry, & MacLeod, 2001).

All Grade 9 learners at the five participating schools were invited to participate in the study. The participants, principals and staff at the respective schools were not obligated to participate in the study and the researcher was mindful not to disrupt the schools' educational programmes. Prior to data collection, and throughout the proposed study, all participants were informed of the aims and objectives of the study, as well as their rights as a participant during the course of the study. All participants were informed, *inter alia*, that participation in the proposed study was completely voluntary and that they have the right to withdraw from participation any time during the course of the proposed study. Furthermore, the participants were assured of the confidentiality of their responses and that all information on the scale is completely anonymous. There was no immediate risk associated with the current study and no purported benefits. However, the participants' exposure to the variety of occupations presented in the SACII might elicit insight into their career development and career choices (McIlveen, 2007).

The data was safeguarded in a locked office, on a password-protected computer and only the primary researcher, statistical consultants, and the supervisor of this study had access to the data. The data will be destroyed after the conclusion of this study, as per the study's ethics agreement.

#### **4.10 Chapter summary**

In this chapter, the research methodology employed in the current study was discussed. The chapter began with a presentation of the research aims, objectives and hypotheses, which was followed by the presentation of the research design, procedure and a detailed discussion of the study's participants. Hereafter, the original development of the SACII (Morgan, 2014) was discussed, followed by the procedures employed in the current study in developing the SACII-X and back-translating the Afrikaans version of the SACII. The statistical techniques employed in this study to identify potential weak items and to examine the circular/circumplex model of the translated versions of the SACII were also delineated. The chapter concluded with an explication of the ethical considerations of the current study.

The ensuing chapter presents the results of the study.

## CHAPTER 5

### RESULTS OF THE STUDY

#### 5.1 Introduction

The purpose of this study was to translate and assess the psychometric properties of the South African Career Interests Inventory across gender and race among secondary school learners in the Cape Winelands region of the Western Cape. To achieve this, the following objectives were noted: to establish an isiXhosa version of the South African Career Interest Inventory (SACII-X); to further develop the Afrikaans version of the SACII; to investigate differences in the psychometric properties and interest structure of male and female Grade 9 secondary school learners (as measured by the SACII) and, finally, to investigate differences in the psychometric properties and interest structure of Black, Coloured and White Grade 9 secondary school learners (as measured by the SACII). Accordingly, the following hypotheses were tested:

H1: The psychometric properties and interest structure of male Grade 9 learners will differ significantly from female Grade 9 learners. Specifically, it is hypothesised that male Grade 9 learners will obtain higher scores on the Realistic and Investigative scales, whereas female Grade 9 learners will obtain higher scores on the Social and Artistic scales.

H2: There will be no statistically significant difference in the psychometric properties and interest structure of Black, Coloured, and White Grade 9 learners. It is hypothesised that, in the development of the SACII, the adoption of a constrained emic approach will produce items that are representative of the interest of different groups in the present study.

The two hypotheses were tested using a non-experimental, causal-comparative research design, where the psychometric properties and interest structure of male and female, as well as Black, Coloured and White Grade 9 learners were investigated and compared for significant differences.

Accordingly, the following chapter presents the results of the statistical analyses applied to the data to address the aforementioned hypotheses. The results are presented in the following order:

(a) descriptive statistics for the items; (b) descriptive statistics for the RIASEC types; (c) measurement invariance; (d) reliability analysis; (e) Classical Test Theory item analysis; (f) principal component analysis; (g) angular location and communality estimates; (h) circumplex analyses; and, finally (i) discriminant analyses.

## **5.2 Descriptive statistics for the SACII items**

Preliminary data analysis was employed to explore whether the dataset met the requirements for the parametric assumptions of normality (Field, 2013). Items were assessed in terms of their skewness and kurtosis; skewness values between -2.00 and +2.00 and kurtosis values between -7.00 and +7.00 were considered sufficient for the parametric assumptions of normality (Field, 2013). Furthermore, the data were cleaned to eliminate any outlying minimum or maximum values or missing values in the dataset. Based on this analysis, 27 cases were excluded from the dataset due to excessive missing values. Accordingly, the number of participants included in the statistical analyses was reduced to 628 ( $n = 628$ ).

Inspection of the mean and median values at the item level indicated that participants' responses were positively skewed, with a large proportion of the participants endorsing responses toward the *disagree* category. These positively skewed responses were particularly evident with the items in the Realistic, Enterprising, and Conventional scales. In contrast, the item mean and median values indicated negatively skewed responses on the Artistic and Social items, where the participants mostly endorsed responses on the *agree* category. All items in the SACII demonstrated acceptable skewness and kurtosis values. The skewness values for all items ranged between -.505 and .347 and the kurtosis values for all the items, which were all negative, ranged between -1.175 and -1.546. As a result, none of the items violated the assumptions of normality (Field, 2013). The descriptive statistics for the items are presented in Appendix H.

## **5.3 Descriptive statistics for the RIASEC scales**

The descriptive analysis demonstrated that for the entire sample, the participants endorsed lower scores on the Realistic and Investigative scales and higher scores on the Artistic and Enterprising scales. Moreover, examination of the bar charts and histograms indicated that Investigative, Artistic, Social and Enterprising scales were normally distributed, while the Realistic and Conventional scales demonstrated a negatively skewed distribution. The skewness and kurtosis values were acceptable for all six scales, with the negative kurtosis values demonstrating a light-tailed distribution. In other words, there was a lack of outliers in the data (Field, 2013). The

descriptive statistics for the entire sample on all six RIASEC scales are presented in Table 5.1 below.

Table 5.1

*Descriptive statistics for the RIASEC scales as measured by the SACII*

Scale	N	Mean	Median	SD	Skewness	Kurtosis	SE
R	628	52.12	51.00	20.406	.483	-.401	.814
I	628	56.09	56.00	18.475	.112	-.450	.737
A	628	69.91	70.00	22.234	.012	-.652	.887
S	628	65.72	68.00	20.472	-.205	-.694	.817
E	628	67.11	68.00	21.244	.027	-.496	.848
C	628	61.88	61.00	21.605	.219	-.562	.862

*N = 628*

The descriptive analysis for the six RIASEC scales by gender indicated that the male participants endorsed higher scores on the Realistic, Investigative and Conventional scales, whereas the female participants endorsed higher scores on the Artistic and Social scales. The participants' score by gender was near identical on the Enterprising scale. Table 5.2 presents the descriptive statistics for the six scales by gender.

Table 5.2

*Descriptive statistics for the RIASEC scales by gender as measured by the SACII*

Scale	N	Mean	Median	SD	Skewness	Kurtosis	SE
<b>Males</b>							
R	257	61.31	60.00	19.720	.141	-.477	1.230
I	257	57.09	58.00	17.080	-.051	-.404	1.065
A	257	67.93	69.00	21.767	.009	-.691	1.358
S	257	59.32	61.00	20.243	-.024	-.820	1.263
E	257	67.05	68.00	20.501	-.142	-.611	1.279
C	257	62.81	61.00	21.127	.074	-.712	1.318
<b>Females</b>							
R	371	45.75	43.00	18.365	.801	.304	.953
I	371	55.39	56.00	19.375	.213	-.480	1.006
A	371	71.28	71.00	22.479	.003	-.635	1.167
S	371	70.16	72.00	19.453	-.317	-.511	1.010
E	371	67.15	67.00	21.771	.123	-.441	1.130
C	371	61.23	60.00	21.936	.316	-.444	1.139

*Note:* Males  $N = 257$ ; Females  $N = 371$ 

In terms of race, the results indicated that the Black participants endorsed higher scores on the Social, Enterprising and Conventional scales, with the highest scores being obtained on the Artistic scale. These results were similar for the Coloured participants, endorsing the highest scores on the Enterprising scale. For the Indian/Asian participants, the highest scores were endorsed on the Artistic scale, while the White participants scored the highest on the Investigative scale. However, considering the small sample size of the Indian/Asian ( $n = 5$ ) and White ( $n = 59$ ) participants, these results should be interpreted with caution. The descriptive statistics for the six RIASEC scales by race are presented in Table 5.3 below.



Table 5.3

*Descriptive statistics for the RIASEC scales by race as measured by the SACII*

Scale	N	Mean	Median	SD	Skewness	Kurtosis	SE
<b>Black</b>							
R	261	56.93	56.00	18.781	.346	-.163	1.163
I	261	57.31	57.00	16.735	.192	.137	1.036
A	261	75.62	74.00	19.165	.095	-.258	1.186
S	261	68.70	70.00	18.514	-.209	-.207	1.146
E	261	69.86	69.00	20.024	.125	.074	1.239
C	261	66.25	66.00	18.851	.223	.119	1.167
<b>Coloured</b>							
R	303	51.06	49.00	20.889	.600	-.346	1.200
I	303	55.76	56.00	19.785	.063	-.802	1.137
A	303	68.61	68.00	22.850	.074	-.787	1.313
S	303	66.84	68.00	20.475	-.241	-.791	1.176
E	303	68.63	70.00	20.966	-.110	-.685	1.204
C	303	61.73	60.00	22.055	.257	-.754	1.267
<b>Indian/Asian</b>							
R	5	34.60	34.00	10.877	.793	.388	4.864
I	5	49.00	51.00	6.671	.152	-.858	2.983
A	5	64.40	61.00	30.427	.064	-1.195	13.607
S	5	48.60	48.00	20.816	-.179	-2.000	9.309
E	5	39.80	45.00	11.189	-.596	-2.168	5.004
C	5	31.40	28.00	7.301	1.276	.949	3.265
<b>White</b>							
R	59	37.75	30.00	17.128	1.266	.560	2.230
I	59	52.95	54.00	19.279	.299	-.427	2.510
A	59	51.76	46.00	20.545	.657	-.762	2.675
S	59	48.25	43.00	19.981	.633	-.697	2.601
E	59	49.44	45.00	18.872	.788	.018	2.457
C	59	45.88	38.00	22.144	1.253	.825	2.883

*Note:* Black  $n = 261$ ; Coloured  $n = 303$ ; Indian/Asian  $n = 5$ ; White  $n = 59$ .

Finally, the descriptive results by language demonstrated that the Afrikaans participants scored higher on the Artistic and Social scales, with their highest scores on the Enterprising scale. The English participants scored the highest on the Artistic scales, while the isiXhosa participants endorsed the highest scores on the Artistic scale as well. Similar to the descriptive statistics by race, the results presented for English language group should be interpreted with caution due to the small sample size ( $n = 24$ ). Table 5.4 presents the descriptive statistics by language.

Table 5.4

*Descriptive statistics for the RIASEC scales by language as measured by the SACII*

Scale	N	Mean	Median	SD	Skewness	Kurtosis	SE
<b>Afrikaans</b>							
R	338	48.08	44.00	20.652	.754	-.135	1.123
I	338	54.89	55.00	19.906	.178	-.715	1.083
A	338	65.25	64.00	23.440	.169	-.889	1.275
S	338	63.74	66.00	21.793	-.148	-.996	1.185
E	338	65.36	65.00	22.353	.028	-.888	1.216
C	338	58.85	57.00	23.051	.382	-.745	1.254
<b>English</b>							
R	24	44.92	45.00	19.267	.633	-.375	3.933
I	24	53.50	52.00	19.115	.204	-.795	3.902
A	24	65.04	55.50	23.181	.534	-.571	4.732
S	24	59.29	55.00	21.686	.103	-1.005	4.427
E	24	57.29	56.00	20.305	-.073	-.999	4.145
C	24	50.38	49.50	21.550	.688	-.270	4.399
<b>isiXhosa</b>							
R	266	57.91	57.00	18.749	.308	-.215	1.150
I	266	57.84	58.00	16.323	.098	.124	1.001
A	266	76.26	75.00	18.814	.091	-.158	1.154
S	266	68.82	69.50	18.123	-.162	-.170	1.111
E	266	70.22	69.00	19.346	.169	.165	1.186
C	266	66.77	67.00	18.460	.213	.069	1.132

*Note:* Afrikaans  $n = 338$ ; English  $n = 24$ ; isiXhosa  $n = 266$ .

## 5.4 Measurement invariance

Three measures of invariance were employed in the present study to establish equivalence between the Afrikaans and isiXhosa versions of the SACII, namely configural invariance, metric invariance and scalar invariance; due to the small sample size ( $n = 24$ ), the English participants were excluded from this analysis. These measures were tested for each respective RIASEC scale on the SACII, rather than testing the entire model. As a point of departure, configural invariance was established for five of the six scales, with the exception of the Artistic scale indicating a lack of measurement invariance. The establishment of configural invariance provided a foundation from which to investigate metric and scalar invariance. A summary of the results for the three measures per scale is presented below.

### 5.4.1 Realistic scale

The first measure of invariance, configural invariance, was investigated to examine whether participants from different language groups used the same frame of reference when responding to the items in the Realistic scale. For the Afrikaans and isiXhosa participants, the relative  $\chi^2 = 3.37$  indicated a marginally acceptable fit to the data. Furthermore, the RMSEA (.089) demonstrated reasonable fit, whereas the  $p$ -RMSEA ( $p = .00$ ), SRMR (.059) and GFI (.98) indicated acceptable fit.

The establishment of configural invariance warranted the investigation of metric invariance, where it examined whether participants from different groups interpreted the items in the Realistic scale similarly. The relative  $\chi^2 = 3.15$  demonstrated a marginally acceptable fit to the data. In addition, there were no statistically significant ( $p = 1.00$ ) differences detected between the language groups, signifying metric invariance.

Finally, this allowed for the investigation of scalar invariance to determine whether the means of the latent variables were equal between the language groups. A relative  $\chi^2 = 3.36$  indicated a marginally acceptable fit to the data. However, the statistically significant ( $p = .00$ ) differences between the Afrikaans and isiXhosa participants signified a lack of scalar invariance. These differences were detected at the  $p < .01$  level. A summary of the measurement invariance tests for the Realistic scale is presented in Table 5.5.

### 5.4.2 Investigative scale

As a point of departure, configural invariance was investigated to examine whether the Afrikaans and isiXhosa participants employed similar conceptual frameworks when responding to the items

in the Investigative scale. Marginally acceptable fit was demonstrated by the relative  $\chi^2 = 3.57$  and RMSEA (.092). However, acceptable fit was demonstrated by  $p$ -RMSEA ( $p = .00$ ), SRMR (.056) and GFI (.98), demonstrating configural invariance.

This merited the investigation of metric invariance on the Investigative scale. As demonstrated by the previous analysis, the relative  $\chi^2 = 3.23$  demonstrated marginally acceptable fit to the data for the different language groups and the statistically non-significant difference ( $p = 1.00$ ) between the two language versions demonstrated metric invariance. This warranted testing for scalar invariance.

The relative  $\chi^2 = 3.31$  indicated a marginally acceptable fit to the data for the two language versions of the Investigative scale on the SACII. However, statistically significant differences ( $p = .00$ ) were detected at the  $p < .01$  level between the Afrikaans and isiXhosa participants and scalar invariance was not established. A summary of the measurement invariance tests for the Investigative scale is presented in Table 5.5.

#### **5.4.3 Artistic scale**

In contrast to the previous two scales, configural invariance was not established for the Artistic scale, signifying that for this specific scale, members from different language groups interpreted the items differently. The relative  $\chi^2 = 6.60$  was particularly high, indicating unacceptable fit to the data. Moreover, the RMSEA (.094),  $p$ -RMSEA ( $p = .00$ ) and SRMR (.067) coefficients were marginally acceptable. However, the GFI (.81) and Adjusted GFI (.77) coefficients were unacceptable. As a result, configural invariance was not established and further assessment of measurement invariance was not warranted. A summary of the configural invariance test for the Artistic scale is presented in Table 5.5.

#### **5.4.4 Social scale**

The Social scale demonstrated the most promising results for all three measures of invariance. Firstly, configural invariance was established, with the relative  $\chi^2 = 2.34$  demonstrating acceptable fit to the data between the Afrikaans and isiXhosa participants. Furthermore, the RMSEA (.067),  $p$ -RMSEA ( $p = .00$ ) and SRMR (.054) coefficients were all acceptable. Lastly, the GFI = .97 indicated acceptable fit for the Social scale. This warranted the investigation of metric invariance.

For metric invariance, a relative  $\chi^2 = 2.25$  demonstrated acceptable fit to the data and that the items in the Social scale were interpreted similarly by the different language groups. Moreover,

there were no statistically significant differences ( $p = .94$ ) between the Afrikaans and isiXhosa versions of the SACII, and metric invariance was established

This warranted the examination of scalar invariance. The relative  $\chi^2 = 2.34$  demonstrated acceptable fit to the data. In addition, there were no statistically significant ( $p = .59$ ) differences between the two language groups, which signified scalar invariance. A summary of the measurement invariance tests for the Social scale is presented in Table 5.5.

#### **5.4.5 Enterprising scale**

In conjunction with the Social scale, the Enterprising scale also demonstrated promising results for the three measures of invariance. For the measurement of configural invariance, the relative  $\chi^2 = 2.25$  demonstrated acceptable fit to the data for the two language versions of the SACII. In addition, acceptable fit was indicated by the RMSEA (.068),  $p$ -RMSEA ( $p = .00$ ) and SRMR (.065) coefficients. Lastly, the GFI = .97, in combination with the other reported coefficients, provided support for configural invariance.

The establishment of configural invariance merited the investigation of metric invariance. Acceptable fit to the data between the Afrikaans and isiXhosa participants was demonstrated by the relative  $\chi^2 = 2.25$ . This was supported by the lack of statistically significant differences ( $p = 1.00$ ) between the two language groups and as a result, metric invariance was established.

Lastly, scalar invariance was investigated for the Enterprising scale. The relative  $\chi^2 = 3.07$  demonstrated reasonably acceptable fit to data between the Afrikaans and isiXhosa versions of the SACII. In addition, there were no statistically significant ( $p = 1.00$ ) differences between the two language groups. These results warranted the establishment of scalar invariance. A summary of the measurement invariance tests for the Enterprising scale is presented in Table 5.5.

#### **5.4.6 Conventional scale**

As with the previous scales, configural invariance for the Conventional scale was investigated as a point of departure. The relative  $\chi^2 = 2.79$  indicated acceptable fit to the data for the two language groups. The results were augmented by acceptable coefficients for the RMSEA (.077),  $p$ -RMSEA ( $p = .00$ ) and SRMR (.062). Finally, the GFI = .97 demonstrated acceptable fit to the data, which provided support for configural invariance.

The establishment of configural invariance warranted the investigation of metric invariance. The relative  $\chi^2 = 2.74$  demonstrated acceptable fit to the data between the Afrikaans and isiXhosa participants. However, statistically significant differences ( $p = .01$ ) were detected between the

language groups at the  $p < .05$  level. Accordingly, metric invariance was not established for the Conventional scale and the investigation of scalar invariance was not merited. A summary of the measurement invariance tests for the Conventional scale is presented in Table 5.5.

Table 5.5

*Summary of measurement invariance tests per scale*

	R	I	A	S	E	C
<b>Configural</b>						
Relative $\chi^2$	3.37	3.57	6.60	2.34	2.25	2.79
RMSEA	.089	.092	.094	.067	.068	.077
90% CI	.084-.094	.087-.098	.091-.098	.061-.072	.063-.072	.073-.082
$p$ -RMSEA	.00	.00	.00	.00	.00	.00
SRMR	.059	.056	.067	.054	.065	.062
GFI	.98	.98	.81	.97	.97	.97
<b>Metric</b>						
Relative $\chi^2$	3.15	3.23		2.25	2.25	2.74
$p$	1.00	1.00		.94	1.00	.01
<b>Scalar</b>						
Relative $\chi^2$	3.36	3.31		2.34	3.07	
$P$	.00	.00		.59	1.00	

### 5.5 Reliability coefficients

Two measures of reliability, namely Cronbach's alpha and Guttman's Lambda 6 were used in this study. For the entire sample, both Cronbach's alpha and Guttman's Lambda 6 were  $> .90$ , indicating acceptable reliability coefficients (Nunnally & Bernstein, 1994). These values are presented in Table 5.6. Moreover, the reliability coefficients by gender were also acceptable ( $> .90$ ), as presented in Table 5.7.

Table 5.6

*Reliability coefficients for the six RIASEC scales as measured by the SACII*

Scale	Cronbach's alpha	Guttman's Lambda 6
R	.94	.94
I	.92	.92
A	.92	.93
S	.92	.93
E	.93	.93
C	.93	.94

*Note: N = 628*

Table 5.7

*Reliability coefficients for the six RIASEC scales by gender as measured by the SACII*

Scale	Cronbach's alpha	Guttman's Lambda 6
Males		
R	.93	.93
I	.90	.91
A	.92	.93
S	.92	.93
E	.93	.93
C	.94	.94
Females		
R	.94	.94
I	.93	.94
A	.92	.93
S	.93	.92
E	.92	.94
C	.93	.95

*Note: Males n = 257; Females n = 371*

Table 5.8

*Reliability coefficients for the six RIASEC scales by race as measured by the SACII*

Scale	Cronbach's alpha	Guttman's Lambda 6
<b>Black</b>		
R	.92	.93
I	.90	.91
A	.89	.91
S	.91	.92
E	.92	.93
C	.91	.92
<b>Coloured</b>		
R	.94	.95
I	.92	.94
A	.92	.94
S	.92	.93
E	.92	.93
C	.93	.94
<b>Indian/Asian</b>		
R	.81	.
I	<b>.08</b>	.
A	.97	.
S	.94	.
E	.82	.
C	.83	.
<b>White</b>		
R	.96	.
I	.94	.97
A	.94	.98
S	.95	.98
E	.94	.98
C	.97	.99

*Note:* Black  $n = 261$ ; Coloured  $n = 303$ ; Indian/Asian  $n = 5$ ; White  $n = 59$ .



Similarly, most of the reliability coefficients by language were acceptable ( $> .80$ ), but due to the small sample size ( $n = 24$ ), Guttman's Lambda 6 could not be computed for the English participants. The reliability coefficients by language are presented in Table 5.9.

Table 5.9

*Reliability coefficients for the six RIASEC scales by language as measured by the SACII*

Scale	Cronbach's alpha	Guttman's Lambda 6
Afrikaans		
R	.95	.95
I	.93	.94
A	.93	.95
S	.93	.94
E	.93	.94
C	.95	.95
English		
R	.93	.
I	.91	.99
A	.92	.
S	.93	.99
E	.92	.
C	.94	.
isiXhosa		
R	.92	.93
I	.91	.90
A	.88	.91
S	.93	.91
E	.92	.92
C	.90	.92

*Note:* Afrikaans  $n = 338$ ; English  $n = 24$ ; isiXhosa  $n = 266$ .

## 5.6 Classical Test Theory item analysis

In an attempt to identify possibly weak items in the SACII, the reliability coefficients, descriptive statistics, average inter-item correlations, and corrected item-total correlation of the items for each scale were investigated (DeVellis, 2013). For the descriptive statistics, items with low mean, median and/or variance values relative to the other items were identified as potentially weak items. In addition, items with negative inter-item correlation coefficients were considered problematic. Lastly, corrected item-total correlation coefficients  $< .50$  were flagged for potential removal. These values for the items per scale are presented in Table 5.10 to 5.15.

For the Realistic scale, none of the items improved Cronbach's alpha for the entire scale if removed. Moreover, all of the average inter-item correlation coefficients were positive and relatively high. For the corrected item-total correlation, item 16 ("Operate heavy machinery") indicated a coefficient  $< .50$  and indicated the lowest average inter-item correlation. Subsequently, item 16 was flagged for potential removal. These values are presented in Table 5.10.

For the Investigative scale, none of the items improved the reliability for the entire scale if removed. As with the Realistic scale, all of the average inter-item correlation coefficients were positive and moderately high. The corrected item-total correlation for item four ("Use new ways of removing diseases from crops") indicated a coefficient  $< .50$ . In addition, item four also demonstrated the lowest average inter-item correlation. As a result, item four was identified for possible removal. Table 5.11 presents the CTT analysis for the Investigative scale.

For the Artistic scale, the CTT analysis indicated that no items would improve the overall reliability of the scale if removed. Similar to the previous scales, none of the average inter-item correlations were negative and indicated moderately positive relationships. Moreover, three items demonstrated corrected item-total correlation coefficients  $< .50$ . These items were I9 ("Write a musical score"), I14 ("Translate languages for people"), and I88 ("Take photographs for a newspaper"). These items also demonstrated low average inter-item correlations and were identified for possible removal. Table 5.12 presented the analysis for the Artistic scale.

Table 5.10

*Classical Test Theory Item Analysis for the Realistic Scale*

Item	Alpha if item deleted	Average inter-item correlation	Corrected item-total correlation	Mean	SD
I11	.94	0.36	.51	2.04	1.21
I16	.94	0.35	.48	2.36	1.42
I28	.93	0.43	.62	2.36	1.40
I38	.93	0.44	.63	2.05	1.34
I47	.94	0.40	.56	2.80	1.50
I48	.93	0.45	.63	2.31	1.42
I58	.93	0.45	.63	2.23	1.38
I64	.94	0.39	.54	2.36	1.31
I69	.93	0.44	.61	2.39	1.37
I81	.93	0.46	.66	2.09	1.31
I83	.93	0.46	.65	2.26	1.44
I93	.93	0.44	.61	2.71	1.51
I96	.93	0.47	.66	2.23	1.38
I97	.93	0.46	.65	2.25	1.30
I102	.94	0.42	.58	1.97	1.24
I106	.93	0.43	.60	2.03	1.30
I109	.94	0.40	.55	2.22	1.34
I110	.93	0.48	.67	2.12	1.32
I113	.93	0.45	.62	2.34	1.39
I126	.93	0.48	.69	2.17	1.32
I131	.93	0.45	.62	2.16	1.33
I132	.93	0.48	.68	2.29	1.45
I137	.94	0.40	.54	2.41	1.39

Table 5.11

*Classical Test Theory Item Analysis for the Investigative Scale*

Item	Alpha if item deleted	Average inter-item correlation	Corrected item-total correlation	Mean	SD
I4	.91	0.31	.45	2.65	1.48
I22	.91	0.38	.57	2.99	1.48
I24	.91	0.39	.59	2.88	1.47
I25	.91	0.37	.55	2.42	1.34
I35	.91	0.36	.54	2.56	1.44
I36	.91	0.38	.57	2.85	1.46
I39	.91	0.38	.58	2.78	1.43
I40	.91	0.36	.53	2.97	1.49
I44	.91	0.38	.58	2.76	1.46
I68	.91	0.35	.51	2.50	1.42
I76	.91	0.35	.51	3.15	1.55
I78	.91	0.41	.63	2.47	1.35
I85	.91	0.40	.60	2.52	1.42
I87	.91	0.38	.57	2.56	1.40
I92	.91	0.36	.54	2.49	1.38
I94	.91	0.38	.58	2.47	1.44
I95	.91	0.36	.54	2.61	1.43
I103	.91	0.38	.57	2.76	1.52
I105	.91	0.34	.50	2.44	1.35
I120	.91	0.39	.60	2.73	1.51
I128	.91	0.41	.63	2.55	1.43

Table 5.12

*Classical Test Theory Item Analysis for the Artistic Scale*

Item	Alpha if item deleted	Average inter-item correlation	Corrected item-total correlation	Mean	SD
I1	.92	0.30	.50	2.75	1.52
I2	.92	0.31	.50	2.57	1.47
I8	.92	0.30	.50	2.83	1.45
I9	.92	0.28	.44	2.91	1.49
I14	.92	0.28	.43	2.50	1.45
I18	.92	0.34	.54	2.75	1.52
I42	.92	0.36	.58	2.82	1.51
I45	.92	0.29	.45	2.91	1.55
I50	.92	0.35	.56	2.53	1.42
I52	.92	0.37	.59	2.32	1.33
I57	.92	0.36	.57	2.62	1.49
I70	.92	0.33	.52	2.83	1.50
I72	.92	0.33	.53	2.59	1.45
I73	.92	0.33	.52	2.50	1.50
I75	.92	0.32	.52	3.04	1.58
I77	.92	0.34	.54	2.84	1.54
I79	.92	0.36	.58	2.55	1.50
I80	.92	0.33	.53	2.72	1.55
I84	.92	0.31	.50	2.68	1.48
I88	.92	0.29	.45	2.75	1.41
I108	.91	0.40	.66	2.48	1.45
I117	.92	0.37	.61	2.63	1.50
I121	.91	0.38	.62	2.64	1.49
I122	.92	0.31	.50	3.04	1.58
I139	.92	0.34	.54	2.59	1.43
I141	.92	0.36	.58	2.52	1.44

For the Social scale, the CTT analysis demonstrated that the overall Cronbach's alpha for the scale would not improve if certain items were removed. The average inter-item correlations were all positive with weak positive correlation coefficients. Two items in the Social scale indicated corrected item-total correlation coefficients  $< .50$  and subsequently flagged as weaker items. These items were I19 ("Teach people how to cook a meal") and I43 ("Model clothes"). These items also demonstrated the lowest average inter-item correlation coefficients. The CTT analysis for the Social scale is presented in Table 5.13

Table 5.13

*Classical Test Theory Item Analysis for the Social Scale*

Item	Alpha if item deleted	Average inter-item correlation	Corrected item-total correlation	Mean	SD
I5	.92	0.33	.50	2.79	1.54
I7	.92	0.35	.51	2.59	1.42
I19	.92	0.30	.42	2.76	1.48
I31	.92	0.39	.58	3.38	1.46
I33	.92	0.41	.62	3.47	1.48
I41	.92	0.37	.54	3.25	1.53
I43	.92	0.29	.41	2.93	1.58
I60	.92	0.41	.61	2.99	1.43
I65	.92	0.38	.55	2.87	1.51
I66	.92	0.46	.70	3.11	1.52
I82	.92	0.34	.50	2.51	1.39
I89	.92	0.41	.62	3.25	1.56
I98	.92	0.44	.66	2.99	1.53
I99	.92	0.36	.53	2.92	1.56
I107	.92	0.45	.69	3.18	1.51
I112	.92	0.42	.63	2.94	1.52
I116	.92	0.43	.65	3.33	1.51
I124	.92	0.43	.66	3.08	1.50
I127	.92	0.37	.55	2.60	1.42
I136	.92	0.41	.61	2.96	1.48
I138	.92	0.39	.57	2.89	1.49
I140	.92	0.38	.56	2.94	1.49

The CTT analysis for the Enterprising scale indicated that the overall reliability for the scale would improve if item three (“Sell properties”) was removed. The average inter-item correlations demonstrated that none of the correlations were negative and indicated a weak relationship between the items. The corrected item-total correlation indicated one item with a coefficient  $< .50$ , namely item three (“Sell properties”). In addition, item three also demonstrated the lowest mean, standard deviation and average inter-item correlation coefficient in relation to the other items in the scale. Consequently, this item was flagged for potential removal from the scale. Table 5.14 presents the CTT analysis for the Enterprising scale.

Table 5.14

*Classical Test Theory Item Analysis for the Enterprising Scale*

Item	Alpha if item deleted	Average inter-item correlation	Corrected item-total correlation	Mean	SD
I3	.93	0.23	.32	2.18	1.22
I10	.92	0.34	.52	2.89	1.44
I17	.92	0.31	.50	2.64	1.44
I27	.92	0.33	.50	2.43	1.38
I37	.92	0.35	.53	2.42	1.35
I51	.92	0.31	.50	3.32	1.49
I54	.92	0.31	.50	3.38	1.51
I56	.92	0.37	.57	2.42	1.36
I59	.92	0.37	.58	2.93	1.46
I63	.92	0.36	.55	3.03	1.48
I67	.92	0.37	.57	2.73	1.46
I74	.92	0.39	.61	2.63	1.43
I91	.92	0.42	.66	2.61	1.44
I100	.92	0.39	.61	2.61	1.45
I101	.92	0.37	.58	2.34	1.34
I104	.92	0.40	.63	2.69	1.45
I111	.92	0.38	.60	2.50	1.43

I114	.92	0.30	.50	3.36	1.49
I115	.92	0.40	.63	2.53	1.40
I118	.92	0.40	.63	2.54	1.39
I119	.92	0.37	.58	2.67	1.44
I129	.92	0.38	.59	2.72	1.45
I130	.92	0.38	.58	2.51	1.39
I133	.92	0.33	.51	2.38	1.36
I142	.92	0.38	.59	2.66	1.45

Finally, the CTT analysis of the Conventional scale indicated that the removal of any of the items would not improve the overall reliability of the scale. The average inter-item correlation coefficients were all positive and indicated a moderate positive relationship between the items. Moreover, the corrected item-total correlation coefficients demonstrated that item six (“Take merchandise orders”) had a coefficient  $< .50$ . Item six also demonstrated relatively low mean, standard deviation, inter-item correlation coefficients, and was subsequently identified for possible removal. The CTT analysis for the Conventional scale is presented in Table 5.15 below.

The items flagged for potential removal during the CTT analysis were cross-referenced with the items identified in the principal component analysis and arc-tangent transformation in order to make a decision on their removal from the analysis, as will be discussed in section 5.8.3.



Table 5.15

*Classical Test Theory Item Analysis for the Conventional Scale*

Item	Alpha if item deleted	Average inter-item correlation	Corrected item-total correlation	Mean	SD
I6	.93	0.30	.44	2.31	1.32
I12	.93	0.33	.50	2.33	1.31
I13	.93	0.35	.54	2.66	1.43
I15	.93	0.33	.50	2.40	1.31
I20	.93	0.35	.53	2.36	1.37
I21	.93	0.39	.60	2.47	1.37
I23	.93	0.42	.66	2.68	1.45
I26	.93	0.39	.60	2.59	1.42
I29	.93	0.39	.59	2.49	1.45
I30	.93	0.32	.50	2.31	1.30
I32	.93	0.39	.60	2.76	1.43
I34	.93	0.39	.61	2.54	1.41
I46	.93	0.41	.65	2.63	1.49
I53	.93	0.35	.54	2.11	1.22
I55	.93	0.35	.52	2.45	1.36
I61	.93	0.42	.65	2.52	1.42
I62	.93	0.44	.69	2.63	1.45
I71	.93	0.37	.56	2.53	1.45
I86	.93	0.40	.63	2.30	1.34
I90	.93	0.40	.62	2.28	1.37
I123	.93	0.38	.58	2.23	1.25
I125	.93	0.41	.64	2.60	1.50
I134	.93	0.38	.58	2.46	1.39
I135	.93	0.35	.54	2.43	1.34
I143	.93	0.40	.62	2.83	1.56

## 5.7 Principal component analysis

The underlying structure of the data was investigated at the item and scale level using unrotated principal component analysis (PCA). The 143 items in the SACII and the total scores for the RIASEC types were used as the primary input data in this analysis. As theoretically expected, the unrotated PCA found three distinct factors to emerge from the data – the general factor, people-things and data-ideas components. Appendix I presents the factor loadings on each of the three components for the 143 items. For the majority of the items, the factor loadings were  $\geq .30$  on a single component. The item communalities ranged between .13 and .51. In view of Holland's (1997) calculus assumption, some cross-loadings were expected on adjacent types (i.e., the components for this analysis). However, weaker items were indicated by cross-loadings  $\geq .30$  on non-adjacent or opposite types.

For the current study, there were no cross-loadings between the people-things and data-ideas components. Considering that the first extracted component (i.e., the general factor) is commonly excluded from vocational interest analyses due to the presence of error variance (Tracey, 2012), cross-loadings  $\geq .30$  between the general factor and the people-things component or the general factor and the data-ideas component were ignored. Even though all the items displayed practically significant loadings  $\geq .30$  (Stevens, 2002), four items were flagged for potential removal from the analysis for narrowly meeting the  $\geq .30$  component loadings threshold. These items were E3 (“Sell properties”), A9 (“Write a musical score”), R16 (“Operate heavy machinery”) and S43 (“Model clothes”). These items were cross-referenced with the items identified in the CTT analysis and arc-tangent transformation in order to make a decision on their removal from the analysis, as will be discussed in section 5.8.3.

In addition, the total scores for the six RIASEC types were used as the input data for the unrotated PCA. For all six scales, the factor loadings were  $\geq .30$  on a single component. However, cross-loadings were demonstrated on the Investigative scale for the people-things and data-ideas components ( $C1 = .332$ ;  $C2 = .402$ ). The component loadings for the six scales are presented in Table 5.16. Moreover, the correlation coefficients for the six RIASEC scales were computed to examine the relationship between the scales. The correlations between the scales were relatively high, with particularly strong correlations demonstrated between the Enterprising and Conventional scales ( $r = .85$ ) and the Conventional and Social scales ( $r = .74$ ). However, this was expected considering Holland's (1997) calculus assumption. In contrast, the correlation

coefficients for non-adjacent types were markedly lower in comparison, as expected. The component correlation coefficients for the six RIASEC scales are presented in Table 5.17.

Table 5.16

*Component loadings for six RIASEC scales*

	C1	C2	C3
R	.723	.597	-.134
I	.758	.332	.402
A	.823	-.159	.345
S	.819	-.431	.174
E	.906	-.153	-.286
C	.840	-.073	-.446

*Note. Cross-loadings on Investigative scale on components one and two.*

Table 5.17

*Pearson correlation coefficients on the six RIASEC scales*

	R	I	A	S	E	C
R	1.00					
I	0.58	1.00				
A	0.50	0.59	1.00			
S	0.37	0.53	0.71	1.00		
E	0.58	0.54	0.65	0.74	1.00	
C	0.56	0.50	0.55	0.60	0.85	1.00

### 5.8 Angular location and communality estimates of items and scales

Arc-tangent transformation was employed in the current study to achieve two objectives. Firstly, the component loadings of the 143 items in the second (people-things) and third (data-ideas) unrotated components were transformed into angular locations. This method was employed to identify potentially weak items based on the following criteria: (a) similar angular locations and/or content; (b) incorrect angular location in terms of each respective scale (for example, Social items located among Conventional items); (c) and low communality values. The angular locations and

communalities for the items are presented in Appendix J. Secondly, the six SACII scales were submitted to arc-tangent transformation to calculate their respective angular locations in a circular order. Based on Holland's (1997) hexagonal model, Morgan (2014) proposed that the distance or displacement between the six SACII scales in a circular order should approximate  $60^\circ$  ( $360 \div 6 = 60$ ). This displacement approximation was used as an additional estimate of the SACCI's circular ordering.

### **5.8.1 Angular location and communality estimates for items**

Of the items, 33 met one or more of the above criteria. Subsequently, these items were identified for potential removal from the analysis. Weaker items were detected on the Investigative, Artistic, Social, Enterprising and Conventional scales, but not the Realistic scales. These items are discussed per scale in the sections below. The items and the respective criteria met are presented in Table 5.18.

#### **5.8.1.1 Investigative**

Two items that met one or more of the prescribed criteria were identified on the Investigative scale. These were items four ("Use new ways of removing diseases from crops") and 92 ("Set up equipment for a scientific experiment"). I4 was flagged for demonstrating a low communality value (0.02), whereas I92 was flagged for sharing the same angular placement with an item on the Realistic scale. These items were cross-referenced with the weak items identified in the CTT analysis and PCA in order to make a decision on their removal from the analysis, as will be discussed in section 5.8.3.

#### **5.8.1.2 Artistic**

Eight items that met one or more of the prescribed criteria were identified on the Artistic scale. Items 52 ("Write jingles for advertisements") and 88 ("Take photographs for a newspaper") were flagged for sharing the same angular placement with an item on the Artistic and Investigative scales, respectively. I52 also demonstrated a particularly low communality value (0.01). Moreover, six items indicated low communality values ( $< 0.04$ ). These were items I1 ("Act in a play"), I8 ("Participate in an arts and crafts workshop"), I9 ("Write a musical score"), I14 ("Translate languages for people"), I84 ("Teach people to speak a new language") and I141 ("Write a play"). These items were cross-referenced with the weak items identified in the CTT analysis and PCA in order to make a decision on their removal from the analysis, as will be discussed in section 5.8.3.

### **5.8.1.3 Social**

Three items that met one or more of the prescribed criteria were identified on the Social scale. Item 127 (“Run a feeding programme”) was flagged for sharing the same angular placement with an item on the Artistic scale. In addition, this item also demonstrated a low communality value (0.03). In addition, items 19 (“Teach people how to cook a meal”) and 82 (“Work with elderly people”) were flagged for potential removal based on their respective low communality values ( $I_{19} = 0.03$ ;  $I_{82} = 0.02$ ). These items were cross-referenced with weak the items identified in the CTT analysis and PCA in order to make a decision on their removal from the analysis, as will be discussed in section 5.8.3.

### **5.8.1.4 Enterprising**

Fourteen items that met one or more of the prescribed criteria were identified on the Enterprising scale. Three items were flagged for sharing the same angular placement with an item on the Conventional scale. These items were I51 (“Start a business”), I115 (“Give presentations on how to make a business better”) and I119 (“Sell products”). The remaining items were identified for demonstrating low communality values ( $< 0.04$ ). Items 114 (“Manage a hotel”), 133 (“Sell goods at an auction”) and 142 (“Show customers how to use products”) demonstrated particularly low communality values ( $< 0.01$ ). Items 37 (“Assist customers to buy products”), 74 (“Supervise people’s work activities”), and 129 (“Motivate people at a company to improve their performance”) demonstrated communality values of 0.02. Finally, items 3 (“Sell properties”), 10 (“Teach people how to improve their managerial skills”), 104 (“Interview people applying for new jobs”) and 130 (“Manage a marketing department”) demonstrated communality values of 0.03. These items were cross-referenced with the weak items identified in the CTT analysis and PCA in order to make a decision on their removal from the analysis, as will be discussed in section 5.8.3.

### **5.8.1.5 Conventional**

Six items that met one or more of the prescribed criteria were identified on the Conventional scale. Even though certain items in the Conventional scale displayed similar angular placements with items in the Enterprising scale, these items were not flagged for removal due to the high communality values demonstrated. Rather, the items in the Enterprising scale were flagged due to their low communality values. As a result, the six items in the Conventional scale were flagged for demonstrating low communality values ( $< 0.04$ ). These items were I6 (“Take merchandise orders”), I15 (“Maintain a database”), I30 (“Monitor stock supplies for a construction project“),

I53 (“Capture data onto a spread sheet”), I55 (“Organise transportation of products from a factory”) and I135 (“Administer security access to a building”). These items were cross-referenced with the weak items identified in the CTT analysis and PCA in order to make a decision on their removal from the analysis, as will be discussed in section 5.8.3.

Table 5.18

*Weak items identified based on angular locations and communality estimates*

Item	Similar angular location	Low communality estimate
<b>Investigative</b>		
I4		X
I92	X	
<b>Artistic</b>		
I8		X
I9		X
I14		X
I52	X	X
I84		X
I88	X	
I141		X
<b>Social</b>		
I19	X	X
I82		X
I127		X
<b>Enterprising</b>		
I3		X
I10		X
I33		X
I37		X
I51	X	
I74		X
I104		X

I114		X
I115	X	
I119	X	
I129		X
I130		X
I142		X
<hr/>		
Conventional		
<hr/>		
I6		X
I15		X
I30		X
I53		X
I55		X
I135		X

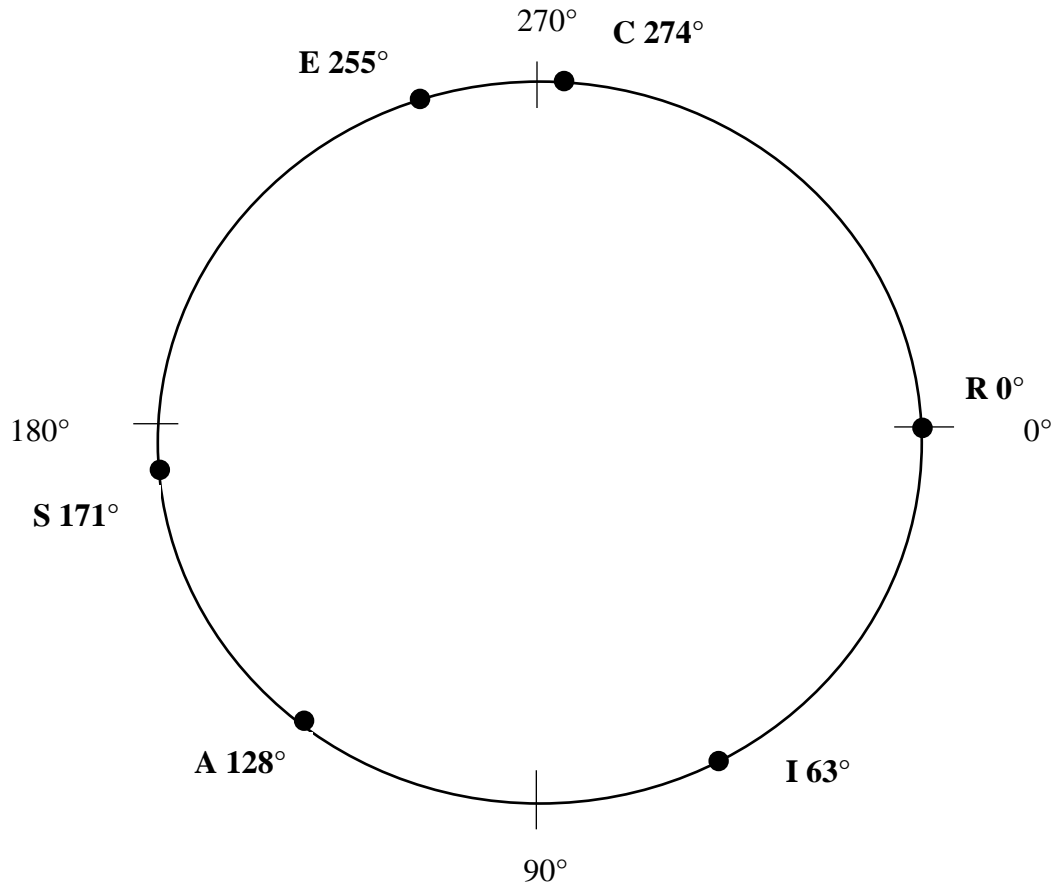
*Note: "X" indicates the criteria met for the potential removal of the items*

### 5.8.2 Angular location and communality estimates for scales

The six scales on the SACII were subjected to arc-tangent transformation to determine their angular placement in a circular order. Based on Holland's (1997) secondary assumptions of consistency and calculus, it was theoretically expected that the scales would be ordered on a circumference of a circle representative of the RIASEC typology (Morgan, 2014).

For the entire sample, the results demonstrated that the angular locations approximated a loose circular model (see Figure 5.1; Morgan, 2014). This model implies that there is no equal spacing or communality constraints applied to scales (Browne, 1992; Morgan, 2014). Moreover, the results indicated that there was no disordering between the scales and that Holland's calculus and consistency assumptions were met. However, there was no equal spacing between the scales and the angular displacement did not meet the 60° approximation (Morgan, 2014).

For example, the angular displacement (i.e., the distance) between the Enterprising and Conventional scales was 19°, whereas the Conventional and Realistic scale demonstrated a distance of 86°. In addition, the communality values (i.e., the length of the respective radii) for the Enterprising and Artistic scales were relatively low (< 0.20). The angular locations for the six scales on the SACII are presented in Table 5.19.



*Figure 5.1. Circular ordering of the SACII scales for the entire sample. Note angular displacement for the Enterprising and Conventional scales.*

Arc-tangent transformation was also employed to determine the angular locations for the respective sample groups of the current study. However, this analysis was meaningless for the Indian/Asian and English-speaking participants, due to their small sample sizes. The results for the respective groups are presented in Tables 5.20 to 5.26.



Table 5.19

*Angular locations for the SACII scales for the entire sample*

	Theoretical angular location	Empirical angular location	Communality	Displacement
R	0°	0°	0.37	0°
I	60°	63°	0.27	3°
A	120°	128°	0.14	8°
S	180°	171°	0.22	9°
E	240°	255°	0.11	15°
C	300°	274°	0.20	26°

*Note. N = 628. Communality vector length =  $r^2$  ( $\neq r$ )*

In terms of gender, the angular locations for the female participants indicated a loose circular model (Browne, 1992), and Holland's calculus assumption was met due to the lack of disordering between the scales. Considering the approximation of a loose circular model, there was no equal spacing between the scales (i.e., there was no 60° displacement for the female participants). For example, a displacement of 26° was demonstrated for Conventional scales. The communality values were mostly acceptable, with the exception of the Enterprising scale (0.19). The results for the angular locations for the female participants are presented in Table 5.20.

Table 5.20

*Angular locations for the SACII scales for female participants*

	Theoretical angular location	Empirical angular location	Communality	Displacement
R	0°	0°	0.21	0°
I	60°	50°	0.27	10°
A	120°	118°	0.19	2°
S	180°	175°	0.20	5°
E	240°	244°	0.10	4°
C	300°	276°	0.23	24°

*Note. n = 371. Communality vector length =  $r^2$  ( $\neq r$ )*

For the male participants, the results indicated that for the majority of the scales, a loose circular model was present in the data. However, Holland's (1997) calculus assumption was violated, as there was disordering between the Enterprising and Conventional scales. In contrast to Holland's proposed RIASEC typology, the ordering between the scales for the male participants was presented in an R-E-C-S-A-I order. However, it should be noted that the disordering between these scales were minimal ( $1^\circ$ ). In addition, the angular location of the six scales did not approximate the  $60^\circ$  threshold. Finally, the communality values for the Enterprising, Conventional and Artistic scales were relatively low ( $< 0.20$ ), whereas the Social scale demonstrated a particularly low communality value (0.07). The results for the angular locations for the male participants are presented in Table 5.21.

Table 5.21

*Angular locations for the SACII scales for male participants*

	Theoretical angular location	Empirical angular location	Communality	Displacement
R	$0^\circ$	$0^\circ$	0.40	$0^\circ$
E	$120^\circ$	$99^\circ$	0.13	$21^\circ$
C	$60^\circ$	$100^\circ$	0.18	$44^\circ$
S	$180^\circ$	$204^\circ$	0.07	$24^\circ$
A	$240^\circ$	$222^\circ$	0.12	$18^\circ$
I	$300^\circ$	$285^\circ$	0.27	$15^\circ$

*Note.*  $n = 257$ . Communality vector length =  $r^2$  ( $\neq r$ )

In terms of race, the angular locations for the Black participants demonstrated that the placements on the circumference of a circle approximated a loose circular model (Browne, 2014). Considering there was no disordering between the placements of the scales, Holland's (1997) calculus assumption was met. However, there was a lack of equal distance between the scale and subsequently – the  $60^\circ$  displacement approximation was not present. For example, an angular displacement of  $17^\circ$  was demonstrated for the Social scale. The communality values for the

Investigative, Artistic, Social, and Enterprising scales were relatively low ( $< 0.20$ ). The results for the angular locations for the Black participants are presented in Table 5.22.

Table 5.22

*Angular locations for the SACII scales for Black participants*

	Theoretical angular location	Empirical angular location	Communality	Displacement
R	0°	0°	0.38	0°
I	60°	53°	0.17	7°
A	120°	125°	0.16	5°
S	180°	163°	0.17	17°
E	240°	244°	0.11	4°
C	300°	268°	0.20	32°

*Note.*  $n = 261$ . *Communality vector length =  $r^2$  ( $\neq r$ )*

For the Coloured participants, the results indicated that the angular locations resembled a loose circular model (Browne, 1992). There was no disordering between the respective scales and Holland's (1997) calculus assumption was met. However, considering the loose circular model, there was no equal displacement between the scales (i.e., 60° distances). For example, the angular displacement for the Enterprising scale was 15°. The communality values for the majority of the scales were acceptable, with the exception of the Artistic (0.14) and Enterprising (0.11) scales. Table 5.23 presents the results for the angular locations for the Coloured participants.

Table 5.23

*Angular locations for the SACII scales for Coloured participants*

	Theoretical angular location	Empirical angular location	Communality	Displacement
R	0°	0°	0.41	0°
I	60°	64°	0.21	4°
A	120°	115°	0.14	5°
S	180°	171°	0.25	9°
E	240°	255°	0.11	15°
C	300°	269°	0.20	11°

*Note.*  $n = 303$ . *Communality vector length* =  $r^2$  ( $\neq r$ )

Similar to the other race groups, the angular locations for the White participants demonstrated a loose circular model (Browne, 1992) and the lack of disordering between the scales indicated consistency with Holland's calculus assumption. The nature of the circular model indicated that there were no equal distances between the respective scales ( $\neq 60^\circ$ ). For example, a distance of  $86^\circ$  was demonstrated for the Conventional scales. These results, however, should be interpreted with caution due to the limited sample size of the White participants. Moreover, the communality value for the Enterprising scale was particularly low (0.13) relative to the other scales ( $> 0.25$ ). Table 5.24 presents the results for the angular locations for the White participants.

Table 5.24

*Angular locations for the SACII scales for White participants*

	Theoretical angular location	Empirical angular location	Communality	Displacement
R	0°	0°	0.73	0°
I	60°	58°	0.61	2°
A	120°	125°	0.35	5°
S	180°	153°	0.25	27°
E	240°	282°	0.13	42°
C	300°	386°	0.42	86°

*Note:*  $n = 59$ . *Communality vector length* =  $r^2$  ( $\neq r$ )

Finally, the results by language indicated that the Afrikaans participants approximated a loose circular model (Browne, 1992) and the lack of disordering between the scales was consistent with the calculus assumption. Based on Browne's (1992) circumplex model classification, the loose circular model for the Afrikaans participants did not demonstrate an equal 60° displacement. For instance, the angular displacement for the Artistic scale was 11°. The communality values were relatively acceptable, with the exception of the Artistic (0.16) and Enterprising (0.11) scales. The results for the angular locations for the Afrikaans participants are presented in Table 5.25.

Table 5.25

*Angular locations for the SACII scales for Afrikaans participants*

	Theoretical angular location	Empirical angular location	Communality	Displacement
R	0°	0°	0.39	0°
I	60°	66°	0.31	6°
A	120°	131°	0.16	11°
S	180°	173°	0.23	7°
E	240°	260°	0.11	20°
C	300°	276°	0.20	24°

*Note: n = 338. Communality vector length =  $r^2$  ( $\neq r$ )*

The results for the isiXhosa participants indicated that the angular locations resembled a loose circular model (Browne, 1992). There was no disordering between the respective scales, which was consistent with Holland's (1997) calculus assumption. However, the scales did not approximate an equal displacement of 60° that is consistent with a tight circular model (Darcy & Tracey, 2007). By way of illustration, the distance for Social scale was 18°, while the Conventional scale demonstrated an angular displacement of 32°. The communality values for the Investigative, Artistic and Social scales were relatively low (< 0.20), whereas the Enterprising scale was particularly low (0.11). Table 5.26 presents the results for the angular locations for the isiXhosa participants.

Arc-tangent transformation was applied to the Indian/Asian and English-speaking participants. For the Indian/Asian sample ( $n = 5$ ), there was disordering between the Social and

Artistic scales. These results are meaningless due to the small sample size of this subgroup. Similarly, there was disordering between the Enterprising, Conventional and Social scales for the English-speaking participants, also due to the small sample size ( $n = 24$ ). Accordingly, these results were not included in the analysis.

Table 5.26

*Angular locations for the SACII scales for isiXhosa participants*

	Theoretical angular location	Empirical angular location	Communality	Displacement
R	0°	0°	0.39	0°
I	60°	51°	0.18	9°
A	120°	125°	0.17	5°
S	180°	162°	0.19	18°
E	240°	244°	0.11	4°
C	300°	268°	0.21	32°

*Note:  $n = 266$ . Communality vector length =  $r^2 (\neq r)$*

### 5.8.3 Item elimination

Weak items in the SACII were identified during three separate processes, which included CTT item analysis, principal component analysis and arc-tangent transformation. The results from the above-mentioned analyses provided the foundation on which to eliminate certain items from the remaining analyses for the current study. Accordingly, items were eliminated if they were identified for removal across all three of the above analyses. In other words, weak items flagged during the CTT item analysis, PCA and arc-tangent transformation were cross-referenced and removed if they demonstrated insufficient coefficients across all three analyses. All of the weak items that were flagged during the course of the analyses are presented in Table 5.27.

In view of the above, three items were removed from the analysis for demonstrating insufficient coefficients across all three analyses. These items were I3 (“Sell properties”), I14 (“Translate languages for people”) and I19 (“Teach people how to cook a meal”). For the CTT item analysis, these items demonstrated the lowest mean, standard deviation and average inter-item correlation coefficient, in addition to the demonstration of low corrected item-total correlation

coefficients ( $< .50$ ). Even though there were no cross-loadings with non-adjacent types during the PCA, these items demonstrated the lowest component loadings relative to the  $\geq .30$  thresholds. Finally, for the arc-tangent transformation, these items shared similar angular locations with items in other scales and demonstrated particularly low communality values ( $< 0.04$ ). Accordingly, for the remainder of the analysis, the SACII was reduced to 140 items.

Table 5.27

*Weak items flagged for removal from the SACII*

Item	Description	CTT	PCA	ATT
1	Act in a play			X
<b>3</b>	<b>Sell properties</b>	<b>X</b>	<b>X</b>	<b>X</b>
4	Use new ways of removing diseases from crops	X		X
6	Take merchandise orders		X	X
8	Participate in an arts and crafts workshop			X
9	Write a musical score	X		X
10	Teach people how to improve their managerial skills			X
<b>14</b>	<b>Translate languages for people</b>	<b>X</b>	<b>X</b>	<b>X</b>
15	Maintain a database			X
16	Operate heavy machinery	X		
<b>19</b>	<b>Teach people how to cook a meal</b>	<b>X</b>	<b>X</b>	<b>X</b>
30	Monitor stock supplies for a construction project			X
37	Assist customers to buy products			X
43	Model clothes	X	X	
51	Start a business			X
52	Write jingles for advertisements	X	X	
53	Capture data onto a spread sheet			X
55	Organise transportation of products from a factory			X
74	Supervise people's work activities			X
82	Work with elderly people			X
84	Teach people to speak a new language			X
88	Take photographs for a newspaper			X
92	Set up equipment for a scientific experiment	X		X
104	Interview people applying for new jobs			X
114	Manage a hotel			X
115	Give presentations on how to make a business better			X
	Sell products			
119	Run a feeding programme			X

127	Motivate people at a company to improve	X
129	their performance Manage a marketing department	X
130	Sell goods	X
133	Administer security access to a building	X
135	Write a play	X
141	Show customers how to use products	X
142	at an auction	X

## 5.9 Circumplex analyses

### 5.9.1 Randomisation test of hypothesised order relations

The fit of the data (i.e., the correlation matrices) to a tight circular ordering model was examined using Hubert and Arabie's (1987) randomisation test of hypothesised order relations (RTHOR). The scale level correlation matrices for the respective sample groups were used as the primary input data for this analysis. These sample groups included the total sample, male and female participants, Black racial group, Coloured racial group, Indian/Asian racial group and White racial group, and Afrikaans, English and isiXhosa speaking participants. In each analysis, 72 order predictions were made in total. The test of hypothesised order relations proposes a null hypothesis that there is no circular ordering (i.e., random ordering) between the respective scales. For the current study, the probability values for all the sample groups were significant ( $p < .05$ ), demonstrating the result was unlikely to occur due to chance, and the null hypothesis was rejected. In other words, a tight circular ordering consistent with Holland's (1997) calculus assumption emerged from the data.

The correspondence index (CI) values were relatively satisfactory for all the sample groups ( $\geq .60$ ), with the exception of the male participants (CI = .32). A correspondence index value of .50 indicates that 75% of the order predictions were met in the data (Morgan, 2014). Accordingly, for the majority of the sample, more than 75% of the order predictions were met across the respective sample groups. However, the male participants demonstrated a particularly low CI value and only 47 order predictions were met. For the entire sample and for the gender groups, the female participants demonstrated the highest CI value (.72). In terms of race, the Black participants demonstrated the highest CI value (.68), while the Coloured participants demonstrated the lowest CI values (.60). Lastly, for language, the isiXhosa participants demonstrated the highest CI value (.69), whereas the Afrikaans participants demonstrated the lowest (.60). However, these results



should be interpreted with caution due to the small sample sizes of some of the groups. The results for the randomisation test of hypothesised order relations are presented in Table 5.28.

The RTHOR was also employed to compare the fit of the models across gender, race and language. The results indicated that there were no statistically significant differences in model fit between the racial groups (Black, Coloured, and White) or language groups (Afrikaans, English, and isiXhosa;  $p > .05$ ). However, significant differences between the gender groups ( $p = .0167$ ) were demonstrated. Moreover, the positive correspondence index (CI) value demonstrated that the model fit was better for the female sample ( $CI = .20$ ;  $p = .0167$ ).

Table 5.28

*Randomisation test of hypothesised order relations for the SACII*

Matrix	Predictions		CI	<i>p</i> -value
	Met	Tied		
Total	58	0	.61	.0333
Female	62	0	.72	.0167
Male	47	1	.32	.0500
Black	60	1	.68	.0167
Coloured	57	1	.60	.0333
White	58	0	.61	.0167
Afrikaans	57	1	.60	.0333
English	59	0	.64	.0333
isiXhosa	61	0	.69	.0167

*Note.* Total  $n = 628$ ; Female  $n = 371$ ; Males  $n = 257$ ; Black  $n = 261$ ; Coloured  $n = 303$ ; White  $n = 59$ ; Afrikaans  $n = 338$ ; English  $n = 24$ ; isiXhosa  $n = 266$ .

In terms of race, the results demonstrated that the model fit between the Black and Coloured and Black and White participants was better for the Black participants ( $CI^1 = .03$ ;  $p^1 = .4167$ ;  $CI^2 = .04$ ;  $p^2 = .3500$ ). In addition, the results indicated that the model fit between the Coloured and White participants improved for the Coloured participants ( $CI = .00$ ;  $p = .5667$ ). Lastly, the results by language indicated that the model fit between Afrikaans and English samples improved for the Afrikaans group ( $CI = .01$ ;  $p = .2833$ ). In contrast, the RTHOR revealed that the model fit between

the Afrikaans and isiXhosa participants was more suitable for the isiXhosa sample group (CI = -.03;  $p = .6500$ ), while similarly, the model fit between the English and isiXhosa samples was better for the isiXhosa participants (CI = -.03;  $p = .6833$ ). The comparison of model fit for the Indian/Asian sample is not included in this section due to the small sample size ( $n = 5$ ). The results for the comparison of model fit are presented in Table 5.29.

Table 5.29

*Comparison of model fit across gender, race and language*

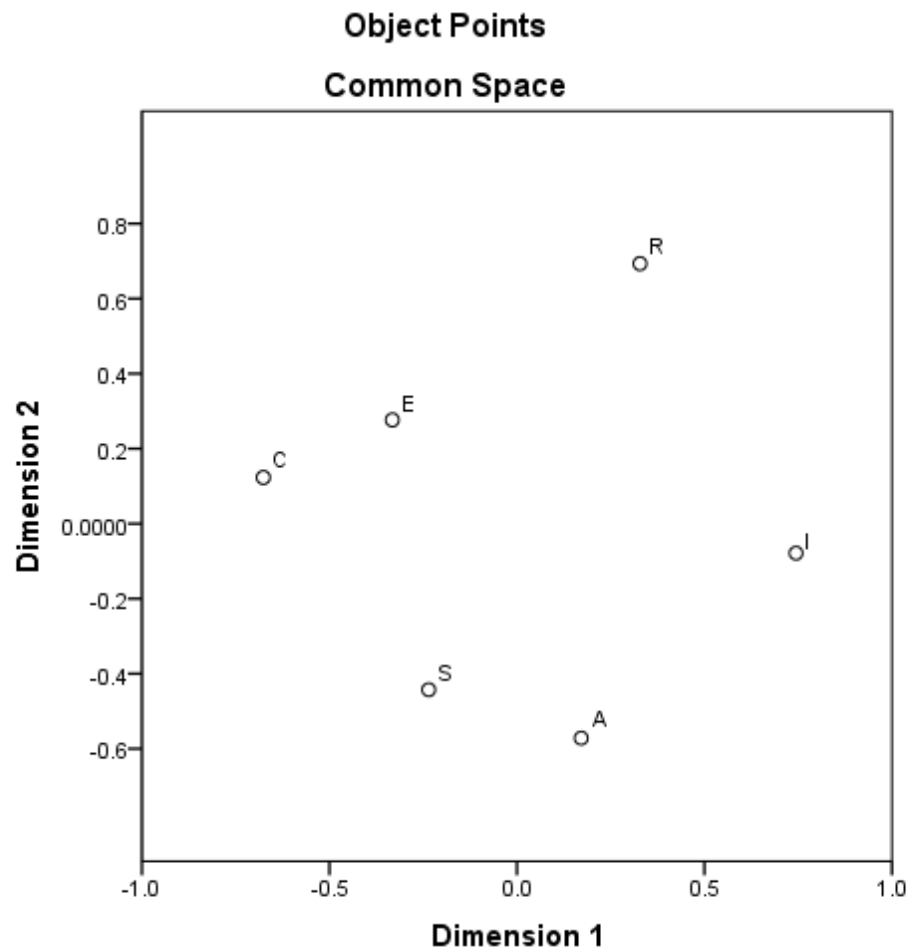
Matrix	Sample comparison	CI	$p$
Gender			
	Female vs Male	.20	.0167
Race			
	Black vs Coloured	.03	.4167
	Black vs White	.04	.3500
	Coloured vs White	.00	.5667
Language			
	Afrikaans vs English	.01	.2833
	Afrikaans vs isiXhosa	-.03	.6500
	English vs isiXhosa	-.03	.6833

*Note.* Female  $n = 371$ ; Males  $n = 257$ ; Black  $n = 261$ ; Coloured  $n = 303$ ; White  $n = 59$ ; Afrikaans  $n = 338$ ; English  $n = 24$ ; isiXhosa  $n = 266$ .  $p < .05$  indicates significant differences in model fit between groups, while a positive CI values indicate a better model fit for the control group and a negative CI values indicates a better model fit for the comparison group.

### 5.9.2 Multidimensional scaling

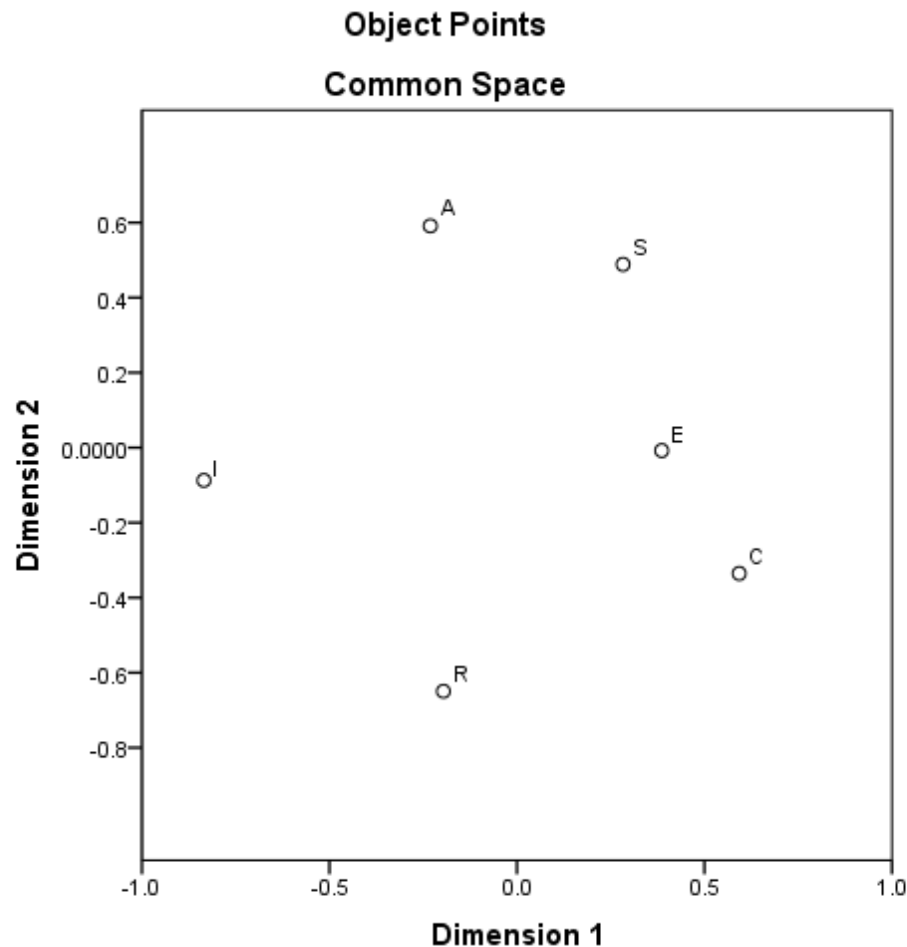
Multidimensional scaling (MDS) was employed in the current study to investigate the six RIASEC types' underlying structural configuration. Non-metric MDS analyses were conducted for the respective male and female, Black, Coloured, and White, and Afrikaans, English, and isiXhosa Grade 9 learners. In addition, non-metric MDS plots were created for each subsample group. These plots are presented in Figure 5.2 – Figure 5.9. Moreover, Procrustes' rotation was applied to the dataset to determine the configuration similarities between the subsample groups. The results for the Procrustes' rotation are presented in Figure 5.10 – Figure 5.16.

In terms of the constrained MDS analysis by gender, the male participants demonstrated acceptable fit, as indicated by the the Stress-1 value (.004), dispersion accounted for (DAF) coefficient (0.999) and Tucker's Coefficient of Congruence (0.999) (Hair et al., 2006). Moreover, the VAF coefficient (.75) was satisfactory. However, the results produced by the non-metric MDS plot demonstrated that the circular model to the data was marginally unacceptable for the male participants (i.e., minimal disordering between Enterprising and Conventional scales). This plot is represented in Figure 5.2.



*Figure 5.2. Non-metric MDS plot of the RIASEC scales for male participants*

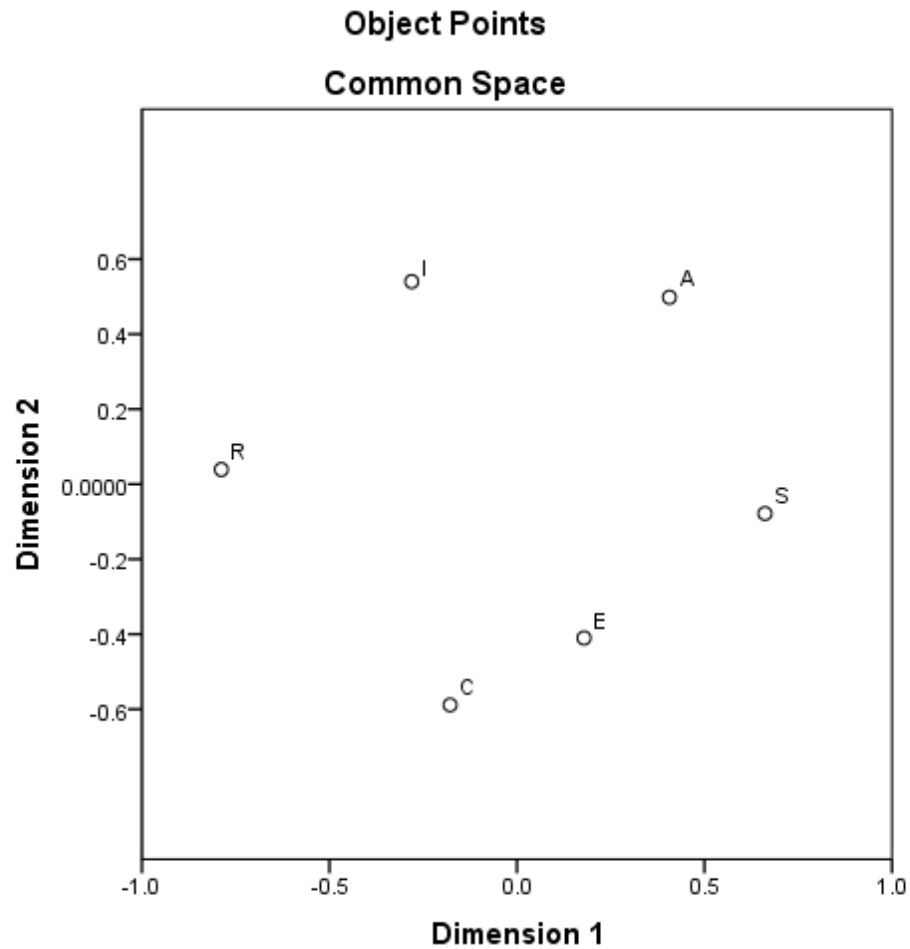
For the female participants, the Stress-1 value (.007), DAF coefficient (0.999), Tucker's Coefficient of Congruence (0.999), and VAF coefficient (.81) demonstrated acceptable fit on both dimensions (Hair et al., 2006). The emergence of an approximate circular configuration in the data was also evident, as produced by the non-metric MDS plot, as represented in Figure 5.3.



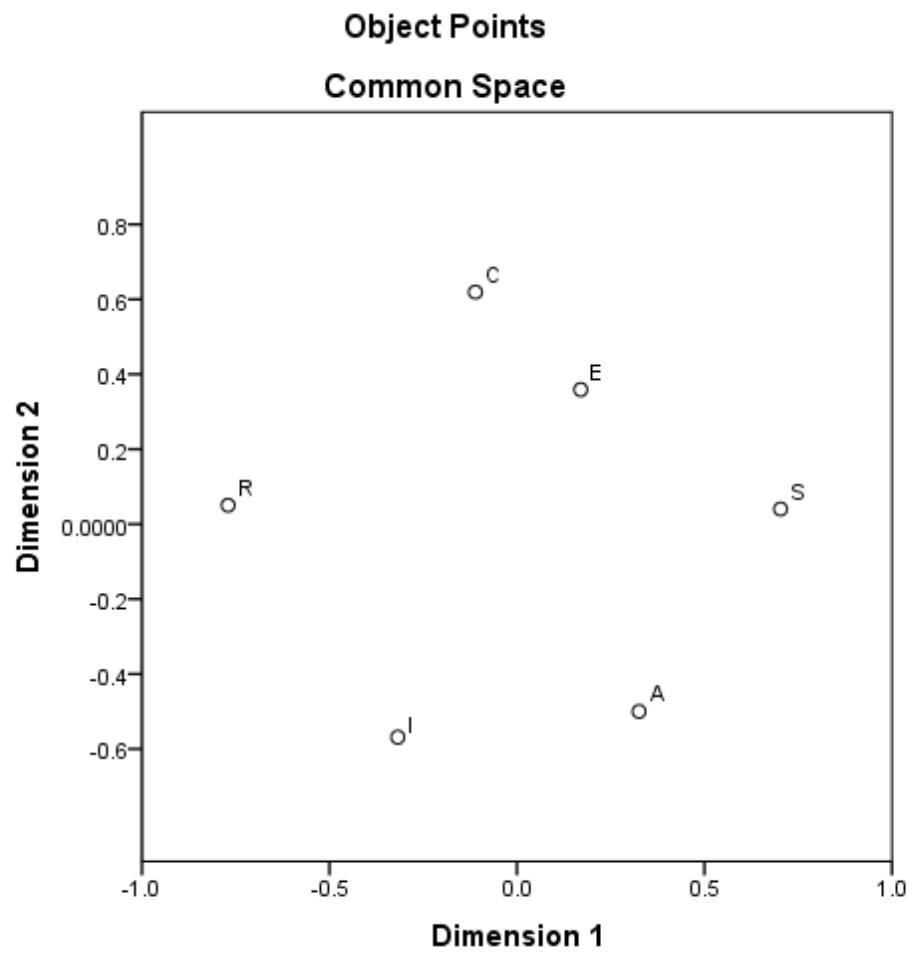
*Figure 5.3. Non-metric MDS plot of the RIASEC scales for female participants*

In terms of race, the constrained MDS analysis for the Black participants demonstrated acceptable fit on both dimensions, as indicated by the Stress-1 value (.003), DAF coefficient (0.999), Tucker's Coefficient of Congruence (0.999), and VAF coefficient (.83). In addition, the non-metric MDS plot demonstrated an approximated circular order – see Figure 5.4. Similarly, the Coloured participants obtained acceptable fit on both dimensions, as indicated by the Stress-1 value (.022), DAF coefficient (0.999), Tucker's Coefficient of Congruence (0.999), and VAF coefficient (.83). The non-metric MDS plot indicated that a circular order, consistent with Holland's theoretical model, was approximated for the Coloured participants. This non-metric MDS plot is presented in Figure 5.5. Lastly, the White participants also obtained acceptable fit, with the Stress-1 value (.005), DAF coefficient (0.999), Tucker's Coefficient of Congruence

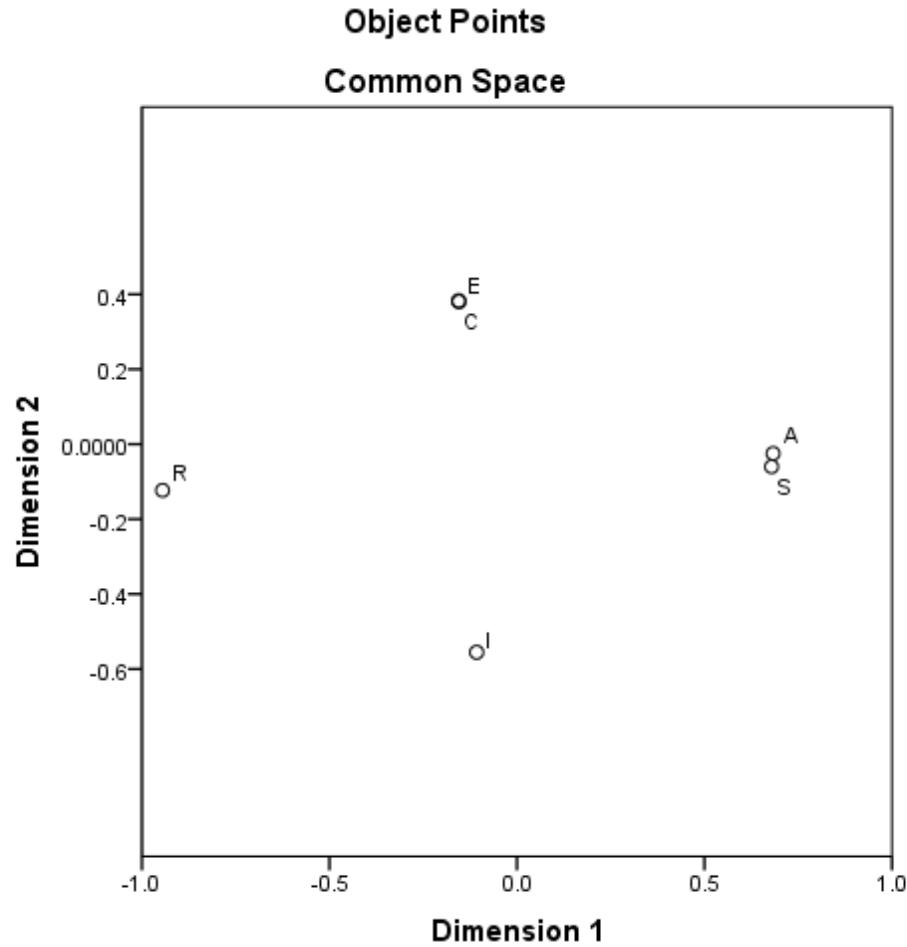
(0.999), and VAF coefficient (.89) all satisfactory. Even though a circular order was estimated in the non-metric MDS plot, near-identical proximities were demonstrated between the Artistic and Social, and Enterprising and Conventional types. These results, however, could be the function of the small sample size of the White participants. The non-metric MDS plot is presented in Figure 5.6.



*Figure 5.4. Non-metric MDS plot of the RIASEC scales for Black participants*



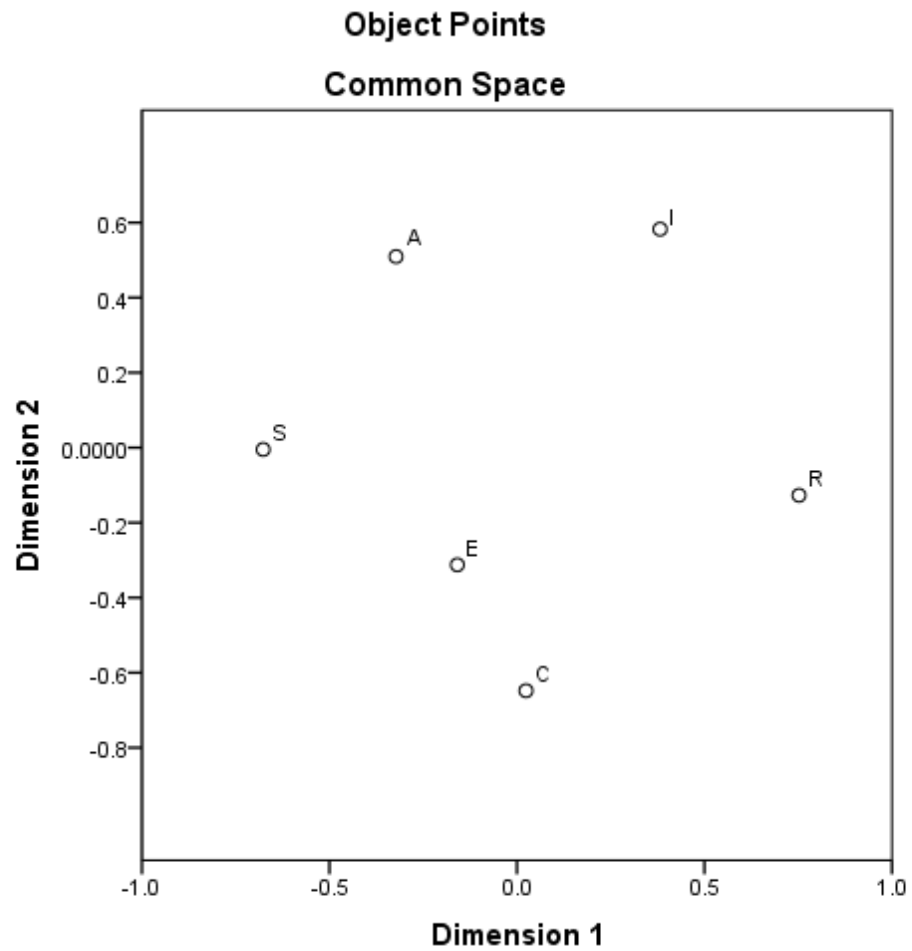
*Figure 5.5. Non-metric MDS plot of the RIASEC scales for Coloured participants*



*Figure 5.6. Non-metric MDS plot of the RIASEC scales for White participants*

In terms language, the Afrikaans participants demonstrated acceptable fit on the MDS analysis, with the Stress-1 value (.003), DAF coefficient (0.999), Tucker's Coefficient of Congruence (0.999), and VAF coefficient (.83) all satisfactory. Moreover, the non-metric MDS plot showed that a circular order was approximated for the Afrikaans participants, albeit with proximities demonstrated between the Enterprising and Conventional scales. These results are presented in Figure 5.7. Similarly, the English participants obtained acceptable fit on the MDS analysis, with satisfactory coefficients demonstrated for the Stress-1 value (.002), DAF coefficient (0.999), Tucker's Coefficient of Congruence (0.999), and VAF coefficient (.89). A circular order was approximated for the English participants in the non-metric MDS plot, as represented in Figure 5.8. Finally, as for all of the language groups, the isiXhosa participants obtained acceptable fit, with the Stress-1 value (.003), DAF coefficient (0.999), Tucker's Coefficient of Congruence

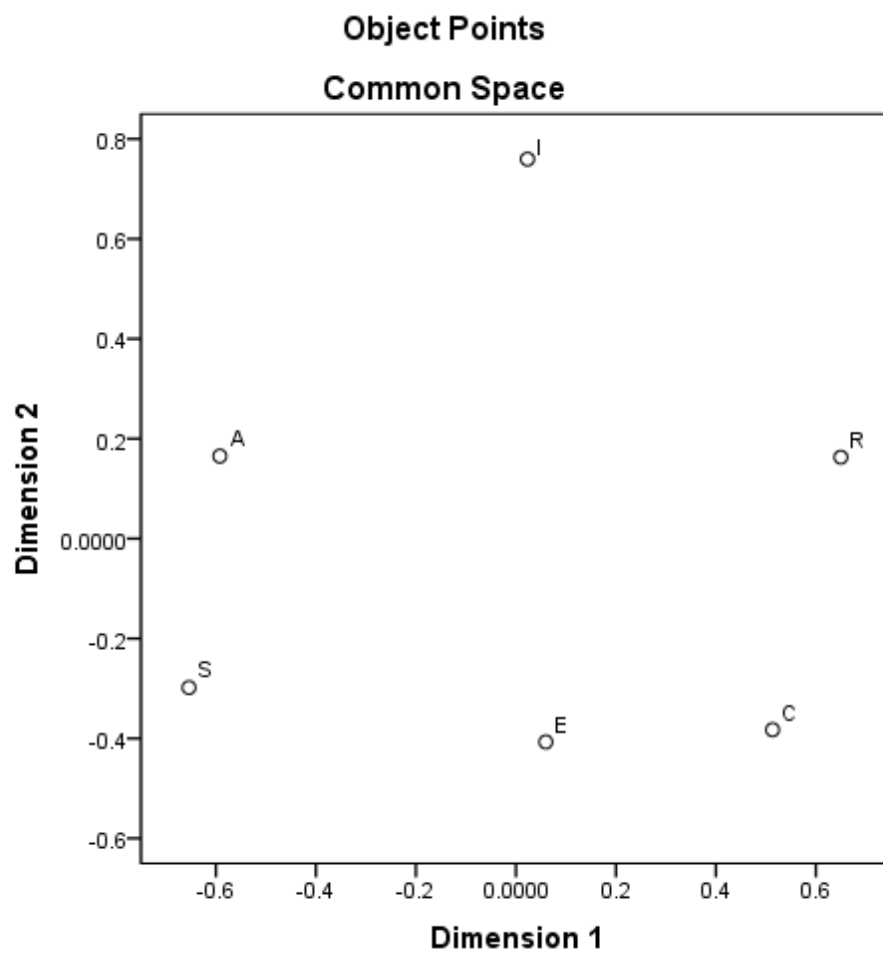
(0.999), and VAF coefficient (.83) all satisfactory. Moreover, a circular order was approximated in the non-metric MDS plot, as represented in Figure 5.9.

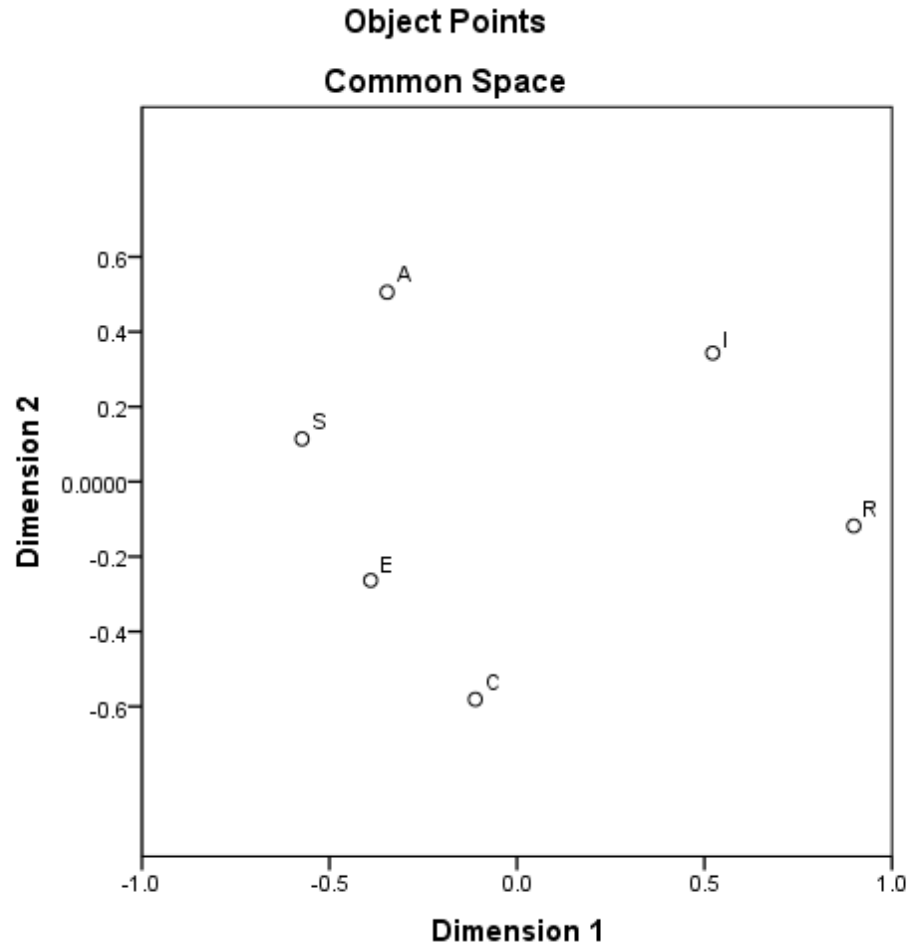


*Figure 5.7. Non-metric MDS plot of the RIASEC scales for Afrikaans participants*



Figure 5.8. Non-metric MDS plot of the RIASEC scales for English participants

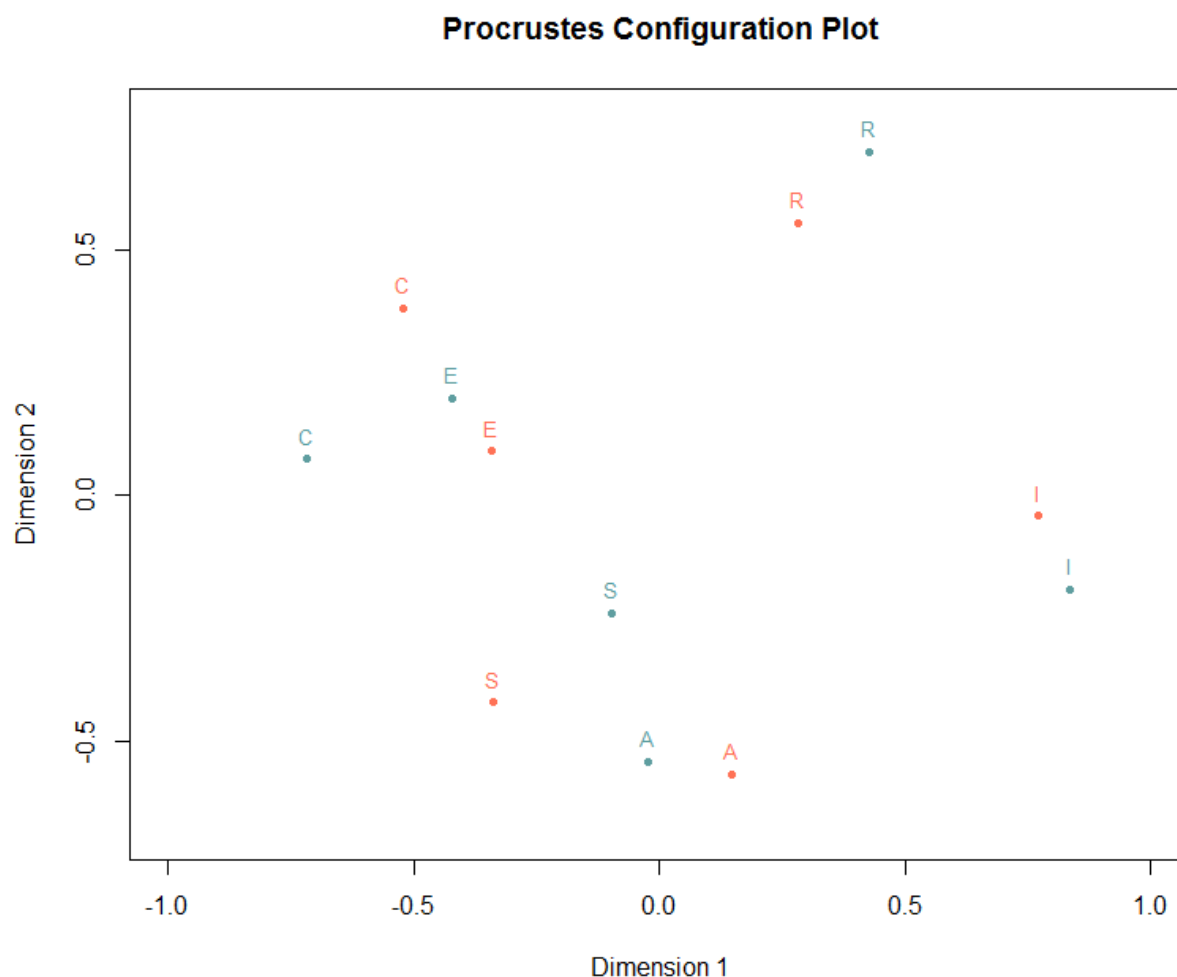




*Figure 5.9. Non-metric MDS plot of the RIASEC scales for isiXhosa participants*

In order to determine the configuration similarities between the RIASEC types, and compare the model fit across the subsample groups, Procrustes' rotation was applied to the dataset. Model-fit comparisons were conducted for the respective gender, racial, and language groups, resulting in seven Procrustes analyses (male vs. female; Black vs. Coloured; Black vs. White; Coloured vs. White; Afrikaans vs. English; Afrikaans vs. isiXhosa; and English vs. isiXhosa).

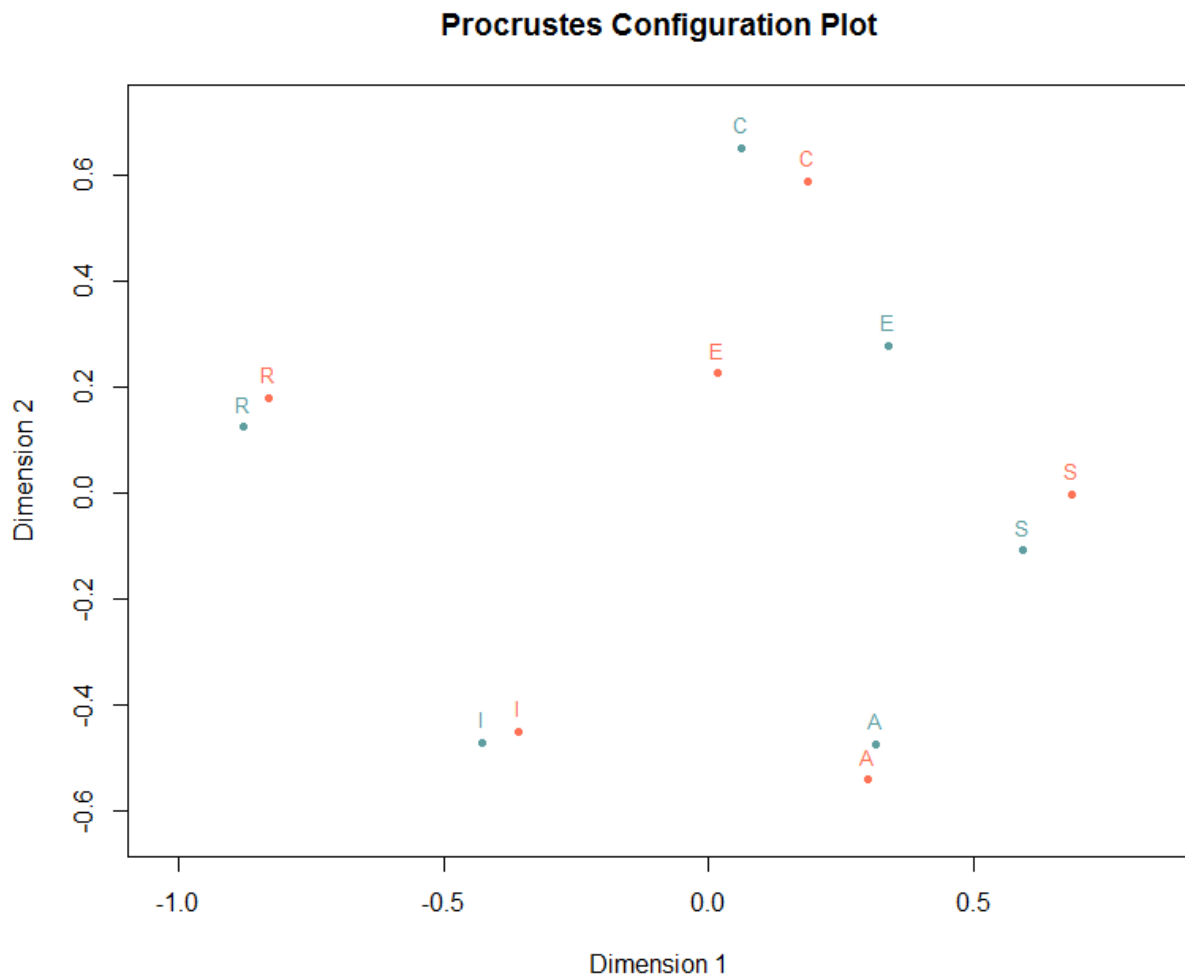
For the gender comparison of model fit, the congruence coefficient (.98) demonstrated satisfactory configuration similarity for the male and female participants. However, visual inspection of the Procrustes' configuration plot displayed disordering between the Enterprising and Convention for the male participants. Moreover, the circular structure obtained by the female participants compared favourably to Holland's theoretical model. These results are presented in Figure 5.10.



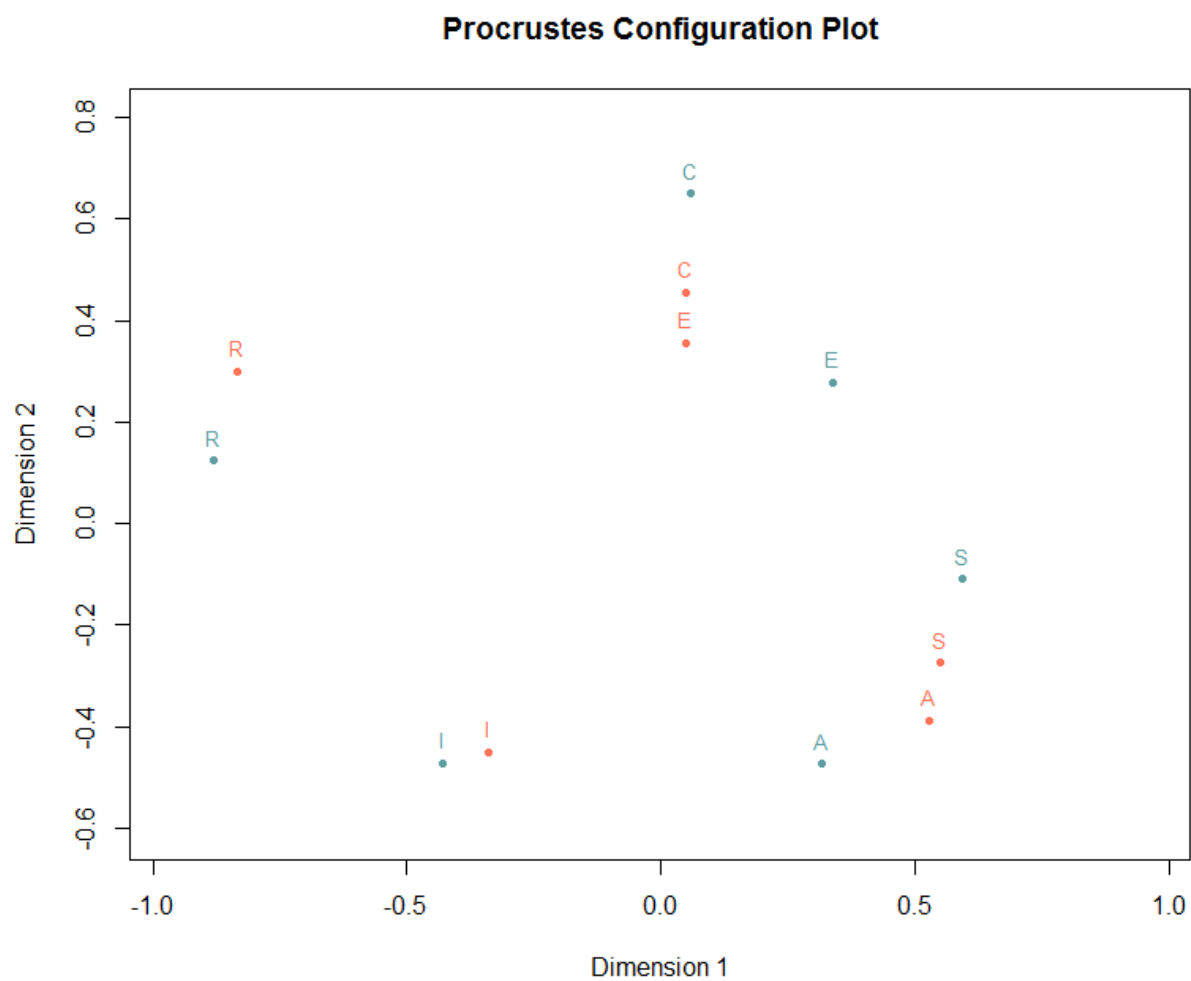
*Figure 5.10. Procrustes configuration plot for male and female participants. Note configurations for male participants presented in blue.*

For the respective racial groups, the congruence coefficient (CC) demonstrated satisfactory configuration similarities for Black and Coloured participants (CC = .99), Black and White participants (CC = .97), and Coloured and White participants (CC = .98). Furthermore, visual inspection of the Procrustes' configuration plots demonstrated marginal configuration dissimilarity for the Enterprising and Conventional types for the Black and Coloured, and Black and White participants. In addition, the Black participants obtained a circular structure that compared favourably to Holland's theoretical model in both instances. The comparisons of model fit between the Black and Coloured, and Black and White participants are presented in Figure 5.11 and Figure 5.12, respectively. Similarly, the Procrustes' configuration plot for the Coloured and

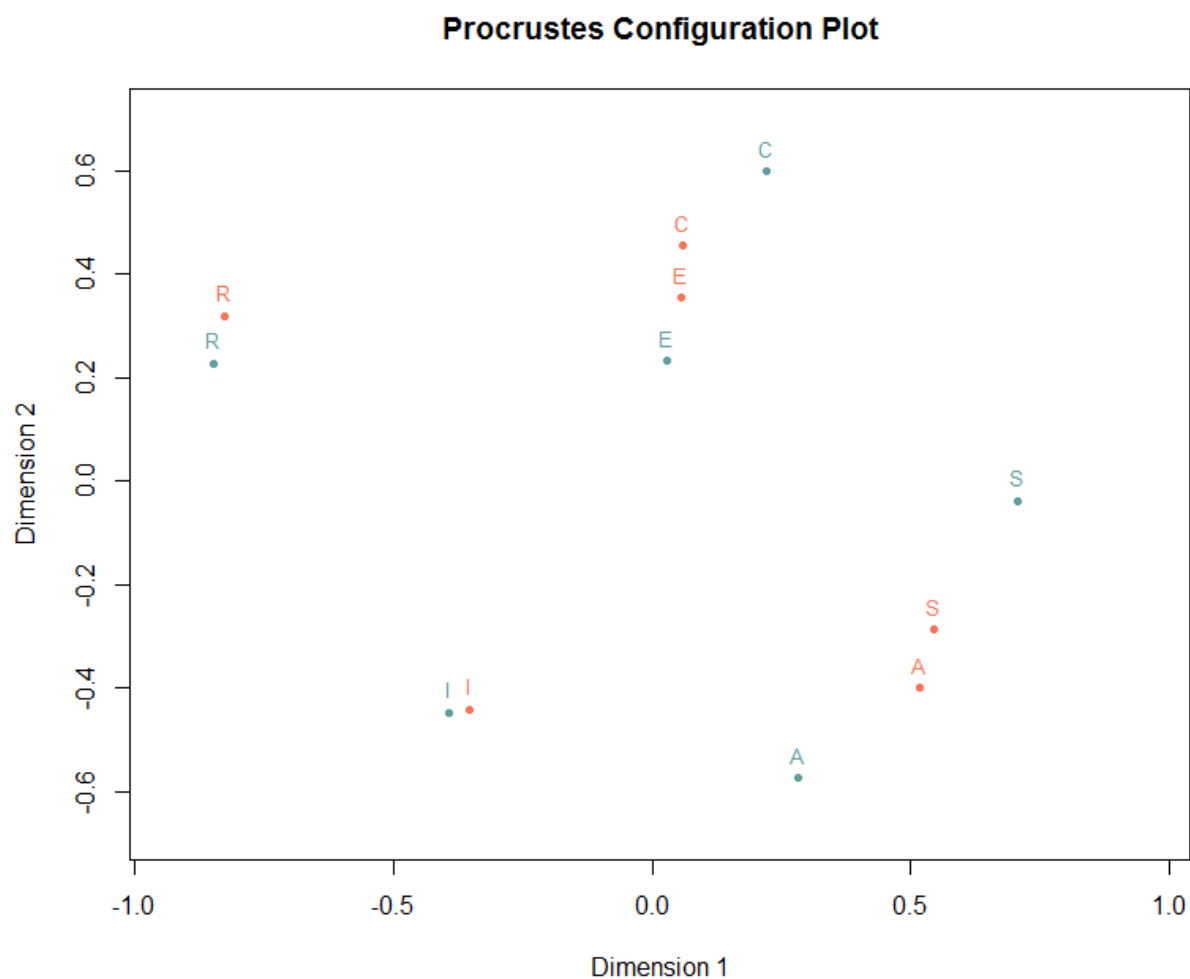
White participants demonstrated some degree of configuration dissimilarity between the Artistic and Social types, and the Enterprising and Conventional types. As presented in Figure 5.13, the Coloured participants obtained a circular structure that compared favourably to Holland's theoretical model.



*Figure 5.11. Procrustes' configuration plot for Black and Coloured participants. Note configurations for Black participants presented in blue.*

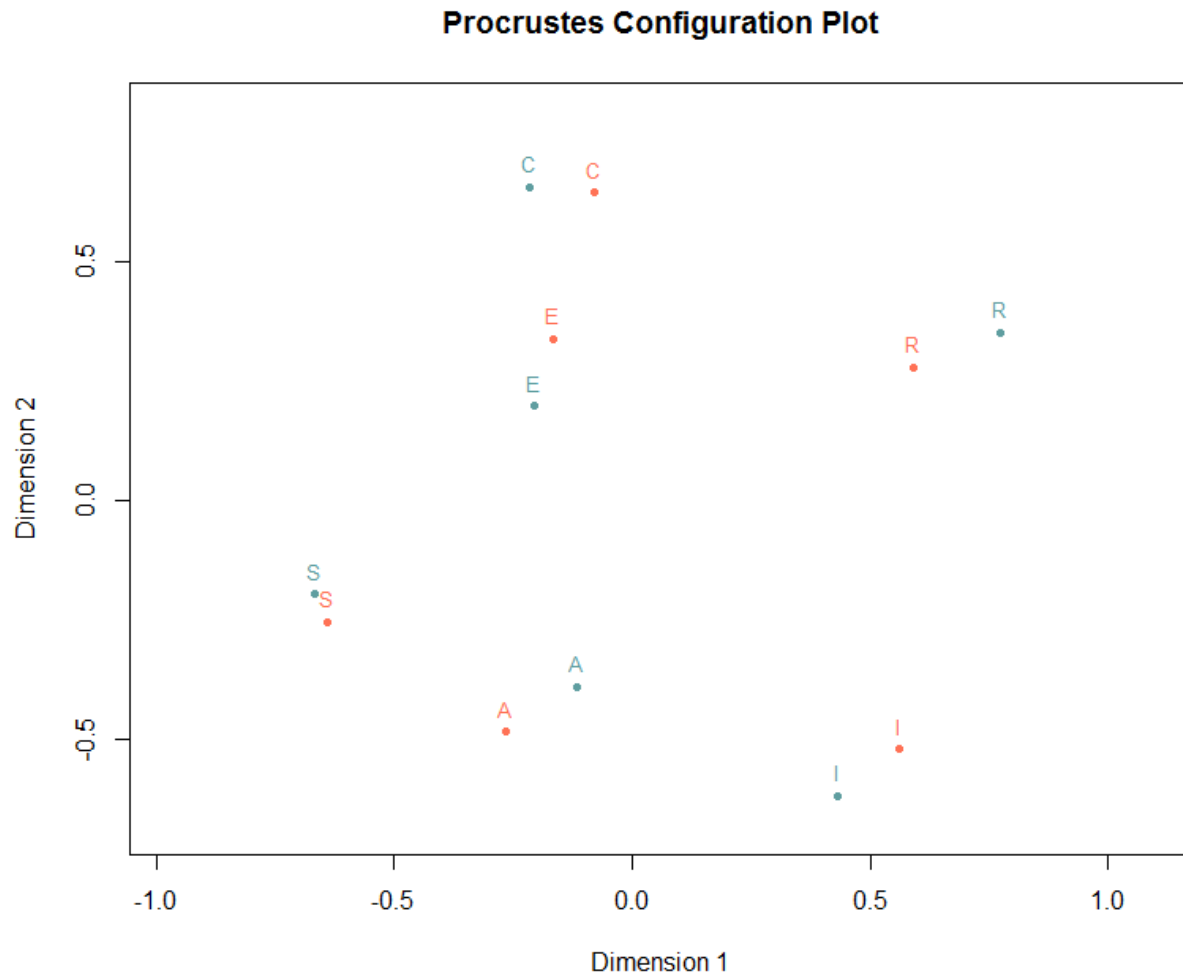


*Figure 5.12. Procrustes' configuration plot for Black and White participants. Note configurations for Black participants presented in blue.*

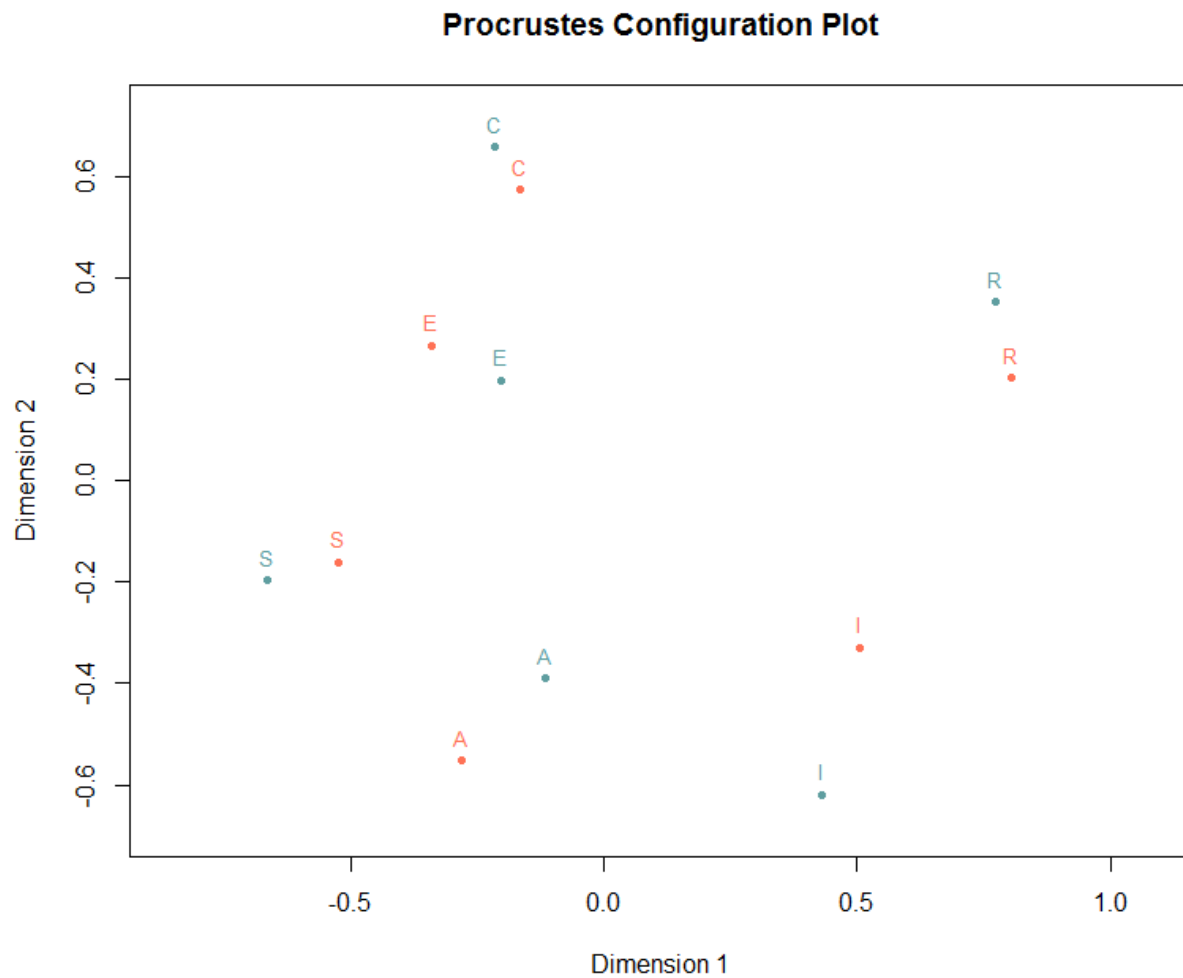


*Figure 5.13. Procrustes' configuration plot for Coloured and White participants. Note configurations for Coloured participants presented in blue.*

In terms of language, satisfactory configuration similarity was obtained for the respective language groups, as demonstrated by the congruence coefficients for the Afrikaans and English participants (.99), Afrikaans and isiXhosa participants (.98), and English and isiXhosa participants (.98). Visual inspection of the Procrustes' configuration plot demonstrated some degree of configuration dissimilarity between the Enterprising and Conventional types for the Afrikaans and English participants, as presented in Figure 5.14. However, both the Afrikaans and isiXhosa, and English and isiXhosa participants obtained circular structures that compared favourably to Holland's theoretical model. These results are presented in Figure 5.15 and Figure 5.16, respectively.



*Figure 5.14. Procrustes' configuration plot for Afrikaans and English participants. Note configurations for Afrikaans participants presented in blue.*



*Figure 5.15. Procrustes' configuration plot for Afrikaans and isiXhosa participants. Note configurations for Afrikaans participants presented in blue.*



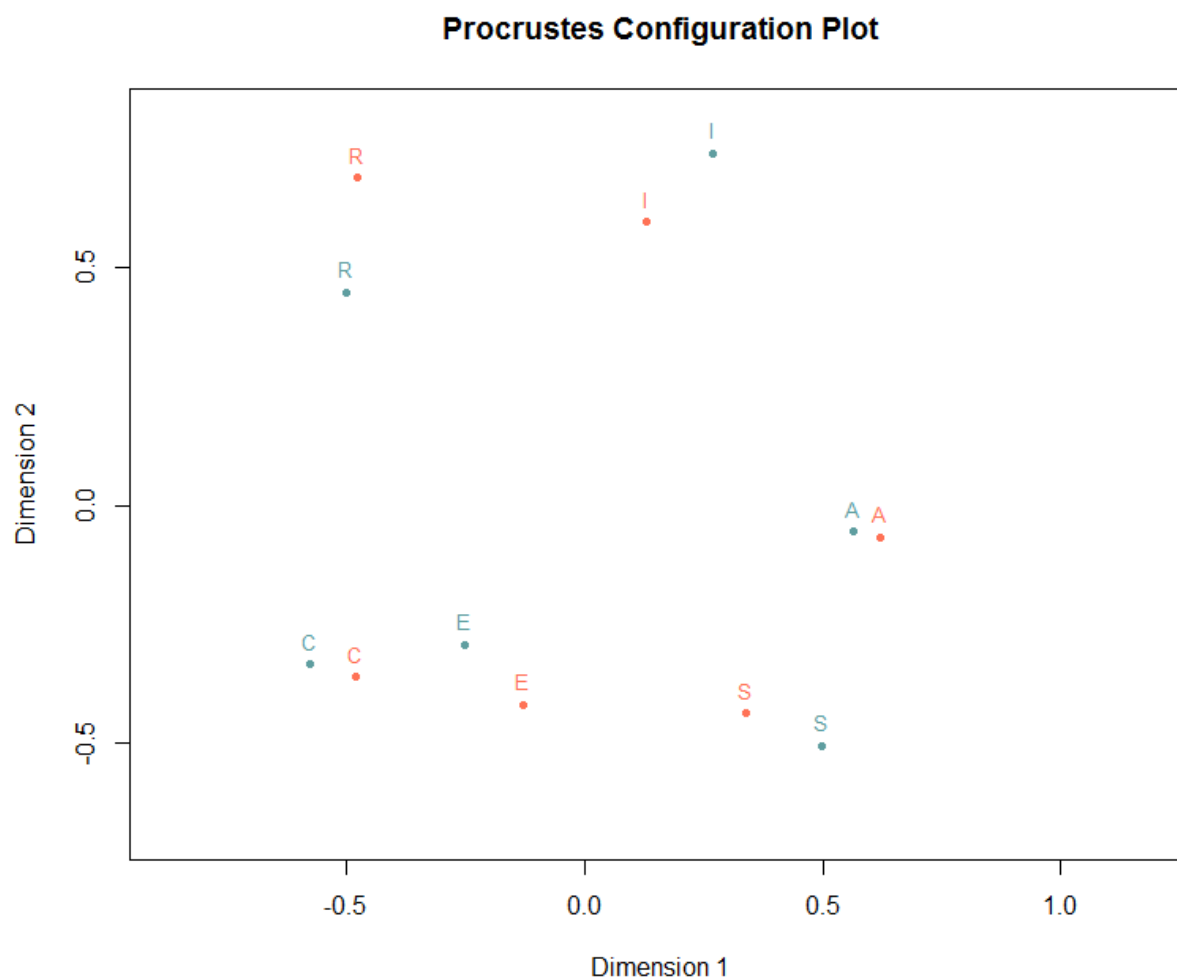


Figure 5.16. Procrustes' configuration plot for English and isiXhosa participants. Note configurations for English participants presented in blue.

### 5.9.3 Circumplex covariance structure modelling

In order to investigate the fit of the data to four circumplex models (i.e., Browne's, 1992 unconstrained model, equal-communality model, equal-spacing model, and circulant model), circumplex covariance structure modelling, specified to an one-parameter ( $m = 1$ ) Fourier series, was applied to the total sample, and respective gender, racial, and language subsample groups.

For the total sample, the results demonstrated that the unconstrained model achieved the best overall fit across the four competing circumplex models. The RMSEA values obtained by the total sample were unsatisfactory (i.e.,  $> .08$ ) across all four models. These results, however, should be interpreted with caution, considering that the RMSEA produces positively biased (i.e., too high)

coefficients in models with small degrees of freedom, such as Holland's ( $df = 3$ ; Kenny et al., 2011). Subsequently, models that fit the data well may be rejected due to this bias (Kenny et al., 2011). Moreover, the unconstrained model's SRMR (.02), TLI (.96), CFI (.99), and GFI (.99), the Equal-Communality model's CFI (.92), and GFI (.91), and the Equal-Spacing model's SRMR (.03), TFI (.94), CFI (.97), and GFI (.96) were all satisfactory. The unconstrained model for the total sample also produced the lowest ECVI value (.09) across all four models. The results for the four circumplex models for the total sample are presented in Table 5.30.

Table 5.30

*Total sample fit statistics of the four circumplex models*

<i>ml</i>	$\chi^2$	<i>Df</i>	RMSEA	SRMR	TLI	CFI	GFI	ECVI
Unconstrained	22.7	3	.102	.02	.96	.99	.99	.09
Equal-Communality	202.8	8	.197	.05	.86	.92	.91	.36
Equal-Spacing	93.9	8	.131	.03	.94	.97	.96	.192
Circulant	297.8	13	.187	.07	.87	.88	.86	.50

*Note.*  $N = 628$

As an additional estimate of the six scales' circular ordering, the angular locations of the RIASEC types were plotted on the circumference of a circle. The displacement approximation demonstrated that for the total sample, the six scales were not equidistant ( $\neq 60^\circ$ ) and subsequently, the equal spacing target associated with Holland's hexagonal model was rejected. The Realistic, Investigative, Artistic, and Social scales approximated a general displacement of  $60^\circ$ . The Conventional and Enterprising types, however, demonstrated a relatively close displacement. These results are presented in Figure 5.17.

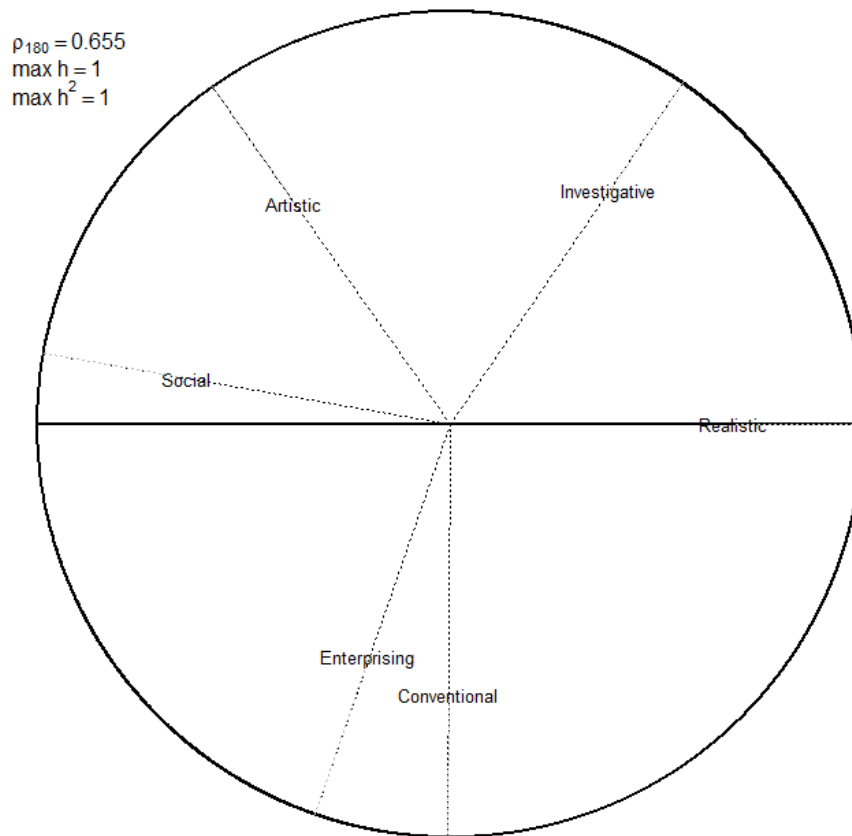


Figure 5.17. Total sample angular locations of the six RIASEC types for the unconstrained model

For the respective gender groups, the unconstrained model demonstrated the best overall fit for both male and female participants, with the results for the female participants signifying better comparative model-fit. For the male participants, the RMSEA values were unsatisfactory (i.e., > .08) for all four circumplex models. As illustrated with the results for the total sample, the RMSEA often produces values that are too high in models with small degrees of freedom, and as a result, may reject models that fit the data well (Kenny et al., 2011). Additionally, satisfactory SRMR and CFI (> .90) coefficients were obtained for the unconstrained, equal-communality, and equal-spacing models. Moreover, the unconstrained model for the male participants demonstrated satisfactory TLI (.98) and GFI (.99) values, and also produced the lowest ECVI (.12) coefficient. For the female participants, the RMSEA (.04) value for the unconstrained model was satisfactory, with unsatisfactory coefficients obtained by the other three competing models (> .08).

Furthermore, the SRMR, CFI, and GFI (> .90) were satisfactory for the unconstrained, equal-communality, and equal-spacing models, whereas the TLI (.99) for the unconstrained model was also sufficient. As with the male participants, the unconstrained model produced the lowest ECVI (.07) coefficient. These results are represented in Table 31.

Table 5.31

*Fit statistics by gender of the four circumplex models*

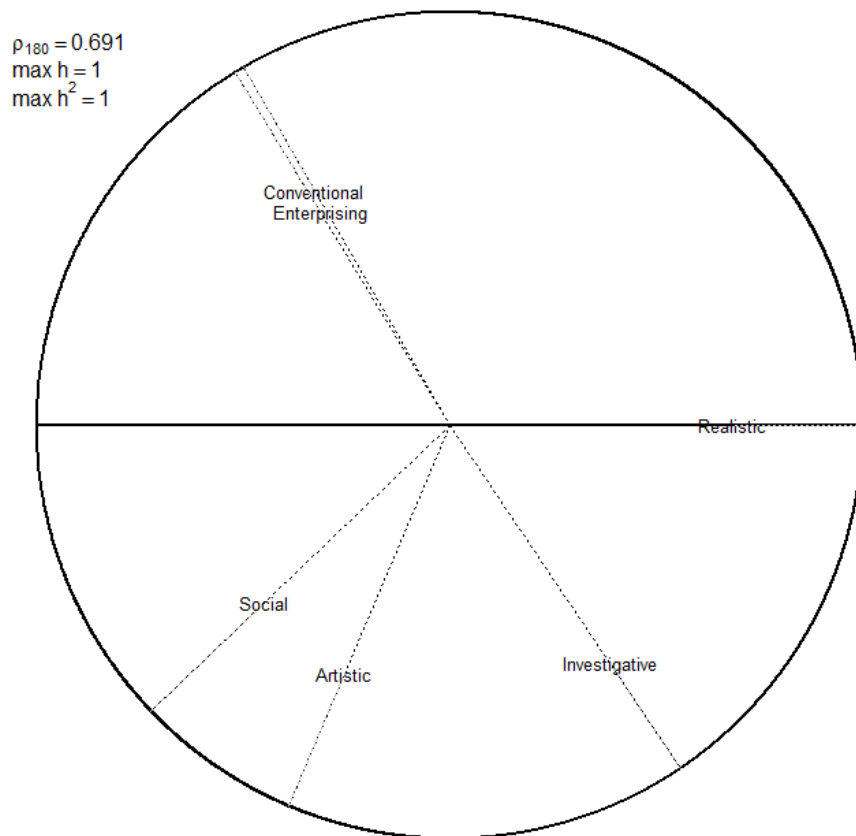
<i>Males</i>								
<i>ml</i>	$\chi^2$	<i>Df</i>	RMSEA	SRMR	TLI	CFI	GFI	ECVI
Unconstrained	36.2	3	.13	.02	.94	.99	.98	.12
Equal-Communality	267.6	8	.23	.05	.83	.91	.88	.47
Equal-Spacing	180.3	8	.19	.05	.89	.94	.92	.33
Circulant	441.1	13	.23	.08	.83	.85	.82	.73
<i>Females</i>								
<i>ml</i>	$\chi^2$	<i>Df</i>	RMSEA	SRMR	TLI	CFI	GFI	ECVI
Unconstrained	5.7	3	.04	.01	.995	.99	.99	.07
Equal-Communality	197.9	8	.20	.05	.87	.93	.91	.36
Equal-Spacing	44.4	8	.09	.02	.97	.99	.98	.11
Circulant	243.7	13	.17	.06	.90	.91	.89	.41

*Note. Male, n = 257 ; Female, n = 371.*

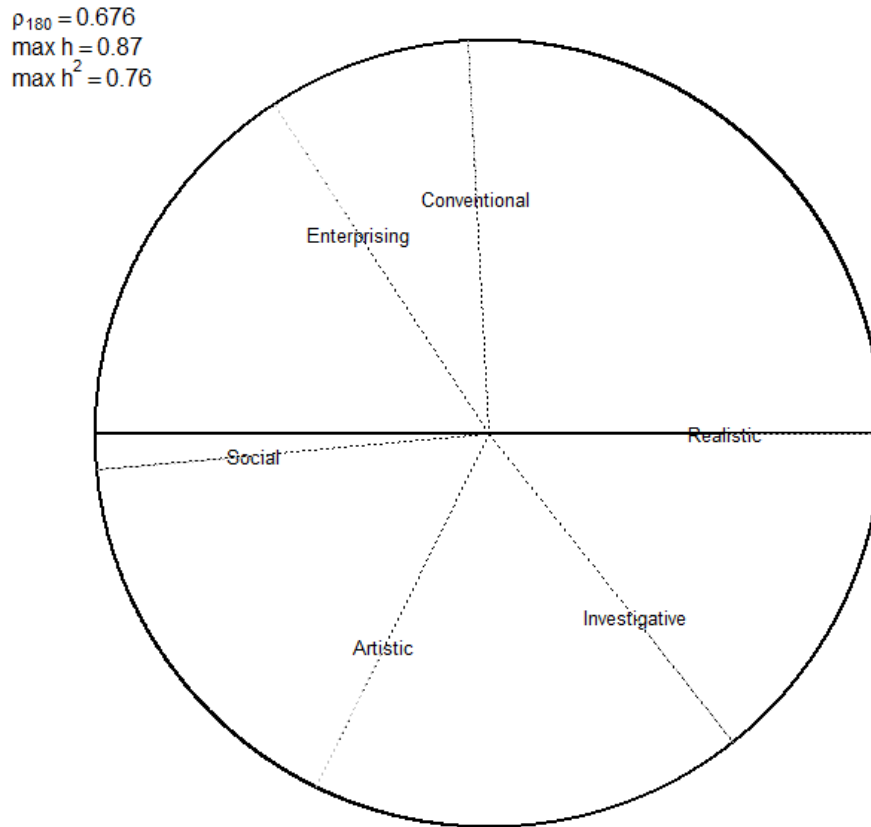
To test the circular structure of the six RIASEC types, the angular locations of the scales were plotted on the circumference of a circle. For both the male and female participants, the spacing between the RIASEC scales were not equal to the theorised 60° displacement. For the male participants, an estimated 60° spacing was evident between the Realistic, Investigative, and Artistic types. However, disordering was demonstrated between the Enterprising and Conventional types, and this displacement was exceedingly close. These results are presented in Figure 5.18.

For the female participants, the spacing between the RIASEC types were not equidistant ( $\neq$  60°), with an estimated 60° spacing approximated between the Realistic, Investigative, Artistic, and Social types, and with the Enterprising and Conventional scales displaced slightly closer. The

female participants demonstrated the highest degree of equal spacing across the respective subsample groups, as represented in Figure 5.19.



*Figure 5.18. Male angular locations of the six RIASEC types for the unconstrained model*



*Figure 5.19. Female angular locations of the RIASEC types for the unconstrained model*

In terms of race, the unconstrained model demonstrated the best overall fit across the four competing circumplex models for the Black, Coloured, and White participants. For the Black participants, the RMSEA values obtained by the four circumplex models were all unsatisfactory ( $> .08$ ). However, due to the small degrees of freedom associated with Holland's model, these results should be interpreted with caution (Kenny et al., 2011). In addition, the SRMR ( $< .05$ ), TLI, CFI, and GFI ( $> .90$ ) coefficients demonstrated satisfactory fit on the unconstrained and equal-spacing models. Moreover, the ECVI (.09) value for unconstrained model was the lowest across the four circumplex models for this subsample group. Similarly, for the Coloured participants, the best overall fit was demonstrated by the unconstrained model. Unsatisfactory RMSEA coefficients ( $> .08$ ) were obtained across the four circumplex models, potentially as a function of the small degrees of freedom (Kenny et al., 2011). However, for the unconstrained and equal-spacing

models, acceptable fit was demonstrated by the SRMR (< .05), TLI, CFI, and GFI (> .90), and the lowest ECVI (.12) value was obtained on the unconstrained model. Lastly, the results for the White participants indicated that across the four competing circumplex models, the unconstrained model obtained the best overall fit. The RMSEA (> .08) and SRMR (> .05) were unsatisfactory for all four models. However, due to the size of the White sample and small degrees of freedom associated with Holland's model (Kenny et al., 2011), these results should be interpreted considering these factors. Moreover, the unconstrained model obtained satisfactory fit on the CFI (.91) and GFI (.93), but failed to obtain satisfactory fit on the TLI (.55) coefficient. The fit statistics for the Black, Coloured, and White participants are presented in Table 5.32.

Table 5.32

*Fit statistics by race of the four circumplex models*

<i>Black</i>								
<i>ml</i>	$\chi^2$	<i>df</i>	RMSEA	SRMR	TLI	CFI	GFI	ECVI
Unconstrained	17.7	3	.09	.02	.97	.99	.99	.09
Equal-Communality	160.7	8	.17	.05	.90	.95	.93	.30
Equal-Spacing	95.5	8	.13	.03	.94	.03	.96	.19
Circulant	275.9	13	.18	.07	.89	.91	.88	.47
<i>Coloured</i>								
<i>ml</i>	$\chi^2$	<i>df</i>	RMSEA	SRMR	TLI	CFI	GFI	ECVI
Unconstrained	38.7	3	0.14	.03	.93	.99	.98	.12
Equal-Communality	224.9	8	0.21	.06	.91	.06	.90	.40
Equal-Spacing	113.9	8	0.15	.03	.92	.96	.95	.22
Circulant	313.8	13	0.19	.07	.86	.88	.86	.53
<i>White</i>								
<i>ml</i>	$\chi^2$	<i>df</i>	RMSEA	SRMR	TLI	CFI	GFI	ECVI
Unconstrained	136.6	3	.27	.07	.55	.91	.93	.28
Equal-Communality	383.5	8	.27	.10	.53	.75	.83	.66
Equal-Spacing	284.5	8	.24	.09	.65	.81	.87	.50
Circulant	565.6	13	.26	.15	.57	.63	.77	.93

*Note.* Black,  $n = 261$ ; Coloured,  $n = 303$ ; White,  $n = 59$ .

In addition, the angular locations of the three respective racial groups were plotted on the circumference of a circle to investigate the circular structure of the six RIASEC types. For all three racial groups, the theorised 60° displacement was rejected. That is, the RIASEC scales for the Black, Coloured, and White participants were not spaced equally ( $\neq 60^\circ$ ). For the Black participants, the Artistic and Social, and Enterprising and Conventional types demonstrated a relatively close displacement, whereas an estimated 60° spacing was evident between the Realistic and Investigative types (see Figure 5.20). Similarly, the Enterprising and Conventional types for the Coloured participants were space relatively closely, whereas the Realistic, Investigative, Artistic, and Social types demonstrated an approximate 60° displacement (see Figure 5.21). Lastly, the circular structure obtained by the White participants was similar to that of the Black participants, in that the Artistic and Social, and Enterprising and Conventional demonstrated a relatively close displacement, while an approximate 60° displacement was demonstrated between the Realistic and Investigative types. These results are represented in Figure 5.22.





Figure 5.20. Black participants' angular locations of the RIASEC types for the unconstrained model

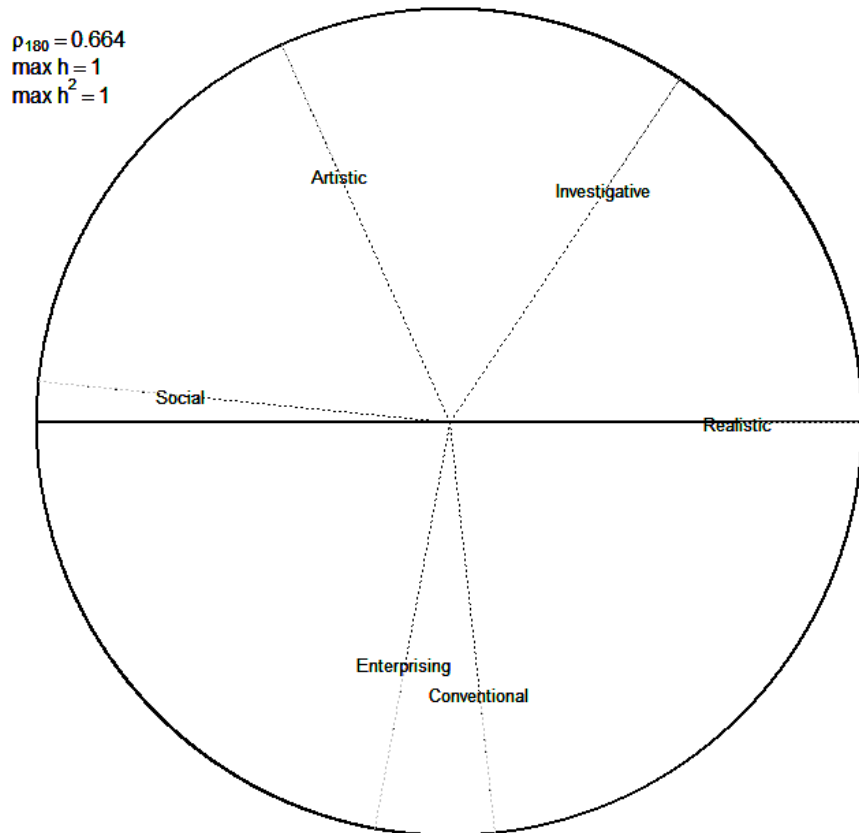


Figure 5.21. Coloured participants' angular locations of the RIASEC types for the unconstrained model

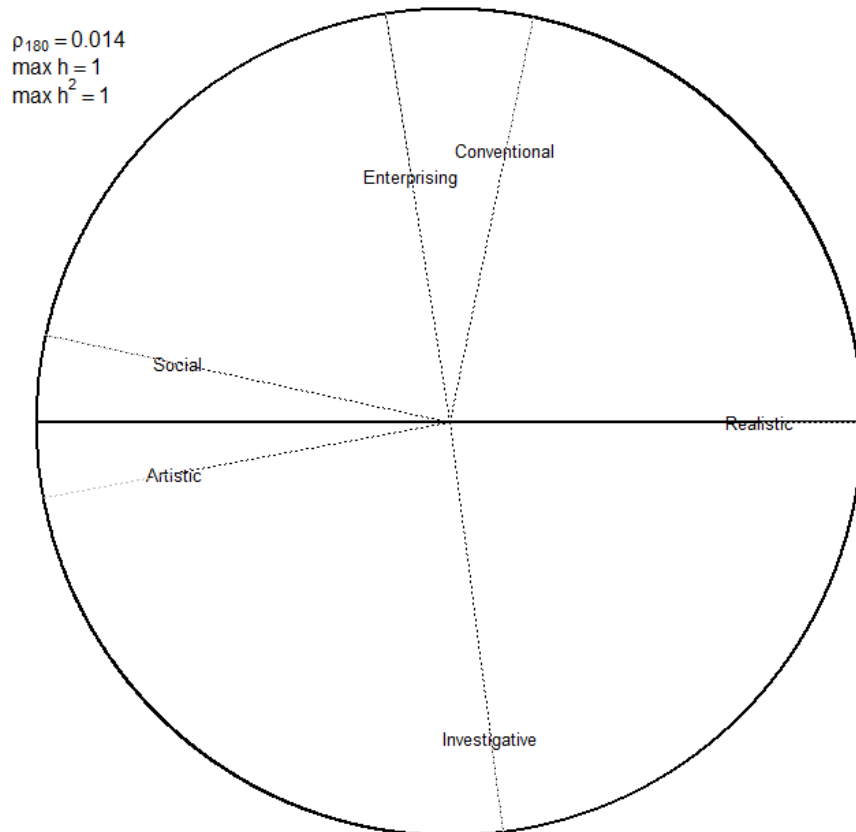


Figure 5.22. White participants' angular locations of the RIASEC types for the unconstrained model

Finally, in terms of language, the best overall model fit for the Afrikaans, English, and isiXhosa participants was demonstrated on the unconstrained model, and as a whole, the results for the isiXhosa participants signified better comparative model-fit. For the Afrikaans participants, the RMSEA values were unsatisfactory (i.e.,  $> .08$ ) for all four circumplex models, potentially due to the small degrees of freedom associated with Holland's model (Kenny et al., 2011). However, satisfactory fit was demonstrated by the SRMR ( $< .05$ ), TLI, CFI, and GFI ( $> .90$ ) coefficients on the unconstrained and equal-spacing models. In addition, the unconstrained model demonstrated the lowest ECVI (.11) value across the competing models.

For the English participants, unsatisfactory RMSEA ( $> .08$ ) values were demonstrated on the four circumplex models. However, due to the small sample size and degrees of freedom (Kenny et al., 2011), these result may be meaningless. Furthermore, acceptable fit was demonstrated on

the SRMR (.05), CFI (.92), and GFI (.94) coefficients for the unconstrained model – unsatisfactory fit was obtained on the TLI (.62) coefficient. As with previous results, the unconstrained model obtained the lowest ECVI (.27) value.

Finally, for the isiXhosa participants, marginally satisfactory fit was obtained by the RMSEA (.08) for the unconstrained model – the remaining three models, however, produced unsatisfactory fit (i.e., > .08). However, acceptable fit was obtained on the SRMR ( $\leq$  .05), TLI, CFI, and GFI (> .90) coefficients for the unconstrained, equal-communality, and equal-spacing models. For the circulant model, these coefficients were marginally unsatisfactory. Lastly, the unconstrained model demonstrated the lowest ECVI (.09) value across the four competing circumplex models. The fit statistics by language are presented in Table 5.33.

Table 5.33

*Fit statistics by language of the four circumplex models*

<i>Afrikaans</i>								
<i>ml</i>	$\chi^2$	<i>df</i>	RMSEA	SRMR	TLI	CFI	GFI	ECVI
Unconstrained	29.5	3	.12	.03	.95	.99	.99	.11
Equal-Communality	250.5	8	.22	.06	.81	.90	.89	.44
Equal-Spacing	113.0	8	.15	.03	.92	.96	.96	.22
Circulant	345.3	13	.20	.08	.84	.86	.85	.58
<i>English</i>								
<i>ml</i>	$\chi^2$	<i>df</i>	RMSEA	SRMR	TLI	CFI	GFI	ECVI
Unconstrained	132.9	3	.26	.05	.62	.92	.94	.27
Equal-Communality	330.8	8	.25	.08	.65	.81	.85	.57
Equal-Spacing	331.0	8	.25	.08	.65	.81	.85	.57
Circulant	501.9	13	.25	.12	.67	.71	.79	.83
<i>isiXhosa</i>								
<i>ml</i>	$\chi^2$	<i>df</i>	RMSEA	SRMR	TLI	CFI	GFI	ECVI
Unconstrained	17.4	3	0.08	0.02	0.98	1.00	0.99	0.09
Equal-Communality	162.8	8	0.18	0.05	0.90	0.95	0.92	0.30
Equal-Spacing	99.9	8	0.14	0.03	0.94	0.97	0.95	0.20
Circulant	278.1	13	0.18	0.07	0.89	0.91	0.88	0.47

Note. Afrikaans,  $n = 338$ ; English,  $n = 24$ ; isiXhosa,  $n = 266$ .

The circular structure of the respective language groups was investigated by plotting the angular locations of the six RIASEC types on the circumference of a circle. Similar to previous results, the displacement of the six RIASEC types were in contrast to the theorised  $60^\circ$ . In particular, the RIASEC scales for the Afrikaans, English, and isiXhosa participants were not equally spaced ( $\neq 60^\circ$ ). For the Afrikaans participants, an estimated  $60^\circ$  spacing was evident between the Realistic, Investigative, Artistic and Social types, whereas the Enterprising and Conventional types were spaced relatively close to each other (see Figure 5.23). Similar results were demonstrated by the English participants, with the Enterprising and Conventional types spaced relatively close to each other, whereas the Realistic, Investigative, Artistic, and Social types demonstrated an approximate  $60^\circ$  displacement (see Figure 5.24). Lastly, for the isiXhosa participants, the Artistic and Social, and Enterprising and Conventional types demonstrated a relatively close displacement, whereas an estimated  $60^\circ$  spacing was evident between the Realistic and Investigative types. These results are represented in Figure 5.25.

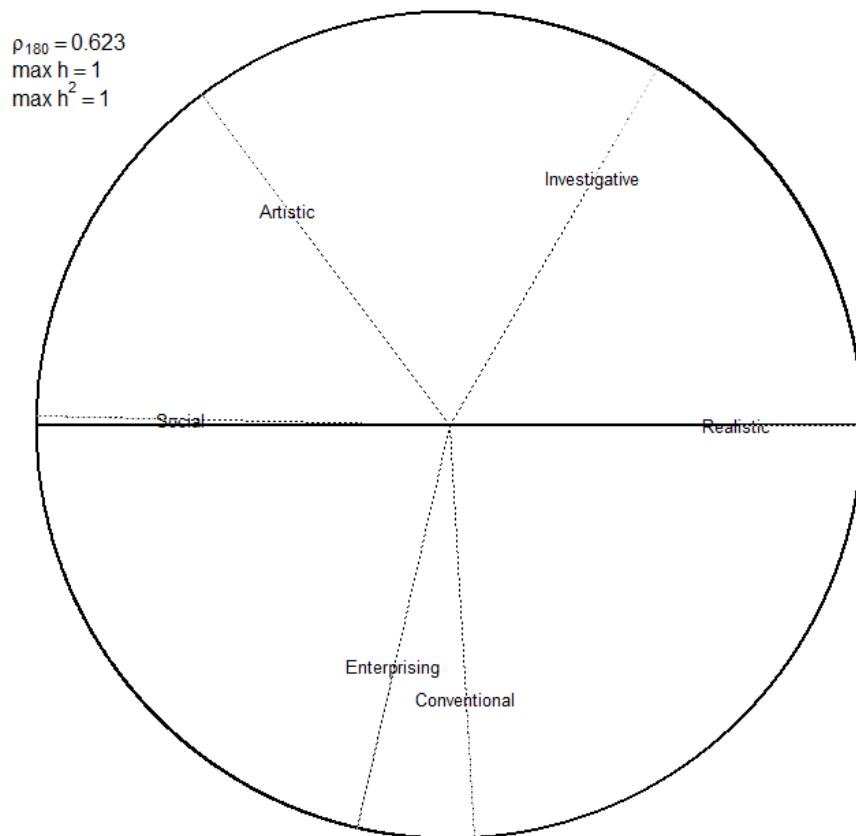


Figure 5.23. Afrikaans participants' angular locations of the RIASEC types for the unconstrained model

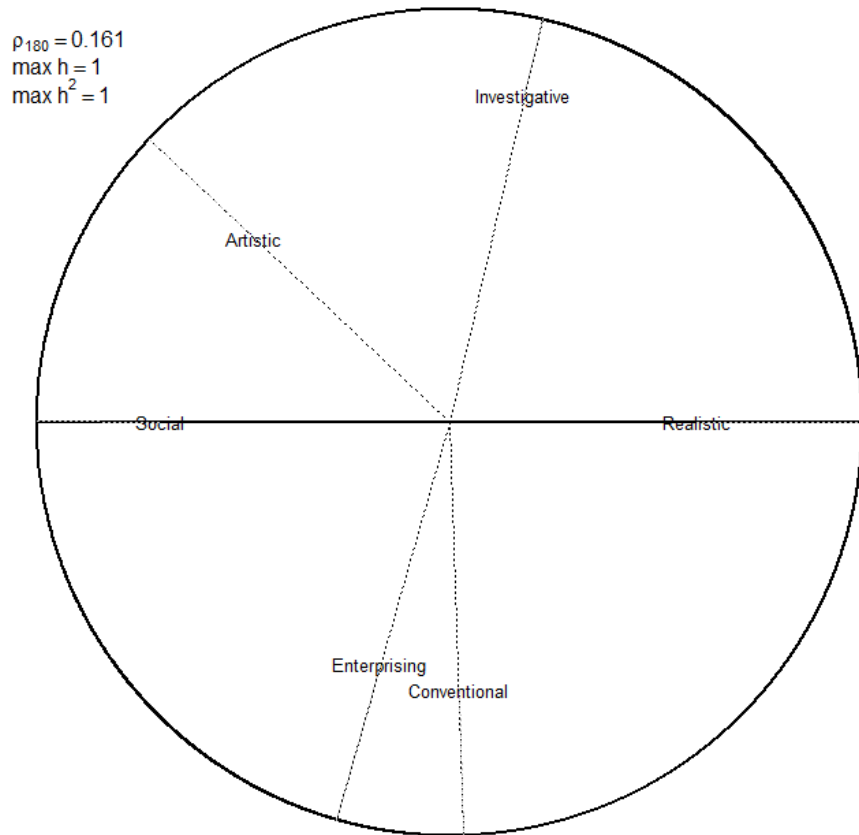


Figure 5.24. English participants' angular locations of the RIASEC types for the unconstrained model

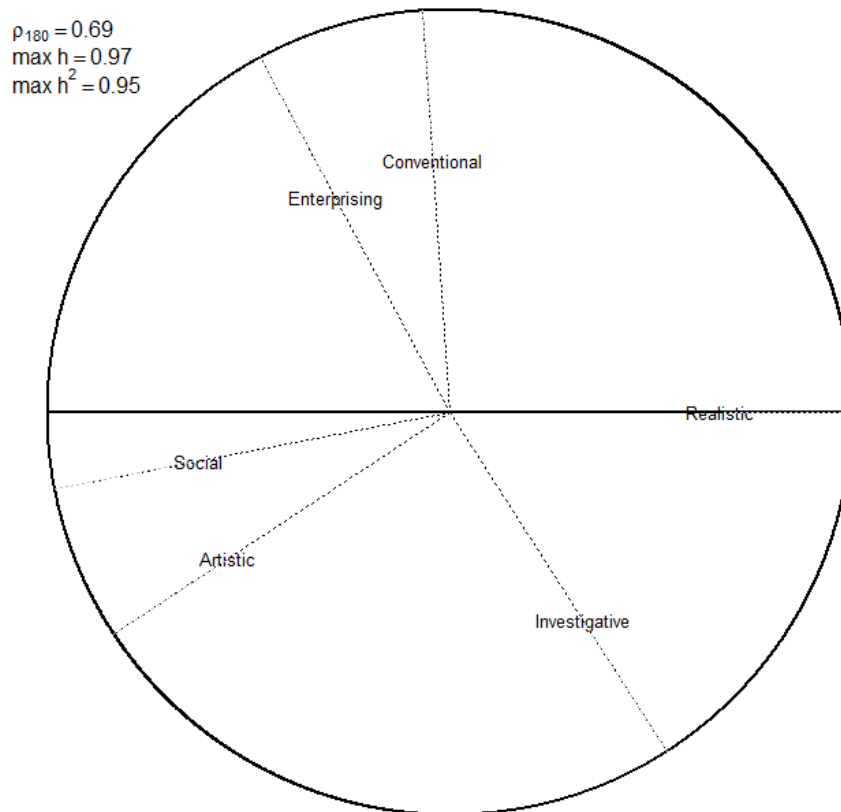


Figure 5.25. isiXhosa participants' angular locations of the RIASEC types for the unconstrained model

### 5.10 Discriminant analysis

The comparison of model fit using RTHOR was followed up with discriminant analysis (DA) to investigate significant differences across gender, race, and language. For each sample group, DA was applied to the entire sample, which was followed by analysis at the scale level.

The results for the DA by gender revealed one discriminant function that accounted for 100% of the variance. The results indicated that for the entire sample, there were significant differences in the interest structure of males and females, with  $\Lambda = .672$ ,  $\chi^2(1) = 247.9$ ,  $p = .000$ . The canonical  $R^2 = 0.33$  demonstrated a medium effect size, which explained 9% of the total variance. The results at the scale level indicated that for the Realistic scale, there were significant differences between males and females, with  $\Lambda = .859$ ,  $\chi^2(1) = 94.9$ ,  $p = .000$ . The canonical  $R^2 = 0.14$  demonstrated a small effect size, which explained only 1% of the total variance. The functions at group centroids indicated that the female participants were discriminated by the Realistic scale (-.33). In other

words, the male participants achieved improved scores Realistic scale when compared to the female participants. The results for the Social scale demonstrated significant differences between males and females, with  $\Lambda = .932$ ,  $\chi^2 (1) = 44.031$ ,  $p = .000$ . The canonical  $R^2 = 0.07$  demonstrated a small effect size, which explained only 1% of the total variance. The functions at group centroids indicated that the male participants were discriminated by the Social scale ( $r = -.32$ ), which means that the Social scale was more applicable for the female participants. For the remainder of the scales, there were no significant difference between males and females. The results for the entire sample and for the six scales on the SACII by gender are presented in Table 5.34.

Table 5.34

*Discriminant analysis for total sample and SACII scales by gender*

	Wilk's Lambda ( $\Lambda$ )	Chi-square	$p$	$R^2$	Function at group centroids (Males)	Function at group centroids (Females)
Total	.672	247.9	.000	0.33	.	.
R	.859	94.9	.000	0.14	.486	-.33
I	.998	1.272	.259	0.00	.054	-.037
A	.995	3.435	.064	0.01	-.089	.062
S	.932	44.031	.000	0.07	-.324	.224
E	1.000	0.03	.955	0.00	-.003	.002
C	.999	.812	.368	0.00	.043	-.030

*Note.* Female  $N = 371$ ; Males  $N = 257$

The results for the DA by race revealed three discriminant functions. For the entire sample, the first function explained 78.7% of the variance, canonical  $R^2 = .18$ , whereas the second function explained 17.3 % of the variance, canonical  $R^2 = .05$ , and the third function explained 4.0% of the variance, canonical  $R^2 = .00$ . In combination, the first and second functions indicated significant differences between the racial groups, with  $\Lambda = .772$ ,  $\chi^2 (18) = 160.574$ ,  $p = .000$ . Similarly, the combination of the second and third function demonstrated significant differences between the racial groups, with  $\Lambda = .943$ ,  $\chi^2 (10) = 36.369$ ,  $p = .000$ . However, the removal of the first and

second function indicated that the third function did not significantly differentiate the racial groups,  $\Lambda = .989$ ,  $\chi^2(4) = 6.956$ ,  $p = .138$ . At the scale level, five of the six scales on the SACII demonstrated significant differences, with only the Investigative scale not indicating significant differences across the racial groups,  $\Lambda = .994$ ,  $\chi^2(4) = 3.665$ ,  $p = .300$ . The canonical  $R^2 = 0.01$  demonstrated a small effect size, which explained only 1% of the total variance. The results for the six scales on the SACII by race are presented in Table 5.35.

Table 5.35

*Discriminant analysis for SACII scales by race*

	Wilk's Lambda ( $\Lambda$ )	Chi- square	$p$	$R^2$	Function at group centroids (Black)	Function at group centroids (Coloured)	Function at group centroids (White)
R	.923	50.071	.000	0.07	.245	-.054	-.731
I	.994	3.665	.300	0.01	.066	-.018	-.170
A	.908	60.463	.000	0.09	.269	-.061	-.855
S	.916	55.037	.000	0.08	.152	.057	-.890
E	.912	57.336	.000	0.09	.135	.075	-.869
C	.915	55.143	.000	0.09	.211	-.007	-.772

*Note.* Black  $N = 261$ ; Coloured  $N = 303$ ; White  $N = 59$ . Indian/Asian sample excluded due to small sample size ( $n = 5$ ).

Lastly, the results by language revealed two discriminant functions. The first function accounted for 81.8% of the variance, canonical  $R^2 = .03$ , while the second function accounted for 18.2% of the variance,  $R^2 = .01$ . When combined, these two functions significantly discriminated the language groups,  $\Lambda = .965$ ,  $\chi^2(12) = 22.017$ ,  $p = .037$ . However, the removal of the first function revealed that the second function did not differentiate significantly between the Afrikaans, English and isiXhosa participants,  $\Lambda = .994$ ,  $\chi^2(5) = 4.036$ ,  $p = .544$ . In addition, the results revealed that there were no statistically significant differences at the scale level across the respective language groups. For example, the Artistic scale demonstrated no significant differences across the language groups, with  $\Lambda = .995$ ,  $\chi^2(2) = 2.859$ ,  $p = .239$ . The canonical  $R^2 = 0.01$



demonstrated a small effect size, which explained only 1% of the total variance. The functions at group centroids indicated that the Afrikaans participants were discriminated by the Artistic scale (.061). The results for the English participants should be interpreted with caution due to the small size of the sample ( $n = 24$ ). The results for the six scales on the SACII by language are presented in Table 5.36.

Table 5.36

*Discriminant analysis for SACII scales by language*

	Wilk's Lambda ( $\Lambda$ )	Chi- square	$p$	$R^2$	Function at group centroids (Afrikaans)	Function at group centroids (English)	Function at group centroids (isiXhosa)
R	.998	1.004	.605	0.00	.024	-.177	-.014
I	.999	.590	.745	0.00	.024	-.106	-.021
A	.995	2.859	.239	0.01	.061	-.146	-.064
S	.999	.339	.844	0.00	-.020	-.021	.027
E	.999	.747	.688	0.00	-.026	-.072	.039
C	.998	1.012	.603	0.00	.026	.110	-.043

*Note.* Afrikaans N = 338; English N = 24; isiXhosa N = 266

### 5.11 Chapter summary

In this chapter, the results for the differences in psychometric properties on the South African Career Interests Inventory across gender and race among secondary school learners were presented. For the first hypothesis, the results indicated statistically significant differences in the interest structure of male and female Grade 9 learners. In particular, the results demonstrated a tight circular ordering for the female sample that is consistent with Holland's calculus assumptions. However, the male participants demonstrated disordering between the Enterprising and Conventional scales and the calculus assumption was violated. Moreover, the discriminant analyses revealed significant differences at the scale level, with the results indicating that males obtained significantly higher scores on the Realistic scale, whereas the female participants obtained significantly higher scores on the Social scale.

For the second hypothesis, the RTHOR and discriminant analyses demonstrated no significant differences in the interest structure of Black, Coloured and White Grade 9 learners. However, the discriminant analyses revealed significant differences at the group and scale level in terms of race for the first and second functions. The removal of the first and second functions, however, indicated that for the third function, there are no significant differences between the racial groups. Therefore, two underlying dimensions can explain the group differences in terms of race (as will be explicated in the next chapter).

Finally, the RTHOR analyses indicated that there were no significant differences in the interest structure of the Afrikaans and isiXhosa-speaking participants. For the English-speaking participants, disordering between the scales was demonstrated, but due to the small size of this sample, the result is meaningless. The discriminant analyses demonstrated significant group differences for the combination of the two identified functions, but non-significant group differences for the second function when the first function was removed. This signified that underlying dimensions could explain the group differences. However, the discriminant analysis at the scale level provided support for the RTHOR analysis, indicating no significant differences across the language groups for the respective scales on the SACII.

In the next chapter, a discussion of the results is presented. This is followed by a presentation of the current study's implications, recommendations, limitations and conclusions.

## CHAPTER 6

### DISCUSSION, RECOMMENDATIONS AND CONCLUSIONS

#### 6.1 Introduction

Contemporary South Africa is continuously faced with a myriad of socio-economic challenges. Accessible employment for the South African population has been thwarted by increasing inflation rates, budgetary restrictions, recessionary impacts, unsustainable employment opportunities and growing income inequality (Mahadea & Simson, 2010; Morgan, 2014). These challenges have resulted in 25.20% of the South African population being unemployed (Statistics South Africa, 2014). What is more concerning is that these unemployment rates are unequally distributed, with statistics indicating an unemployment rate of 36.10% for the youth population (SSA, 2014).

Morgan (2014) argues that adolescence and young adulthood is a particularly vulnerable period for career development since, in addition to unemployment, South African youth are confronted with various career-related concerns. These include insufficient knowledge of career opportunities (Mpofu, Maree, Kasayira, & Van der Westhuizen, 2011), a lack of information regarding local labour markets (Sharf, 2010), uncertainty related to career interests, and limited or inaccessible career counselling and assessment at school (Morgan, 2014; Ruane, Kasayira, & Shino, 2011). Moreover, many schools in disadvantaged communities have minimal career resources (Miles & Naidoo, 2017) and Grade 11 learners report having few viable career role models to emulate (Matshabane, 2016). Most concerning, the career measures adolescents and young adults can access in South Africa are considered outdated, and do not reflect the contemporary world of work (Morgan, 2014). Accordingly, this has led to a call for a contextually and culturally sensitive, indigenised career approaches (Naidoo et al., 2016; Stead & Watson, 2013; Watson, 2010). Practically, this implies that individuals from diverse cultural, language, and socioeconomic environments should be given equal opportunity to complete or respond to any career measure.

This investigation sought to build on Morgan's (2014) initial development of the South African Career Interest Inventory (SACII), by adapting and translating this career measure into isiXhosa and Afrikaans, and produce scores that are reliable and valid in the South African context. Furthermore, the present study investigated gender, racial, and language differences on the SACII. There is an increasing need for career-related research in South Africa in order to promote equity and social justice (Miles, 2015; Prilleltensky & Nelson, 2002). However, the lack

of contextually appropriate, indigenised career measures continues to reinforce the marginalisation of certain groups in South Africa. Accordingly, the present study also sought to afford more individuals with the opportunity to assess their career interest in their first language.

In this final chapter, a discussion of the results of the study is presented. Firstly, the unique contributions of this study are elucidated. The unique contributions emerged as a strategy to address the socio-political and emic challenges related to career counselling in South Africa. Accordingly, in order to address this study's hypotheses, a relevant, reliable and valid version of the SACII was provided in the first language of the participants. In view of these contributions, the results are discussed in relation to the study's research hypotheses. This is followed by a presentation of the implications for theory and practice and recommendations for future research. Finally, an account of the limitations of the study is presented, followed by a conclusion of this investigation.

## **6.2 Unique contributions of the study**

A number of important contributions are made by present study, both to the field of career counselling in the South African context, and the assessment of career interests based on Holland's (1997) theory of vocational personalities. Foremost, the most notable contribution made by this study is the development of the first career interest inventory available for isiXhosa-speaking individuals. Secondly, this study provided a back-translation on the Afrikaans version of the SACII, which was previously unavailable. In addition, prior to this study, the Afrikaans SACII had not been administered to any individuals. Finally, this study applied three measures of invariance to investigate the equal applicability of the Afrikaans and isiXhosa versions of the SACII. In the following section, each of these contributions is discussed in detail.

### **6.2.1 The development of the first isiXhosa career interest inventory in South Africa**

Psychometric measurement in the South African context, as discussed in section 3.2, has a contentious history (cf. Dovey, 1983; Foxcroft & Davies, 2008; Mayekiso et al., 2004; Naidoo et al., 2016; Pretorius, 2008, 2012). During South Africa's apartheid era, testing practices played an integral role in the stratification and marginalisation of a large proportion of the South Africa population, creating limited career opportunities and imbalanced labour markets (Naidoo et al., 2016; Pretorius, 2008; 2012). Despite the promulgation of new legislation by the democratic government to address these imbalances (Naidoo et al., 2016), fair and valid testing practices are not upheld in South Africa (Foxcroft et al., 2004; Pretorius, 2008; 2012). In particular, since the

early 1990's, there have been limited developments in the assessment of vocational interests, rendering popular local inventories outdated, both in terms of content and occupational environments (Morgan, 2014).

Through the development of the SACII, initial steps were taken by Morgan (2014) to address these limitations. The items in the original SACII were written using a constrained emic approach to reflect contemporary career opportunities and pertinent South African occupational environments (Morgan, 2014). Moreover, in contrast to popular local career interest inventories, (such as the SDS (Gevers et al., 1997) and MB-10 (Meyer, 2003), which used primarily White, English- and Afrikaans-speaking samples in their standardisation studies during the 1980s), the SACII was developed and investigated using diverse sample groups in terms of gender, ethnicity, language, age and occupational status (Morgan, 2014).

Notwithstanding, the initial advancements made by Morgan (2014) in developing the SACII, the instrument is limited by one major factor: language availability. Prior to the present study, the SACII was only available in two languages, namely Afrikaans and English. In terms of the 11 officially recognised languages in South Africa, the SACII is only accessible to a small proportion of the population. For instance, Afrikaans is the home language for 13.5% of South Africans, while 9.60% of the population is English speaking (SSA, 2011). Accordingly, in combination, these two language groups account for less than a quarter (23.10%) of the South African population. Yet, the majority of career assessment measures in South Africa are only available in English, with a handful of instruments translated into Afrikaans (Health Professions Council of South Africa (HPCSA), 2014). In contrast, isiXhosa, second to only isiZulu, is the most prevalent language in South Africa, with 16.0% of the national population speaking isiXhosa. More specifically, it is the most common first language in the Eastern Cape, where 78.8% of the population is isiXhosa-speaking and the second-most common language in the Western Cape, where 24.7% of the population speak isiXhosa (SSA, 2011). However, in spite of these demographic statistics, there are presently no career interest inventories available in South Africa for isiXhosa-speaking individuals (HPSCA, 2014; K. de Bruin, personal communication, July 28, 2016; C. Foxcroft, personal communication, July 26, 2016; J. G. Maree, personal communication, July 29, 2016; M. Watson, personal communication, July 27, 2016).

In order to address this shortcoming, the present study sought to develop an isiXhosa translation of the SACII (the SACII-X). To attain this objective, the following steps were

employed. The English version of the SACII was adapted and translated into isiXhosa using a committee forward-translation, back-translation design (de Kock et al., 2013). The items were translated to include language that accommodates various isiXhosa dialects and the contextual factors of amaXhosa individuals from diverse backgrounds. In spite of certain challenges related to the translation process, the SACII-X was refined and deemed appropriate to be employed as one of the primary research instruments for this study. Accordingly, through a variety of psychometric analytic techniques, the study was able to examine the interest structure of isiXhosa-speaking adolescents in their first language and assess the validity of Holland's typology for this under-researched population in the South African context.

The results en bloc for the isiXhosa participants provide support for the psychometric properties of the SACII-X. Regarding the reliability of the SACII-X, both Cronbach's alpha and Guttman's Lambda 6 were all acceptable ( $> .85$ ); the angular locations and communality estimates resembled a loose circular ordering, and most importantly, the RTHOR, MDS and CCSM analyses indicated that a circular ordering structure, consistent with Holland's (1997) calculus assumption, emerged from the data for isiXhosa-speaking adolescents.

The RTHOR analysis was also employed to compare the model fit across the different language groups. There were no significant differences between the Afrikaans, English and isiXhosa participants. Moreover, the results indicated that for all of the language groups, the model fit was best for the isiXhosa participants ( $CI = -.03$ ;  $p = .6500$ ). These results are in line with international research on the adaptation and translation of measures based on Holland's (1997) RIASEC typology (Einarsdóttir et al., 2002; Iliescu et al., 2013; Sidiropoulou-Dimakakou et al., 2008; Šverko & Babarović, 2006; Tak, 2004; Tien, 2009; Zhang et al., 2013). For example, Sidiropoulou-Dimakakou et al. (2008) employed a forward-back translation procedure to develop the Greek version of the SDS. They found support for the validity of Holland's model in Greece, demonstrating similarities in the interest structures of students from the United States and Greece. However, certain inconsistencies were detected in the circular ordering of their sample, which were ascribed to differences in Greek cultural parameters. Similarly, Šverko and Babarović (2006) using a committee forward-back translation procedure in developing the Croatian SDS, demonstrated the reliability and validity of Holland's model in Croatia, as well as adequate circular ordering for the RIASEC structure.

Notwithstanding, the present study can be distinguished from the aforementioned studies based on one primary factor. The majority of international research studies employ an imposed etic approach (Berry, 1989; Church & Lonner, 1998) during the translation and adaptation process, where the items in a measure are directly imported from one country to another (Einarsdóttir et al., 2010). Accordingly, the items are translated and adapted without consideration of the relevance of the theory or the items in the new culture (Einarsdóttir et al., 2010). In contrast, the SACII was originally developed using a constrained emic approach (Morgan, 2014) and the current study translated the items in the SACII using the same method to ensure that the items were representative of the South African context and the Xhosa culture in particular.

More importantly, the results of the present study provide further support for the validity of Holland's RIASEC typology in South Africa (Morgan et al., 2014; 2015) for English, Afrikaans and isiXhosa speaking adolescents, differing from the findings of previous local studies that concluded that Holland's model is invalid in the South African context (Deller, 1997; du Toit & de Bruin, 2002; Schonegevel, 1997). In particular, du Toit and de Bruin (2002), using an English version of the South African SDS, reported unsatisfactory fit between the observed data and the hypothesised circular ordering and found Holland's (1997) RIASEC model to be invalid among Black, female and male South African samples. du Toit and de Bruin's (2002, p. 75) explanations for their findings are elucidating:

A further possible explanation for the unsatisfactory fit between the data and Holland's model is that the participants did not fully understand the meaning of the items. It should be remembered that the participants completed the SDS in English, which in almost all the cases would have been their second or even third language. An interesting question is whether a better fit can be obtained if the SDS is translated into isiXhosa and seTswana.

In using an isiXhosa translation of the SACII, the current study not only obtained a better fit, but there was a satisfactory fit between the observed data and the hypothesised circular ordering, with the  $CI = .69$  comfortably exceeding the non-U.S. average  $CI$  value of  $.48$  (Rounds & Tracey, 1996). The constrained MDS analysis also demonstrated the correct circular ordering and satisfactory VAF coefficients ( $\geq .68$ ) to emerge from the data for the isiXhosa participants. In addition, the VAF coefficient obtained by the isiXhosa participants echoes previous research

(Darcy & Tracey, 2007; Einarsdóttir et al., 2002) and surpasses the VAF coefficient (.75) obtained in Rounds and Tracey's (1993) international meta-analysis. Furthermore, the CCSM analysis demonstrated satisfactory fit on the unconstrained, equal-communality, and equal-spacing models for the isiXhosa participants ( $SRMR \leq .05$ ; TLI, CFI, GFI  $\geq .90$ ), and marginal unsatisfactory fit demonstrated on the circulant model, indicating that for this subsample group, Holland's (1997) model approximated a circumplex. Within this context, a conclusion can be made that, through the use of the SACII-X, Holland's RAISEC model was found to be reliable and valid among an adolescent, isiXhosa-speaking sample. Hence, the SACII-X, as a valid contextually specific interest questionnaire based on Holland's theory of vocational personality, can be utilised in career counselling and assessment with isiXhosa-speaking adolescents.

### **6.2.2 Providing a back-translation for the Afrikaans version of the SACII**

The original version of the SACII was developed in English, and in order to provide more individuals with access to the instrument, it was subsequently translated into Afrikaans (Morgan, 2014). This translation procedure only included a forward-translation design and the Afrikaans items in the SACII were not back-translated into English (B. Morgan, personal communication, August 26, 2015). As a matter of necessity, contemporary researchers and practitioners consider back-translation designs important mechanisms of quality control (Mohatlane, 2014). Moreover, translating items from the target language back into the source language serves as a tool to improve the accuracy of meaning across different languages (Mohatlane, 2014). Accordingly, this technique is important to ensure that the translated concepts are understood similarly between different groups. As such, differences between the two versions might be indicative of translation errors, which in turn could influence participants' responses on the instrument. Within this context, through only employing a forward-translation design, the nuanced career content might have been lost in the original Afrikaans translation of the SACII.

In addition, Morgan's (2014) original investigation and standardisation of the SACII, despite the development of an Afrikaans version, exclusively employed the English version of the SACII as the primary research instrument of the study. Essentially, prior to the current study, the Afrikaans version of the SACII had not been used for research purposes. It appears that the exclusive administration of the English SACII influenced Morgan's (2014) results, as the constrained MDS indicated that the White participants (who likely would have included English and Afrikaans first language speakers) produced the most desirable variance accounted for (VAF)



value for all of the ethnic groups. Accordingly, from a constrained MDS perspective, Morgan (2014) suggested that it is possible that the first language of the participants could possibly account for the better fit for the White participants. In this sense, it was necessary to assess the validity of the Afrikaans SACII, and therefore Holland's model, with Afrikaans speakers within the South African context.

To address the limitations discussed above, the Afrikaans version of the SACII was back-translated into English using a committee, back-translation design (de Kock et al., 2013). In order to examine the equivalence of the English and Afrikaans versions, the original English version of the SACII was compared to the English back-translation of the Afrikaans version of the SACII. Despite some minor amendments to certain items in the Afrikaans SACII (see section 4.7.2), the similarity in content between the two English versions demonstrated that the Afrikaans version accurately captured similar career-related content. In addition, professional language editing provided support that the revised Afrikaans SACII (SACII-Afrikaans) can be employed as one of the primary research instruments for the present study. Accordingly, the current study presents the first administration of the Afrikaans version of the SACII to a sample of Grade 9 secondary school learners.

The results reported for the Afrikaans participants were promising. For all of the language groups, the Afrikaans participants demonstrated the highest reliability coefficients ( $> .90$ ), and the angular locations and communality estimates and CCSM analysis (i.e., the unconstrained model) demonstrated a loose circular ordering (Browne, 1992; Morgan, 2014) for Afrikaans speaking adolescents. These results resonated with both international (Armstrong et al., 2003; Darcy & Tracey, 2007; Holland, 1997) and local (Gevers et al., 1997; Morgan, 2014) research studies that have produced favourable results for the loose circular ordering model. For example, in their standardisation of the South African SDS, Gevers et al. (1997) found support for the loose circular ordering model within the South African context. These results make an important contribution to the applicability of Holland's model in cross-cultural contexts, as there are conflicting results regarding which model provides the best representation of Holland's (1997) vocational personality types within the South African context (Morgan, 2014; Tracey, 2000; Tracey & Rounds, 1993). Additionally, the approximation of a loose circular ordering for the Afrikaans participants contradicts du Toit and de Bruin's (2002) conclusion that, within the South African context, a loose- or tight- circular ordering are inconsistent with Holland's RIASEC typology.

The support for the loose circular ordering was augmented by the RTHOR, MDS, and CCSM analyses, which indicated that the interest structure of the Afrikaans participants was consistent with a loose circular ordering model. Accordingly, the results provided further support for Holland's (1997) calculus assumption. Among all three language groups, the Afrikaans participants obtained the lowest CI values (.60;  $p = .0333$ ). In spite of this, these CI values comfortably exceeded Rounds and Tracey's (1996) average non-U.S. CI value of .48. Moreover, these results closely correspond with other international studies that examined the applicability of the loose circular ordering model in cross-cultural contexts (Iliescu et al., 2013; Šverko & Babarović, 2006; Tak, 2004). Similarly, Morgan's (2014) original examination of the SACII found support for the tight circular ordering hypothesis across the language groups. Moreover, the constrained MDS results demonstrated the correct circular ordering to emerge from the data for the Afrikaans participants, and also produced a VAF coefficient (.83) that comfortably exceeded Rounds and Tracey's (1993) meta-analytic VAF (.75), and also compared favourably to previous research (Darcy & Tracey, 2007; Einarsdóttir et al., 2002). The results for the CCSM also demonstrated satisfactory fit on the unconstrained model (i.e., loose circular ordering model), with unsatisfactory fit obtained on the equal-communality, equal-spacing, and circulant models. These results should be interpreted within the context of extant research, where a number of circumplex covariance structure modelling analyses also obtained unsatisfactory fit (Darcy & Tracey, 2007; Gupta, 2008). Notwithstanding, the current findings confirm the application of Holland's model for Afrikaans speaking participants.

Notwithstanding the limitations of the present study, these results provide support for the use of Holland's (1997) RIASEC model in the assessment of vocational interest with Afrikaans speaking adolescents within the South African context. In addition, the circular ordering model consistent with the calculus assumption lends support for the validity of the Afrikaans translation of the SACII. While there is a need for more work to be done to replicate these findings, this study signifies the strong potential of the SACII to be used as a measure of vocational interests for South Africans of different gender, racial and language groups.

### **6.2.3 Examining the equivalence between the Afrikaans and isiXhosa versions of the SACII**

The comparison of groups in psychological research often assumes that research instruments (e.g., surveys, questionnaires) measure the same psychological construct (Milfont & Fischer, 2010). In instances where this assumption is met, valid group comparison can be conducted and

the similarities and/or difference between the groups can interpreted in a meaningful manner (Cheung & Rensvold, 2002). However, if the instrument is discordant across groups, the interpretation of the differences and similarities between the groups might not be meaningful (Milfont & Fischer, 2010). In response to this, Cheung and Rensvold (2002) aver that measurement invariance is imperative to establish when group comparisons are conducted. Specifically, without the establishment of measurement invariance, between-group differences cannot be interpreted unambiguously, as the differences may be ascribed to differential functioning on the scales or items, rather than attitudinal differences (Cheung & Rensvold, 2002). In cross-cultural research, measurement invariance is particularly important when participants speak different languages, or when translated versions of a research instrument are employed (Cheung & Rensvold, 2002; Janssens, Brett, & Smith, 1995; Reise, Widaman, & Pugh, 1993; Riordan & Vandenberg, 1994; Steenkamp & Baumgartner, 1998).

In view of the objectives and hypotheses of the present study, an attempt was made to establish measurement invariance for the Afrikaans and isiXhosa versions of the SACII. However, considering the length of the SACII (143 items), and therefore the inadvertent number of parameters, the sample size of the present study was insufficient to run a full structural equation model (Kline, 2011) on the entire SACII scale. To address this, a MGCFA was conducted on each of the six RIASEC scales on the SACII to determine measurement invariance. In order to conduct meaningful group comparisons, three measures of invariance were investigated, namely configural invariance, metric invariance and scalar invariance. Configural invariance was employed as a baseline measure of invariance, and the establishment thereof warranted the examination of metric invariance. If metric invariance was established, the investigation of scalar invariance was merited. Accordingly, the measurement invariance tests were sequential and dependent on the establishment of previous measures of invariance (Davis, 2014).

The results for the investigation of measurement invariance provided promise of the equal applicability of the Afrikaans and isiXhosa SACII. With the exception of the Artistic scale, configural invariance was established for five of the six RIASEC scales. For the Realistic, Investigative, Social, Enterprising and Conventional scale, the measurement model fitted successfully under the condition of configural invariance. This revealed that for the Afrikaans and isiXhosa participants, the scales on the SACII reflected the same underlying constructs. Moreover, the results signified that the different language groups employed the same conceptual framework

when responding to the items (Davis, 2014). These results indicated that for the five scales, construct validity was established (van de Vijver & Tanzer, 2004). That is, the scales were measuring what they purported to measure – vocational interests related to a myriad of activities (Holland, 1997; Morgan, 2014). Moreover, these results were supported by the Procrustes’ analyses, which demonstrated the Afrikaans and isiXhosa, and English and isiXhosa participants to interpret the items in the RIASEC scales similarly. Accordingly, Vandenberg and Lance (2000) assert that the establishment of configural invariance provides support for the meaningful comparison of groups with reference to measures with similar latent constructs.

A number of reasons can account for the lack of configural invariance for the Artistic scale. For example, configural invariance may fail when the items in a scale are conceptually abstract or require culture specific knowledge (Cheung & Rensvold, 2002; Davis, 2014). However, considering that the SACII was originally developed using a constrained emic approach where the items were written to reflect the world of work within the South African context, culture specific knowledge was accounted for. Another possible reason for the lack of configural invariance on the Artistic scale is that the Afrikaans and isiXhosa participants may have employed different frames of reference when responding to the items, and ultimately attached dissimilar meanings to the concepts (Cheung & Rensvold, 2002; Davis, 2014; de Roover, Timmerman, de Leersnyder, Mesquita, & Ceulemans, 2014; Milfont & Fischer, 2010). In addition, Cheung and Rensvold (2002) argue that errors in the translations process may account for a lack of configural invariance. In the development of the SACII-X, three items (I170 “Use art therapy to help people who need counselling”; I117 “Teach art to people”; I139 “Study the history of art”) on the Artistic scale proved to be challenging to translate into isiXhosa. In particular, there was no direct translation for the word “art” and a composite translation was created, namely “*ukuzoba nokusebenza ngezandla*” (draw and work with your hands). In light of the above, future studies should conduct further measurement invariance tests to establish the possible reasons for configural non-invariance on the Artistic scale (see section 6.5 for a detailed discussion of recommendations).

The establishment of configural invariance for the five scales on the SACII warranted an investigation of metric invariance, which indicated successful fit of the measurement model under the metric condition for the Realistic, Investigative, Social and Enterprising scales. The results signified that for the Afrikaans and isiXhosa participants, the strength of the relationship between the items and the latent constructs was similar for both language groups (Cheung & Rensvold,

2002). In other words, the constructs manifested similarly for the Afrikaans and isiXhosa participants on the Realistic, Investigative, Social and Enterprising scales. Accordingly, these results eliminated item bias (van de Vijver & Tanzer, 2004) on the scales and indicated that meaningful group comparisons could be conducted (Cheung & Rensvold, 2002; Vandenberg & Lance, 2000). The lack of metric invariance on the Conventional scale could potentially indicate that identical latent variables on the scale are measured differently across the two language groups (de Roover et al., 2014). This implies that the comparison of the factor scores across language groups on the Conventional scale cannot be interpreted unambiguously (de Roover et al., 2014). Possible solutions to this problem are proposed in section 6.5.

Finally, the establishment of metric invariance on the Realistic, Investigative, Social and Enterprising scales warranted the investigation of scalar invariance on these four scales. The results indicated unsuccessful fit for the measurement model under the condition of scalar invariance for the Realistic and Investigative scale. This signified that comparisons of the latent means across language groups could not be interpreted meaningfully (Cheung & Rensvold, 2002; Milfont & Fischer, 2010). However, the measurement model fitted successfully under the condition of scalar invariance for the Social and Enterprising scales, which allowed for the comparison of latent means between the Afrikaans and isiXhosa participants. The establishment of scalar invariance signified that the observed scores on the two scales are related to the latent scores (Milfont & Fischer, 2010). In other words, regardless of group membership, individuals with similar scores on latent constructs will obtain similar scores on observed variables (Milfont & Fischer, 2010). Accordingly, the results demonstrate that the comparison of the latent means of the Afrikaans and isiXhosa participants can be interpreted unambiguously on the Social and Enterprising scales.

Notwithstanding the limitations of this approach to measurement invariance (see section 6.5 for discussion on limitations of the present study), the establishment of configural and metric invariance for the majority of the scales provide promise for the valid investigation of differences in the interest structure of female and male, Black, Coloured, and White Grade 9 secondary school learners. These results imply that the language groups employ the same conceptual framework to equate similar subsets of items with similar subsets of constructs and that for the Afrikaans and isiXhosa participants, the constructs are manifested in the same manner. Moreover, support for scalar invariance on the Social and Enterprising scales imply that the items in the two scales

demonstrated similar between-group difference and group differences can be interpreted meaningfully (Cheung & Rensvold, 2002).

### **6.3 Revisiting the present study's hypotheses**

The present study investigated two research hypotheses. Hypothesis 1 examined whether there is a significant difference in the interest structure of male and female Grade 9 secondary school learners, as measured by the SACII. In particular, it was hypothesised that males will obtain significantly higher scores on the Realistic and Investigative scales, whereas females will obtain significantly higher scores on the Social and Artistic scales. Hypothesis 2 investigated whether there is a significant difference in the interest structure of Black, Coloured and White Grade 9 secondary school learners. Specifically, it was hypothesised that there will be significant differences across the racial groups. However, considering the constrained emic approach in the development and translation of the SACII, rejection of this hypothesis was favourable. The results in relation to the above hypotheses are discussed in the section below.

#### **6.3.1 Hypothesis 1: Gender difference on the SACII**

Research on the equal applicability of Holland's (1997) vocational personality typology for gender has produced mixed results (Armstrong et al., 2011; Einarsdóttir et al., 2002; Roberti et al., 2003; Scharf, 2006). In view of this, Holland's typology has been criticised as biased in terms of gender (Creager, 2011; Nel, 2013; Scharf, 2006). However, through using the SACII, Morgan et al. (2015) recently provided support for the structural validity of Holland's model across gender in the South African context in a sample of young adults ( $\bar{x}$  age = 22.90). Accordingly, the present study attempted to replicate these results on a sample of middle adolescents.

The analyses by gender produced particularly favourable results for the female participants. The angular locations and communalities estimates, the constrained MDS, and the CCSM analysis demonstrated that for the female sample, a circular ordering model was approximated (Browne, 1992). The lack of disordering among the six scales also provided support for Holland's (1997) calculus assumption, that is, adjacent types, such as the Social and Artistic types were approximated next to each other on the circumference of a circle and had more in common than non-adjacent or opposite types. In addition, the CCSM results indicated that the six scales were not equidistant and provided support for a circular ordering model (i.e., satisfactory fit was obtained on the unconstrained and equal-spacing models), rather than a circumplex model (Morgan et al., 2014).

In contrast, the angular locations and communality estimates, constrained MDS, and CCSM analysis produced less favourable results for the male participants. The results demonstrated a violation of Holland's (1997) calculus assumption for the male sample. In particular, disordering was found between the Enterprising and Conventional scales. Holland (1997) theorised an ordering of R-I-A-S-E-C to indicate the validity of the model in a specific context, whereas the male participants of the present study demonstrated an ordering of R-E-C-S-I-A. Moreover, the communality values for the Enterprising, Conventional and Artistic scales were relatively low ( $< 0.20$ ), whereas the Social scale demonstrated a particularly low communality value (0.07). The communality values for these four scales demonstrated the amount of variance shared between the items and the pair of factors.

A hypothesis is presented as a possible explanation for the disordering between the Enterprising and Conventional scales for the male participants. The contemporary world of work experienced a major transformation owing to the digital revolution associated with the 21<sup>st</sup> century (Maree & Morgan, 2012; Savickas, 2012). The expeditious advances in information technology have rearranged the social organisation of the world of work, resulting in a global community (Savickas, 2010). Notwithstanding these advances, Holland's (1997) most recent delineation of the six RIASEC personality and environment types was conducted two decades ago. Accordingly, the rapid changes in the contemporary world of work may have resulted in that the pure Enterprising or Conventional types no longer exist, but rather clustered together into a personality and environment type more related to commerce.

Even though disordering was demonstrated by only the male participants, the non-metric MDS and CCSM plots demonstrated that for the total sample, and for all of the respective subsample groups, the Enterprising and Conventional types were strongly correlated and closely displaced in the underlying RIASEC configuration. These results signify that the study's sample may struggle to distinguish between the Enterprising and Conventional types and are therefore inclined to associated the two types with the same underlying construct (B. Morgan, personal communication, June 9, 2016). Moreover, an investigation at the item level of the angular locations and communality estimates of the male participants indicated that items in the Enterprising and Conventional scales cluster together, denoting that male participant interpret these two RIASEC scales in a similar manner. Morgan (2014), in the initial validation of the SACII, also alluded to the high correlation and close displacement between the Enterprising and Conventional types, and

advised researchers and practitioners to explore test respondents' understanding of the items in these scales, rather than relying solely on psychometric results.

In addition, male response bias may also provide a possible explanation for the disordering, since the data collectors noted that the majority of the female participants provided their full attention when completing the SACII, while the male participants were observed to be easily distracted and inattentive.

These results were followed-up by a comparison of model fit using RTHOR. The results provided support for the tight circular ordering model for the female participants. Specifically, the female participants obtained the highest CI value ( $CI = .72$ ) across the constituent gender, racial, and language groups and comfortably exceeded Rounds and Tracey's (1996) average non-U.S. CI value of .48. Accordingly, these results demonstrate the validity of Holland's model on a sample of middle adolescent, South African females. In contrast, the RTHOR results demonstrated that a tight circular ordering did not emerge from the data for the male participants. In particular, for all of the sample groups, the males obtained the lowest CI value ( $CI = .32$ ) and failed to meet the average non-U.S. CI threshold of .48. The lower CI values can be accounted for by the disordering between the Enterprising and Conventional types demonstrated by the angular locations and communality estimate analyses. These results indicate that the scores on the SACII, and therefore Holland's model, is not valid on a sample of middle adolescent, South African males. Moreover, the results signify that the SACII is not invariant across middle adolescent males and females and necessitates further investigation.

The RTHOR and Procrustes' rotation were also employed to conduct formal comparisons of model fit across gender. The results for the RTHOR demonstrated a significant difference in model fit between the male and female samples, with better model fit demonstrated for the female participants on both the RTHOR ( $CI = .20$ ;  $p = .0167$ ) and Procrustes' configurations plot (see Figure 5.10). In addition to comparisons of model fit, discriminant analyses (DA) were employed to investigate gender differences on each of the RIASEC scales. The DA results demonstrated significant differences between the male and female participants. In particular, the DA provided acceptable support for hypothesis 1, as the results demonstrated statistically significant improved scores on the Realistic scale for the male participants, and statistically significant improved scores on the Social scale for the female participants. These results were also evident in the mean scale



scores by gender, with males obtaining higher mean scores on the Realistic scale and females obtaining higher mean scores on the Social scale.

These results are in line with similar international (Day & Rounds, 1997; Einarsdóttir & Rounds, 2009; Holland, 1997; Iliescu et al., 2013; Su et al., 2009) and South African (Allen, 2005; Deller, 1997; Morgan, 2014; Schonegevel, 1997) studies on the applicability of Holland's model across gender. For example, Schonegevel (1997) demonstrated that Black adolescent males obtained higher scores on the Realistic scale, whereas Black female adolescents obtained higher scores on the Social scale in the South African context. These results were resonated in Allen (2005) and Deller's (1997) studies, who found South African males to obtain higher scores on the Realistic scale. However, the present study contradicts the promising results reported by Morgan (2014) and Morgan et al. (2015) on the validity of the scores on the SACII across gender. Despite the RTHOR analysis demonstrating better model fit for the female participants, Morgan et al. (2015) demonstrated that the difference in model fit was statistically non-significant, signifying the structural validity of Holland's model across gender groups in the South African context.

There are various possible explanations for the different gender endorsements on the Realistic and Social scales for the present study. For instance, Weisgram et al. (2010) argue that males and females tend to develop vocational interests based on different occupational values. In particular, research suggests that females are inclined to endorse altruistic occupational values, which result in weak predictability to pursue Realistic and Investigative career fields (Weisgram et al., 2010). Similarly, Nagy et al. (2010) argue that there might be a lack of adequate distinction for females between the Realistic and Investigative types, leading them to cluster the two scales into one and inadvertently endorse higher scores on the Artistic, Social, Enterprising and Conventional scales (Su et al., 2009). In addition, parental endorsements in the fields of mathematics and science are typically gender stereotyped, signifying the strong relationship between males, the Realistic, Investigative scales, and mathematical ability (Warwas, Nagy, Watermann, & Hasselhorn, 2009). Some empirical studies have also argued that females are inclined to demonstrate lower self-efficacy beliefs in fields of mathematics and science due to limited confidence in these academic fields (Eccles, 1994; Gysbers, Heppner, & Johnston, 2003; Turner et al., 2008). These lower self-efficacy beliefs can influence the vocational interests of women, resulting in lower endorsement of the Realistic and Investigative types (Morgan, 2014).

Furthermore, a potential explanation for the dissimilar results by gender for the present study and the results reported by Morgan et al. (2015) can be the difference in age for the two sample groups. For the current study, the mean age for the entire sample was 15 ( $\bar{x}$  age = 15), whereas the mean age for the entire sample reported by Morgan et al. (2015) was 22.90 ( $\bar{x}$  age = 22.90). Particularly, Iliescu et al. (2013) argue that individual career interests are prone to stabilise in adulthood and since adults are more exposed to the world of work, they tend to have a more differentiated perception of their vocational interest. Accordingly, the assessment of vocational interest during adolescence (particularly early or mid-adolescence) might reflect nascent interests that have not yet stabilised (A.V. Naidoo, personal communication, August 25, 2016).

Additionally, the difference in model fit by gender for the present study could possibly be due to differences in career maturity for the gender groups. For example, scholars have argued that females demonstrate greater career maturity, mostly due to the earlier cognitive development associated with younger female adolescents (Watson, 2008). In addition, cultural factors can also play an important role in the career maturity of individuals and some assumptions related to career maturity can be problematic when applied in cross-cultural contexts (Watson, 2008). For example, certain cultures do not endorse the onset of an age-related maturation process related to a specific developmental period and, prior to this process, adolescents are not expected to consider future responsibilities such as subject choices and employment (Watson, 2008). In view of the above, due to greater career maturity, the female participants could possibly have obtained their better model fit.

The results for the present study indicate that the SACII can be validly administered to a sample of South African middle adolescent, female participants, but not to a sample of South African middle adolescent males. Accordingly, the findings suggest that the SACII cannot be applied indiscriminately across gender and might be measuring different career related constructs for males and females. Even though these results could potentially demonstrate that Holland's model is invalid across adolescent gender groups within the South African context, caution is expressed in drawing such strong conclusions. As will be discussed in section 6.5, future studies should further investigate gender differences on the SACII on larger samples, with adolescent groups at early, middle and later stages of development, as well as compare the interest scores of adolescent and adult samples on the SACII.

### 6.3.2 Hypothesis 2: Racial differences on the SACII

The applicability of Holland's (1997) RIASEC model outside of the U.S. has received considerable research attention, with mixed results reported by a number of studies (Nauta, 2010; Nel, 2013; Rounds & Tracey, 1996; Scharf, 2006). The majority of studies providing evidence for cultural variance (du Toit & de Bruin, 2002; Rounds & Tracey, 1996; Tang, 2009) have employed an etic approach, where Holland's theory and instruments were directly imported from the U.S. and employed in another culture (Morgan, 2014). However, more recent studies have employed emic methodologies, where the items were tailored for a specific context, and demonstrated support for the cross-cultural applicability for Holland's (1997) RIASEC typology (Einarsdóttir et al., 2013; Sidiropoulou-Dimakakou et al., 2008; Šverko & Babarović, 2006; Zhang et al., 2013). Similarly, the SACII was originally developed to reflect the world of work within the South African context. Therefore, it is crucial to establish the cross-cultural validity of the SACII as occupational goals, career aspirations and interests might be expressed differently in different ethnic and cultural groups.

The results for the present study indicated that on a sample of Black, Coloured and White South African adolescents, the scores on the SACII are valid and can be applied indiscriminately. The angular locations and communality estimates, constrained MDS, and CCSM demonstrated that for all three racial groups, the RIASEC types' placements on the circumference of a circle approximated a loose circular ordering model (Browne, 1992). These results are in line with extant research (Darcy & Tracey, 2007; Gupta, 2008; Nagy et al., 2010), who found general support for Browne's (1992) unconstrained model (i.e., loose circular order model). Moreover, there was a lack of disordering between the vocational personality types for the Black, Coloured and White participants, which provided support for Holland's (1997) calculus assumption. In addition, the displacement between the types were not equidistant ( $\neq 60^\circ$ ), providing further support for the circular ordering hypothesis (Morgan, 2014). Similarly, the VAF coefficients obtained on the constrained MDS by the Black (.83), Coloured (.83), and White (.89) participants compared favourably to previous research (Darcy & Tracey, 2007; Einarsdóttir et al., 2002), and comfortably surpassed Rouds and Tracey's (1993) meta-analytic VAF coefficient of .75.

Furthermore, the RTHOR analysis provided support for the tight circular ordering model across all three racial groups. The Black participants demonstrated the highest CI value (CI = .68;  $p = .0167$ ) in terms of race, while the Coloured and White participants demonstrated CI values of

.60 ( $p = .0333$ ) and .61 ( $p = .0167$ ), respectively. These results also compared well to the non-U.S. benchmark CI value of .48 (Rounds & Tracey, 1996). Additionally, the present study's results resonated with international cross-cultural studies (Einarsdóttir et al., 2013; Sidiropoulou-Dimakakou et al., 2008; Šverko & Babarović, 2006; Zhang et al., 2013). For example, Šverko and Babarović (2006) administered the Croatian SDS on a sample of secondary school learners, and reported CI values of .57 and .67 for participants between the ages of 16 and 17, and CI values of .72 and .86 for the participants between the ages of 18 and 19 (Šverko & Babarović, 2006). More importantly, they reported a CI value of .31 for the participants aged 15 years old and failed to find support for the tight circular ordering model. In contrast, the mean age of the present study was 15 ( $\bar{x}$  age = 15) and support was provided for the tight circular ordering model among South African adolescents. Moreover, the CI values reported in this study (.68, .61, and .60) exceeded the results reported by Šverko and Babarović (2006) for similar age group samples.

The RTHOR analysis was also employed to conduct formal comparisons of model fit across the three racial groups. The results indicated that there were no statistically significant differences in model fit, and therefore interest structure, between the Black (CI = .03;  $p = .4167$ ), Coloured (CI = .00;  $p = .5667$ ) and White (CI = .04;  $p = .3500$ ) participants, signifying the cross-cultural validity of the SACII. In addition, the results for the constrained MDS and CCSM demonstrated that for all of the sample groups, the Black participants obtained the best model fit, whereas the White participants achieved the poorest model fit. However, the results for this sample group should be interpreted with caution due to the size of the White sample ( $n = 59$ ). Additionally, the results for the comparison of model fit was augmented by the DA, which provided further support for the applicability of the SACII and Holland's model in different cultural contexts. Even though the DA revealed three discriminant functions, the removal of the first and second function demonstrated that for the third function, there were no significant differences between the Black, Coloured and White participants. Although there were no significant differences in the interest structure of the three racial groups, statistically significant differences were detected at the scale level. In particular, the results indicated that the Coloured and White participants were discriminated by the variate on the Realistic, Artistic and Conventional scales, indicating that the Black participants compared best on these three scales. Similarly, the Black and Coloured participants were discriminated by the variate on the Social and Enterprising scales, demonstrating that, when compared, the White participants obtained higher scores on these two scales.

Accordingly, future studies should investigate racial differences at the scale level on the SACII to determine whether these differences are meaningful.

In view of the above, support was found for the second hypothesis, since there was no significant difference in the psychometric properties or interest structure of the Black, Coloured, and White Grade 9 learners. The current study's results are also in line with Morgan's (2014) original validation of the SACII, indicating support for the circular ordering hypothesis across different ethnic groups in South Africa. Of greater significance, these findings contradict previous South Africans studies that have concluded that Holland's model is invalid when applied to diverse ethnic and cultural samples (Deller, 1997; du Toit & de Bruin, 2002; Schonegevel, 1997). As such, the present study offers a more sanguine perspective of the validity and cross-cultural applicability of Holland's (1997) model in the South African context. The lack of significant difference in psychometric properties and interest structures across the three racial groups signifies that different members of different ethnic groups in South Africa perceive the RIASEC typology similarly. In view of this, Holland's (1997) model may continue to be used in career counselling and assessment practices when valid interest inventories, such as the SACII, are employed (Morgan, 2014).

## **6.4 Implications of the study**

In the following section, the implications for the present study's results are presented. Specifically, the implications for theory, scale translation and adaptation and career counselling are discussed.

### **6.4.1 Implications for theory**

The results of the present study provide promising support for the validity of Holland's vocational personality theory on a sample of adolescent South Africans. More importantly, the results demonstrated that the interest structure of Black, Coloured and White, and Afrikaans, English, and isiXhosa adolescents is consistent with Holland's circular/hexagonal model. In terms of the sample's age, the results are encouraging. Previous researchers have argued that vocational interests are unstable during adolescence and career interest inventories may be used more effectively during adulthood (Darcy & Tracey, 2007; Iliescu et al., 2013; Tracey, 2001; Watson & McMahon, 2004). As such, the results indicate that interest inventories based on Holland's RIASEC model may be validly applied to middle adolescent South Africans. Furthermore, the

present study's results imply that Holland's model is transportable to different cross-cultural contexts, specifically in South Africa.

However, despite the promising results reported for the racial and language groups, this study found that Holland's model, when administering the SACII, might not be valid across gender. In particular, while the results for the female participants were promising, demonstrating consistency with Holland's circular/hexagonal model and calculus assumption, the male participants demonstrated disordering between the RIASEC types, specifically the Enterprising and Conventional types, and failed to provide support for the RIASEC typology. Moreover, there were significant gender differences in terms of interest structure, with males obtaining higher scores on the Realistic scale and females obtaining higher scores on the Social scale. Although these results are in line with similar international and South African studies on the applicability of Holland's model across gender, the results contradict Morgan et al.'s (2015) support for the equal applicability of the SACII across gender. Accordingly, the present study signifies the need for future studies to provide conclusive evidence on the validity of the SACII across gender, especially on adolescent samples.

The disordering demonstrated between the Enterprising and Conventional types for the male participants also denotes the potential value of revisiting Holland's operationalisation of the respective personality and environment types. As discussed in section 6.3.1, Holland's (1997) conceptualisation of his vocational personality theory may be outdated given that the rapid transformation in the world of work may have rendered the RIASEC personality and environment types obsolete. Accordingly, the use of Holland's model to predict an individual's future career path and employment may be improved by refining the personality and environment types in line with contemporary labour contexts.

#### **6.4.2 Implications for scale translation and adaptation**

The SACII was originally developed using a constrained emic approach, where the items in the scale were written to reflect the world of work in the South African context (Morgan, 2014). Morgan (2014) asserts that the SACII is the first serious attempt to develop Holland's RIASEC typology in South Africa, ensuring its validity across a variety of ethnic, gender and language groups. Despite the initial advancements made by Morgan (2014), the SACII was only available in Afrikaans and English. The present study addressed these limitations by translating the SACII into isiXhosa, and provided a back-translation on the Afrikaans version.

The results for the Afrikaans and isiXhosa participants provided support for the validity of the SACII scores for these different language groups. More importantly, the results demonstrated that the interest structure of the isiXhosa participants is consistent with Holland's circular/hexagonal model. Previous research studies conducted in South Africa have argued that the first language of test takers influence their scores on career measures (du Toit & de Bruin, 2002; Morgan, 2014). In particular, du Toit and de Bruin (2002) found Holland's model to be invalid among Black South Africans, but argued that the lack of availability of an interest inventory in an indigenous language may affect their comprehension of the items in the scale.

The translation and adaptation techniques employed in the present study could serve as a model for future research intending to translate the SACII, and other career measures, into indigenous languages. Considering that South Africa has 11 official languages, there is a continuous need to provide more individuals with access to career measures in their home language. Accordingly, scale developers, researchers and translators should be mindful of the target language's labour context (i.e., employ a constrained emic approach), various dialects and contextual factors to obtain the most accurate translation. Moreover, the translation process should ideally include two or more translators, in order to compare and combine translations and create a composite translation that best reflects the source language version. In addition, a back-translation procedure, including two or more translators, should be employed to assess the quality of the translations and to improve the accuracy of meaning across different languages (Mohatlane, 2014). Accordingly, to assess the equivalence of the translation, the source language version and the back-translation version should be compared, with any items identical or similar in content, demonstrating accurate translations. However, the accuracy of the back-translation version is dependent on the accuracy of the forward-translation procedure and scale developers, researchers and translators should eliminate all errors during this initial stage of translations (Mohatlane, 2014). Finally, the ITC's Guidelines for Test Adaptation, particularly the Item Translation and Adaptation Review Form, should guide the translation process to evaluate each item comprehensively, and to identify and revise problematic items (Hambleton & Zenisky, 2011). Accordingly, using the translation techniques employed in the present study, future studies could translate career measures into a variety of different languages to provide more South Africans with access to career assessment and counselling..

### 6.4.3 Implications for practice

This study investigated differences in the psychometric properties of the SACII on a sample of male and female, Black, Coloured and White, as well as Afrikaans, English, and isiXhosa Grade 9 learners. In addition, the present study provided an inventory with which individuals can assess their career interests in their home language. Accordingly, the results indicated that the scores on the SACII, and therefore Holland's model, could potentially be valid in South Africa across ethnicity and language. However, there was a lack of evidence for the equal applicability of the SACII across gender, providing inconclusive support for validity of the SACII across gender.

The present study has three potential implications for career counselling and assessment in South Africa. Firstly, the SACII-X is the first career interest inventory available in an indigenous language in South Africa. Specifically, prior to this study, there has not been an isiXhosa career interest inventory available for South Africans. Considering the promising results for the isiXhosa participants, the measurement of vocational interests based on Holland's typology in South Africa may be valid when the SACII-X is used. Moreover, the interpretation of the results is warranted, since the validity of Holland's model has received increasing support in diverse cross-cultural contexts (cf. Darcy & Tracey, 2007). In view of South Africa's demographic composition, practitioners using the SACII-X will be able to provide a large proportion of South Africans with access to a career measure that produces valid scores that can be administered in their home language. Specifically, 16% (SSA, 2011) of the South African population will be able to assess their career interests in isiXhosa. In view of the above, the SACII-X aligns with the requirement stipulated by the EEA (1998; Naidoo et al., 2016). Furthermore, popular interest inventories in South Africa, such as the SDS (Gevers et al., 1997), SAVII (du Toit et al., 1993) and the MB-10 (Meyer, 2003), are only available in Afrikaans and English, are considered outdated in terms of item content and labour contexts; and lack the use of sufficient analytic techniques to investigate the reliability and validity of Holland's model in South Africa (Morgan, 2014). Accordingly, the development of the SACII-X addresses a major lacuna in the local practice of career counselling and assessment by providing an inventory in an indigenous language and items that reflect the modern world of work in South Africa. As such, the SACII-X allows for the assessment of vocational interests that reflects labour contexts pertinent to isiXhosa-speaking South Africans.

Secondly, in terms of age, the results for the present study demonstrate that the scores on the SACII may be valid on a sample of middle adolescent Grade 9 learners across race and language.



These results are potentially meaningful, as it contradicts previous research asserting that the assessment of vocational interest might not be useful during adolescence (Darcy & Tracey, 2007; Iliescu et al., 2013; Morgan, 2014; Tracey, 2001; Watson & McMahon, 2004). In the context of career counselling and assessment in South Africa, the results suggest that the SACII could be validly administered to South African adolescents to measure their career interests. More importantly, adolescence is a particularly important career development period for South Africans, as in Grade 9, learners are required to select their school subjects for the remainder of their school career. Accordingly, their subject choices in Grade 9 will play an integral role in determining a future study- and career path. Therefore, using a career measure that reflects local and contemporary occupational environments, such as the SACII, career counsellors and practitioners could potentially aid in the prediction of future scholastic and employment success (Morgan, 2014).

Thirdly, the results by gender for this study demonstrate that the SACII cannot be applied indiscriminately between female and male adolescents. These results are in direct contrast to Morgan et al.'s (2015) support for the validity of the SACII across gender and consequently, there is inconclusive support for the equal applicability of the SACII. As such, vocational practitioners should be aware of the gender differences on the SACII, particularly the disordering between the RIASEC types demonstrated by the adolescent male participants in the present study. However, despite the unequal applicability of the SACII across gender in this study, one should be cautious in concluding that the scores on the SACII is invalid across gender groups in South Africa. Accordingly, as discussed in section 6.5, future research should focus on the adolescent gender differences on the SACII to determine the utility of the measure in the context of South African career counselling and assessment.

Finally, career practitioners should bear cognisance of the strong correlation and similar spacing demonstrated by the Enterprising and Conventional types in this study. Rounds and Tracey (1996) assert that the similarities between RIASEC types could potentially be accounted for by different cultural interpretations of the personality and environment types. Accordingly, Morgan (2014) argues that in a culturally diverse country such as South Africa, career counsellors should collaboratively explore the client's interpretation of the respective RIASEC types, as correctly understanding the client's interpretation of these types could aid in accurate vocational recommendations. Accordingly, combining psychological assessment and narrative career

counselling, or a quantitative and qualitative approach, would enable practitioners to best capture their clients' vocational career interest (Albien & Naidoo, 2016; Maree & Morgan, 2012; Morgan, 2014).

### **6.5 Limitations of the study and recommendations for future research**

There are several limitations to this study, which future research should aim to address. In view of the research participants, the present study's sample involved secondary school learners and was restricted to a specific geographical location, namely the Western Province, Cape Winelands district of South Africa that may be considered a peri-urban region. Accordingly, this signifies that the results have restricted generalisability outside secondary school populations and across different South African regions. In South Africa, different regions consist of different cultures, languages and occupational environments (SSA, 2011), which suggest that the items in the SACII might be interpreted differently by members of other regions. Another factor affecting the generalisability of the results was the difference in the sample size of the respective groups participating in the present study. In particular, the sample is under-represented by English-speaking, White and Indian/Asian participants. As such, future research should investigate the validity of the SACII in different South African regions, across different cultures, languages, age groups and occupational environments to determine the best model fit for the scale.

This study's sample size also influenced the examination of measurement invariance in the present study. As discussed in section 6.2.3, the sample size was too small to run a full structural equation model (Kline, 2011) in order to determine measurement invariance. In addition, these analytic techniques were beyond the scope of this study. To address this, MGCFA was conducted on each of the six RIASEC scales. However, employing this technique is not the ideal method to establish measurement invariance (C.C. Theron, personal communication, June 10, 2016). Accordingly, determining measurement invariance, and inadvertently the lack thereof (e.g., on the Artistic scale) between the Afrikaans and isiXhosa versions of the SACII should be interpreted with caution, pending on further investigations of measurement invariance. Therefore, future research should conduct measurement invariance tests on diverse samples, ideally equal in size, to further investigate the equivalence of the SACII in different languages, as well as to establish possible sources of non-invariance on the scales (Milfont & Fischer, 2010). The outcome of these studies could provide potential value in the equal applicability of the SACII across language groups in South Africa. Additionally, the researcher acknowledges that discriminant analysis

employed in the present study is not the most appropriate method to extrapolate group differences across gender, language, and race. Subsequently, future studies should conduct one-way or factorial ANOVAs to examine differences in psychometric properties and interest structures across groups.

Finally, the results for the present study, particularly for the gender and language groups, necessitate further investigation. Currently, support for the equal applicability of the SACII across gender, particularly with adolescents, is inconclusive. For this reason, gender differences on the Afrikaans, English and isiXhosa versions of the SACII should be investigated by future research on larger samples, equal in sample size, and consisting of different age groups. More specifically, group comparisons should be conducted between adolescent, young adult and working adult samples to determine the best model fit on the SACII across gender. In addition, this study documents the development and first administration and analysis of the SACII-X. Therefore, future research should investigate the psychometric properties of the SACII-X at the item level, construct level and scale level. The validity of the SACII-X should also be investigated across different sample groups and geographical locations, such as rural and urban settings, university students and working adults, to determine the scale's reliability and validity and broader application.

## **6.6 Conclusion**

Holland's (1997) vocational personality theory is one of the most influential theories in vocational psychology (Darcy & Tracey, 2007; Gottfredson, 1999; Nauta, 2010; Watson et al., 2007), with the RIASEC model serving as a established point of departure for the development of numerous career interest inventories, both internationally and in South Africa (de Bruin & de Bruin, 2013a; Foxcroft et al., 2004). Notwithstanding the global popularity of his theory, the validity of Holland's (1997) circular/hexagonal model in cross-cultural contexts remains contentious (Rounds & Tracey, 1996), with particularly limited support found for the RIASEC typology in South Africa (du Toit & de Bruin, 2002). However, despite this limited support, the measurement of career interests using Holland's model remains widespread in South Africa (Morgan, 2014). More concerning, these interest inventories are limited in terms of their cross-cultural reliability and validity, and are outdated in content and occupational environments (Morgan, 2014). As a result, Morgan (2014) developed the SACII to address these shortcomings and demonstrated that the scale, and therefore Holland's model, may be valid in the South African context to measure career

interests. However, it was imperative to replicate these findings before definitive conclusions can be made regarding the universal reliability and validity of the SACII. Accordingly, this study aimed to explore the validity of the SACII by investigating differences in the interest structure of female and male, as well as Black, Coloured and White Grade 9 learners.

The results for the present study demonstrated the scores on the SACII to be reliable and valid on an adolescent sample across different racial and language groups, and signified that Holland's circular/hexagonal model may be valid within the South African context. Even though the present study failed to find support for the equal applicability of the SACII across gender, with better model fit demonstrated by the female participants, and disordering demonstrated by the male participants, the results by race and language have potentially important implications for the measurement of career interests in South Africa using Holland's model. In particular, the results are at odds with previous research that failed to find support for the RIASEC model with diverse samples in South Africa (Deller, 1997; du Toit & de Bruin, 2002; Schonegevel, 1997); however, these studies would not have had the benefit of using an emic constructed interest questionnaire such as the SACII available in three language.

In addition, through developing the isiXhosa version of the SACII, the present study makes a constructive contribution to the debate surrounding the influence of language on test takers' career interest scores (du Toit & de Bruin, 2002; Morgan, 2014). The results demonstrated sufficient reliability and validity data for the SACII-X, which suggest that the SACII-X may be a valid measure of the vocational interests for isiXhosa-speaking South Africans. Within this context, future studies should conduct additional research on gender difference on the SACII, ideally with samples diverse in ethnicity, age and language. It is further recommended that research explore the psychometric properties of the SACII-X within urban settings and conduct additional measurement invariance tests across the Afrikaans, English, and isiXhosa versions of the SACII.

In conclusion, the results for the present study demonstrate the SACII to be a valid measure across racial and language groups, and augment the initial findings reported by Morgan (2014). Furthermore, within the context of previous local research, the results are more optimistic in terms of the validity of Holland's model in the South African context. There was confirmatory evidence that the English, Afrikaans and the isiXhosa versions of the SACII may be used as a valid career interest inventory, within the diverse South African context.

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## Appendix A: WCED approval letter



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tel: +27 021 467 9272

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Private Bag x9114, Cape Town, 8000

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**REFERENCE:** 20150930-3811

**ENQUIRIES:** Dr A T Wyngaard

Mr Stephan Rabie  
69 Skaamrosie Street  
Proteavalley  
Bellville  
7530

**Dear Mr Stephan Rabie**

### **RESEARCH PROPOSAL: INVESTIGATING GENDER AND ETHNIC DIFFERENCES ON THE SOUTH AFRICAN CAREER INTEREST INVENTORY AMONG HIGH SCHOOL STUDENTS**

Your application to conduct the above-mentioned research in schools in the Western Cape has been approved subject to the following conditions:

1. Principals, educators and learners are under no obligation to assist you in your investigation.
2. Principals, educators, learners and schools should not be identifiable in any way from the results of the investigation.
3. You make all the arrangements concerning your investigation.
4. Educators' programmes are not to be interrupted.
5. The Study is to be conducted from **18 August 2015 till 30 September 2016**
6. No research can be conducted during the fourth term as schools are preparing and finalizing syllabi for examinations (October to December).
7. Should you wish to extend the period of your survey, please contact Dr A.T Wyngaard at the contact numbers above quoting the reference number?
8. A photocopy of this letter is submitted to the principal where the intended research is to be conducted.
9. Your research will be limited to the list of schools as forwarded to the Western Cape Education Department.
10. A brief summary of the content, findings and recommendations is provided to the Director: Research Services.
11. The Department receives a copy of the completed report/dissertation/thesis addressed to:  
**The Director: Research Services  
Western Cape Education Department  
Private Bag X9114  
CAPE TOWN  
8000**

We wish you success in your research.

Kind regards.

Signed: Dr Audrey T Wyngaard

**Directorate: Research**

**DATE: 30 September 2015**

## Appendix B: Principal permission letter



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jou kennisvenoot • your knowledge partner

To Whom It May Concern,

Re: Investigating gender and racial differences on the South African Career Interest Inventory among secondary school students

I am a PhD student at Stellenbosch University. I will be conducting research on the career interests of Grade 9 pupils on the South African Career Interest Inventory (SACII). The findings will help me improve the SACII's applicability across all groups in South Africa.

In order to achieve this, I request permission for the following:

- To gain access to all Grade 9 pupils at your school
- Upon return of the consent forms signed by the pupils' guardians, to conduct a single, 40 minute session with all Grade 9 pupils, where they will complete the paper-and-pencil version of the SACII

I have received ethical approval from Stellenbosch University's Research Ethics Committee to conduct this study. In addition, the Western Cape Education Department provided me with permission to conduct research at high schools in the greater Stellenbosch area. Professor Tony Naidoo will be supervising my research.

Please sign the designated area below to indicate your permission to conduct research at your school.

Thank you in advance,  
Stephan Rabie  
Department of Psychology  
Stellenbosch University  
srabie@sun.ac.za  
079 906 5484

---

Permission of the Principal to participate in the study: Investigating gender and racial differences on the South African Career Interest Inventory among secondary school students

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Signature

---

Date





## Appendix C: Letter of invitation



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### Letter of Invitation

Title of Study: Investigating gender and ethnic differences on the South African Career Interest Inventory among high school students.

Primary Researcher: Stephan Rabie, MA Psychology, Department of Psychology, Stellenbosch University.

Research Supervisor: Anthony Naidoo, Professor, Department of Psychology, Stellenbosch University.

I, Stephan Rabie, from the Department of Psychology, Stellenbosch University, invite your child to participate in a research project entitled Investigating gender and ethnic differences on the South African Career Interest Inventory among high school students.

The purpose of this proposed quantitative study is to investigate gender and ethnic differences on the South African Career Interest Inventory (SACII) among grade 9 high school students in the Western Cape Winelands District of South Africa. Should you choose to participate, you will be asked to complete a demographic questionnaire and complete a paper-and-pencil version of the SACII. The 169 items in the SACII are related to vocational interests and are presented as statements to which the participant will indicate their agreement or disagreement on a 5-point Likert-type scale, ranging from (1) strongly disagree to (5) strongly agree.

The expected duration of your participation will be between 30 and 60 minutes for completing the paper-and-pencil version of the SACII.

Prospective participants should fulfil the following criteria:

- Participants should be in grade 9 in high school.
- Participants should be of either black or white ethnicity.
- Participants should be between the ages of 14 and 17.

If you have any questions, please feel free to contact me (see below for contact information).

Thank you,

Stephan Rabie

MA Psychology

Department of Psychology

Stellenbosch University

Email: [srabie@sun.ac.za](mailto:srabie@sun.ac.za)

Mobile: 0799065484



## Appendix D: Passive consent forms



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jou kennisvenoot • your knowledge partner

### UNIVERSITEIT STELLENBOSCH

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#### TOESTEMMING VIR DEELNAME AAN ONDERSOEK

#### **Investigating gender and racial differences on the South African Career Interest Inventory among secondary school students**

Geagte voog,

Ek is Stephan Rabie, 'n doktrale student in die Sielkunde Departement aan die Universiteit Stellenbosch. Ek vra jou toestemming om jou kind toe te laat om deel te neem aan 'n navorsingstudie uitgevoer met Graad 9 studente by hoërskole in die groter Stellenbosch-omgewing. Die huidige studie sal die primêre data vir my navorsing verskaf en sal lei tot 'n navorsingstesis. Die studie sal ook voordele vir jou kind bied, deur hom/haar te help met hul loopbaan besluite en vakkeuses en sal help om toekomstige loopbaan voorligtingsprogramme vir Suid-Afrikaanse studente te ontwikkel. Jou kind is gekies as 'n moontlike deelnemer aan hierdie studie omdat hy/sy manlik of vroulike en 'n Graad 9 hoërskool-student is.

#### **1. DOEL VAN DIE STUDIE**

Die doel van hierdie studie is om geslag en rasseverskille op die South African Career Interest Inventory (SACII) onder Graad 9 hoërskool-student in die Wes-Kaapse Wynland Distrik van Suid-Afrika te ondersoek. Die SACII is 'n vraelys wat bestaan uit 'n lys van 143 aktiwiteite wat uitgevoer word in verskillende beroepe en dit word gebruik om jou loopbaan belangstellings te bepaal.

#### **2. PROSEDURES**

As jy toestemming verleen vir jou kind om vrywillig deel te neem aan hierdie studie, sal ons haar/hom vra om die volgende te doen:

### **'n Demografiese vraelys voltooi:**

Die demografiese vraelys bestaan uit vrae wat verband hou met ouderdom, geslag, etnisiteit en die huistaal van jou kind. Die doel van hierdie vraelys is om die biografiese en demografiese kenmerke van die steekproef van hierdie studie te vestig. Hierdie inligting sal vertroulik en heeltemal anoniem gehou word nie - slegs die primêre navorser en die studieleier sal toegang tot hierdie inligting te hê.

### **'n Papier-en-potlood weergawe van die SACII voltooi:**

Deelnemers sal gevra word om al die items op die SACII tydens 'n klasperiode by die skool te voltooi. Die SACII is ontwikkel om 'n individu se loopbaan belangstellings te meet. Die items op die SACII word as stellings voorgestel waarop die deelnemers hul ooreenkoms of meningsverskil op 'n skaal sal aandui, wat wissel van (1) stem glad nie saam nie tot (5) stem ten volle saam. Die deelnemers se antwoorde op hierdie items sal vertroulik en anoniem behandel word en gestoor word op 'n wagwoord-beskermdre rekenaar.

## **1. POTENSIËLE RISIKO'S EN ONGEMAKLIKHEDE**

Hierdie studie stel die deelnemers bloot aan minimale tot geen risiko, aangesien die inhoud wat behandel sal word, nie indringend of skadelik is nie. Die response van die deelnemers is totaal vrywillig en hulle is onder geen verpligting om enige vraag waarmee hulle ongemaklik voel te beantwoord nie.

## **2. POTENSIËLE VOORDELE VIR DEELNEMERS EN/OF VIR DIE SAMELEWING**

Die deelnemers sal nie geldelike voordeel verkry uit deelname nie. Deelname in hierdie studie sal egter bydra tot die gelyke toepaslikheid van die SACII oor verskillende geslag en rasse-groepe in

Suid-Afrika. Verder sal hierdie studie bydra tot 'n psigometriese instrument wat die spesifieke belange van Suid-Afrikaners kan meet, asook die deelnemers blootstel aan die verskillende beroepskeuses wat aan hulle beskikbaar is.

### **3. BETALING VIR DEELNAME**

Deelname is heeltemal vrywillig en geen betaling sal vir deelname aangebied word nie.

### **4. VERTROULIKHEID**

Enige inligting wat verkry word in verband met hierdie studie of wat geïdentifiseer kan word met die deelnemers sal vertroulik bly en sal slegs bekend gemaak word op gronde van jou toestemming of as dit wettig vereis word. Vertroulikheid sal gehandhaaf word deur die data op 'n wagwoord-beskermdre rekenaar te stoor, waartoe slegs die navorser en die studieleier toegang sal hê.

### **5. DEELNAME EN ONTTREKKING**

Jou kind het 'n keuse om deel te neem aan hierdie studie of nie. Indien jy toestemming verleen vir jou kind om vrywillig deel te neem, mag hy/sy enige tyd sonder enige gevolge onttrek. Jou kind kan ook weier om enige vrae te beantwoord, maar sal steeds toe gelaat word om deel neem aan hierdie studie. Die ondersoeker kan jou kind te onttrek van hierdie navorsing indien omstandighede ontstaan wat dit noodsaaklik maak.

### **6. IDENTIFISERING VAN ONDERSOEKSPAN**

Indien u enige vrae of kommentaar oor die navorsing het, skakel gerus die studieleier (die persoon wat verseker dat alle navorsing korrek gedoen word) of die primêre navorser:

Professor Anthony Naidoo

Departement Sielkunde

Universiteit Stellenbosch

(021) 808 3461 / [avnaidoo@sun.ac.za](mailto:avnaidoo@sun.ac.za)

Stephan Rabie  
Departement Sielkunde  
Universiteit Stellenbosch  
(021) 808 2857 /srabie@sun.ac.za

## 7. REGTE VAN DEELNEMERS

Jou kind mag jou/sy/haar toestemming terugtrek enige tyd en deelname staak sonder enige benadeling. As jy enige vrae het oor die regte van jou kind as 'n deelnemer, kontak Me Maléne Fouché [mfouche@sun.ac.za; 021 808 4622] by die Afdeling Navorsingsontwikkeling.

<b>HANDTEKENING VAN NAVORSINGSDEELNEMER OF REGSVERTENWOORDIGER</b>
--

Die inligting hierbo is aan die deelnemer beskryf deur Stephan Rabie in Afrikaans of Engels en die deelnemer is bevoeg in hierdie taal of dit is bevredigend vertaal aan hom/haar. Die deelnemer is die geleentheid gebied om vrae te vra en die vrae is beantwoord tot sy/haar bevrediging.

Let wel dat hierdie is 'n **PASSIEWE TOESTEMMINGSFORM**. Daarom, indien **JY NIE** toestemming verleen vir jou kind om aan hierdie studie deel te neem nie, stuur asseblief hierdie vorm na die betrokke personeellid by jou kind se skool. Indien jy egter **TOESTEMMING** verleen vir jou kind deelneem, **HOEF JY NIE HIERDIE DOKUMENT TE TE ONDERTEKEN EN TERUG TE STUUR NIE**.

---

**Deelnemer**

---

**Naam van regsverteenvoordiger (indien van toepassing)**

---

**Handtekening van deelnemer of regsverteenvoordiger**

---

**Datum**

**HANTEKENING VAN NAVORSINGSDEELNEMER OF REGSVERTEEENWOORDIGER**

Ek verklaar dat ek die inligting wat in hierdie dokument is verduidelik het aan \_\_\_\_\_[naam van die deelnemer] en/of [sy/haar] verteenwoordiger \_\_\_\_\_[naam van die verteenwoordiger]. [Hy/sy] is aangemoedig en genoeg tyd gegee om my enige vrae te vra. Hierdie inligting is in [Afrikaans / \* Engels / \* Xhosa / \* Ander] verduidelik of [geen vertaler is gebruik / hierdie gesprek is in \_\_\_\_\_ vertaal deur \_\_\_\_\_].

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Handtekening van ondersoeker

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Datum



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**STELLENBOSCH UNIVERSITY  
CONSENT TO PARTICIPATE IN RESEARCH**

---

**Investigating gender and racial differences on the South African Career Interest Inventory  
among secondary school students**

Dear guardian, / [Mzali obekekileyo](#),

I am Stephan Rabie, a Doctoral student in the Psychology Department at Stellenbosch University. I ask your permission to allow your child to participate in a research study conducted with grade 9 students at high schools in the greater Stellenbosch area. The present study will help me complete the Psychology Research Masters programme and will result in a research thesis. The study will also have benefits for your child in helping him/her with their career decisions and will help develop future career guidance programmes in Kayamandi. Your child was selected as a possible participant in this study because she/he is a male or female, grade 9 high school student.

NdinguStephan Rabie, umfundi weeDoctoral kwizifundo zengqondo kwidyunivesithi yase Stellenbosch. Ndicela imvume yokuba umntana wakho athabathe inxaxheba kwisifundo esisebenzisa abafundi be bakala le-9 kwezikolo zaseStellenbosch ngobubanzi. Esisifundo sizokundanceda ukuba ndikwazi ukufumana isidanga sam. Esisifundo siyokumnceda umntwana wakho ekuthabatheni isigqibo malunga nobomi bemfundo okanye bomsebenzi wakhe kwaye, singanceda kubekho nezinye izifundo ezilandelayo ezizakuthi zibancede abafundi.

**1. PURPOSE OF THE STUDY/ ISIZATHU SOLUPHANDO**

The aim of this study is to investigate gender and racial differences on the South African Career Interest Inventory (SACII) among grade 9 high school student in the Western Cape Winelands District of South Africa. The SACII is a questionnaire that consists of a list of 143 activities that are performed in different jobs and it is used to determine your career interests.

Owona mxholowolo wesisifundi kukuphanda ngeyantlukwano zobuni nobuhlanga kwi- South African Career Interest Inventory (SACII) kubafundi bebakala le-9 kwizikolo eziphakamileyo zeNtshona Koloni. I-SACII liphethshana lemibuzo elinemibuzo elinamibuzo eliquka izenzo engama 143 ezenziwa kwimisebenzi eyahlukileyo kwaye isetyenziselwa ukwazi ukuba ithini iminqweno yakho yomsebenzi.



## 2. PROCEDURES/ INKQUBO

If you provide consent for your child to volunteer to participate in this study, we would ask her/him to do the following:

Ukuba uyavuma ukuba umntwana wakho athabathe inxaxheba koluphando, siyakuncela ukuba enze oku kulandelayo:

Complete a biographical questionnaire/ [Aphendule imibuzo echaza ngobuyena](#)

The biographical questionnaire consists of four questions related to your child's age, gender, ethnicity and home language. The purpose of this questionnaire is to establish the biographic and demographic characteristics of the sample of this study. This information will be kept confidential and completely anonymous – only the primary researcher and the researcher supervisor will have access to this information.

Imibuzo echaza ngobuyena yimibuzo enento yokwenza neminyaka yobudala, ubuni, uhlanga kunye nolwimi lomntwana. Isizathu salemibuzo kukwazi ubuni nemvelaphi yabantu abathabatha inxaheba koluphando. Lenkcukacha iyakukhuselwa kwaye ibeyimfihlo – ayakukwaziwa ngumphandi kwakunye nomphathi wakhe kuphela.

Complete a paper-and-pencil version of the SACII/ [Aphendule imibuzo kwiphepha ngepensile.](#)

Participants will be asked to complete all the items in the SACII during class. The SACII was developed to measure an individual's career interest structure. The items in the SACII are presented as statements to which the participants will indicate their agreement or disagreement on a 5-point Likert-type scale, ranging from (1) *strongly disagree* to (5) *strongly agree*. The participants' responses to these items will be kept confidential and safeguarded on a password-protected computer.

Abathabathi nxaxheba baya kucelwa ukuba baphendule yonke imibuzo ye SACII ngexesha lezifundo eklasini. I-SACII yacetya ukuqinisekisa ulwakhiwo lomdla womntu malunga nemisebenzi. Le-SACII yakhiwe ngendlela yokuba iziintetho ezithile ayakuthi umfundi aphendule ukuba uyavumelana na okanye akavumelani nazo, apho ayakuthi akhethe inani ukusuka ku-1 *Andivumelani kwaphela* ukuya ku-5 *Ndivumelana ngokugqibeleleyo*. Iimpendulo zabathabathi nxaxheba ziyakukhuselwa zibeyimfihlo zigcinwe kwigumbi elivulwa ngamanani ayimfihlo.

## 3. POTENTIAL RISKS AND DISCOMFORTS/ IZINTO EZINGABUBUNGOZI OKANYE ZINGATHANDEKI

This study poses minimal risk to the participants, seeing that the content which will be discussed is not intrusive or harmful. Participants' responses are completely voluntary and they are under no obligation to answer any question with which they feel uncomfortable.

Kuba oluphando lungesosiphazamiso kwaye lungabeki mfundi mngciphekweni, alunabungozi lunabo. Inxaxheba yomfundi ngamnye iyintando yakho ngokugqibeleleyo kwaye abanyanzelekanga ukuba baphendule imibuzo abangayithendiyo okanyi abangakwaziyo ukuyiphendula.

#### **4. POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY/ IGALELO ELINALO KUBAFUNDI NASEKUHLALENI**

The subjects will not benefit monetarily from participation. However, this study will contribute to the equal applicability of the SACII across different gender and racial groups in South Africa. Furthermore, this study will contribute to provide a psychometrically sound instrument to measure the specific interests of South Africans.

Abathabathi nxaxheba abayi kufumana mali koluphando. Kodwa, oluphandoluyakunceda ukusetyenziswa kwe-SACII ukufumanisa iyantlukwano zobuni nobuhlanga mbombo zone zoMzantsi Afrika

#### **5. PAYMENT FOR PARTICIPATION/ UBHATALO LWABATHABATHI NXAXHEBA**

Participation is completely voluntary and no payment for participation will be offered.

Abathabathi nxaxheba bathabatha inxaxheba mahala nangokuthanda kwabo kwaye abayi kubhatalwa ngexaxheba yabo

#### **6. CONFIDENTIALITY/IMFIHLELO**

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. Confidentiality will be maintained by means of keeping the data in a password protected document that only the researcher and the research supervisor will have access to

Yinke ingcombolo nenkcukacha efumaneka koluphando nemalunganawe iyakuba yimfihlo kwaye iyakubhentswa xa uthe wavuma okanye umthetho wavuma ukuba ibhentsiswe.

#### **7. PARTICIPATION AND WITHDRAWAL/ UKUTHABATHA INXAXHEBA NOKUYEKA**

Your child can choose whether to be in this study or not. If you provide consent for your child to volunteer to be in this study, she/he may withdraw at any time without consequences of any kind. Your child may also refuse to answer any questions they don't want to answer and still remain in the study. The investigator may withdraw your child from this research if circumstances arise which warrant doing so.

Umntwana wakho angavuma okanye angavumi ukuthabatha inxaxheba kwesisifundo. Ukuba wena mzali uyavuma ukuba athabathe inxaxheba, angangavumi yena okanye ayeke nanini na efuna kungekho sinyanzeliso. Umntana uvumelekile ukungavumi ukuphendula imibuzo angafuni kuyiohendula kodwa aqhubekeke noluphando. Umphandi angamkhupha umntwana koluphando xa efumanisa kunyanzelekile ukuba enze njalo.

#### **8. IDENTIFICATION OF INVESTIGATORS/ IINKCUKACHA ZABAPHANDI**

If you have any questions or concerns about the research, please feel free to contact the research supervisor (the person who oversees that all research is conducted correctly):

Ukuba unemibuzo onayo malunga noluphando unganxibelelana nomphathi womphandi (umntu oqinisekisa ukuba uphando lwenziwa ngendlela eyiyo):

- Professor Anthony Naidoo  
Department of Psychology  
Stellenbosch University  
(021) 808 3461 / [avnaidoo@sun.ac.za](mailto:avnaidoo@sun.ac.za)

**9. RIGHTS OF RESEARCH SUBJECTS/ AMALUNGELO ABATHABATHI NXAXHEBA**

Your child may withdraw your consent at any time and discontinue participation without penalty. Your child is not waiving any legal claims, rights or remedies because of her/his participation in this research study. If you have questions regarding your child's rights as a research subject, contact Ms Maléne Fouché [mfouche@sun.ac.za; 021 808 4622] at the Division for Research Development.

Umntwana angayeka nanini na ukuthabatha inxaxheba kungekho sohlwayo. Umntwana wakho akaphulukani namalungelo ake ngokuthabatha inxaxheba koluphando. Ukuba unemibuzo onayo malunga namalungelo omntwana wakho ngokuthabatha inxaxheba kuphando unganxibelelana noMs Maléne Fouché [mfouche@sun.ac.za; 021 808 4622] kwi Division for Research Development.

**SIGNATURE OF RESEARCH SUBJECT OR LEGAL REPRESENTATIVE/ Umtyikityo womthathi nxaxheba okanye u meli womthetho.**

The information above was described to the participant by Stephan Rabie in Afrikaans or English and the participant is in command of this language or it was satisfactorily translated to him/her. The participant was given the opportunity to ask questions and these questions were answered to his/her satisfaction.

Ndonelisekile, nma mzali, nge ngecukacha endizinikiweyo kweliphepha ngaso isi ngesi nesixhosa kwaye ithe yatolikwa k a k u hle . Ndiy a q o n d a u k u b a i k h o n a i m i b u z o e n d i n a y o , n d i n a k o u k u b a n d i q h a k a m s h e l a n e n o m p h a n d i k w a y e i m i b u z o y a m iyakuphendulwa ngokupheleleyo

PLEASE NOTE THAT THIS IS A PASSIVE CONSENT FORM. THEREFORE, IF YOU **DO NOT** PROVIDE CONSENT FOR YOUR CHILD TO PARTICIPATE IN THIS STUDY, PLEASE SEND THIS FORM BACK TO THE RESPECTIVE STAFF MEMBER AT YOUR CHILD'S SCHOOL. HOWEVER, IF YOU **DO** PROVIDE CONSENT FOR YOUR CHILD TO PARTICIPATE, YOU DO NOT HAVE TO SEND THIS FORM BACK.

NCEDA UQAPHELE UKUBA ESI SISIXANDO SEMVUME. NGOKO KE, UKUBA AWUVUI UKUBA UMNTWANA WAKHO ATHABATHE INXAXHEBA KWESISIFUNDO, NDEDAUBUYISE LEFOMU ESIKOLWENI. UKUBA UYAVUMA UKUBA UMNTWANA ATHABATHE INXAXHEBA AKUNYANZELEKANGA UYIBUYISE

\_\_\_\_\_  
Name of Subject/Participant / **Igama lomthabathi nxaxheba**

\_\_\_\_\_  
Name of Legal Representative (if applicable) **Igama lommeli mthetho**

\_\_\_\_\_  
Signature of Subject/Participant or Legal Representative

\_\_\_\_\_  
Date

**SIGNATURE OF INVESTIGATOR/ Umtyikityo womphandi**

I declare that I explained the information given in this document to \_\_\_\_\_ [*name of the subject/participant*] and/or [his/her] representative \_\_\_\_\_ [*name of the representative*]. [He/she] was encouraged and given ample time to ask me any questions. This conversation was conducted in [Afrikaans/\*English/\*Xhosa/\*Other] and [no translator was used/this conversation was translated into \_\_\_\_\_ by \_\_\_\_\_].

*Ndiyavuma ukuba ezincukacha zicaciswe kakuhle kum\_\_\_\_\_ [ Igama lomthathi nxaxheba] kwakunye/okanye*

*Um-meli wakhe \_\_\_\_\_ [ ig a m a l o m m eli] . U y e w a k h u t h a z w a k w a y e w a n i k w a i x e s h a e l a n e l e y o l o k u n d i b u z a i i m i b u z o*

\_\_\_\_\_  
**Signature of Investigator/**

**Umtyikityo womphandi**

\_\_\_\_\_  
**Date**

**Umhla**

**Appendix E: Biographical questionnaire**

<b>Code:</b>	S	1	4	2				
--------------	---	---	---	---	--	--	--	--

<b>Biographical Information</b>
---------------------------------

Please complete the following biographical information below before completing the questionnaire.

**1. Current Age** (in years)

**2. Gender**

Man	1
Woman	2

**3. Ethnic Group**

Black	1
Coloured	2
Indian/Asian	3
White	4

Other (please specify) \_\_\_\_\_

**4. Home Language:**

Afrikaans	1
English	2
IsiNdebele	3
IsiXhosa	4
IsiZulu	5
Sesotho sa Leboa (Northern Sotho)	6
Sesotho	7
Setswana	8
siSwati	9
Tshivenda	10
Xitsonga	11

Other (please specify) \_\_\_\_\_

**5. Highest Qualification Completed**

Grade 12 (Matric)	1
University Degree	2
Diploma	3
Certificate	4

Other (please specify) \_\_\_\_\_

**6. What is your mom's/guardian's highest level of education?** \_\_\_\_\_

**7. What is your dad's/guardian's highest level of education?** \_\_\_\_\_

**8. What is your mom's/guardian's occupation?** \_\_\_\_\_

**9. What is your dad's/guardian's occupation?** \_\_\_\_\_

**10. Are you currently a registered student at a university/technikon/college/etc?**

Yes  1  
 No  2

**11. If you answered yes to question 6, where are you registered?**

University  1  
 Technikon  2  
 College  3  
 Other (please specify) \_\_\_\_\_

**12. If you are a student, please indicate what academic year you are registered for:**

First  1                      Fourth  4  
 Second  2                      Honours  5  
 Third  3                      Masters/Doctorate  6  
 Other (please indicate) \_\_\_\_\_

**13. If you are a student, please indicate which Faculty you are registered in:**

Art, Design and Architecture  1  
 Economic and Financial Sciences  2  
 Education  3  
 Engineering and the Built Environment  4  
 Health Sciences  5  
 Humanities  6  
 Law  7  
 Management  8  
 Science  9  
 Other \_\_\_\_\_

**14. Do you have full time employment?** \_\_\_\_\_

Yes  
No

1
2

**15. Where did you grow up? (Please choose one option that is most correct)**

Urban (city)  
Rural town  
Rural village  
Farm  
None of the above

1
2
3
4
5

Kode:	S	1	4	2				
-------	---	---	---	---	--	--	--	--

## Biografiese Inligting

Verskaf asseblief die onderstaande biografiese inligting voor jy die vraelys voltooi.

**1. Ouderdom** (in jare)

**2. Geslag**

Man   
 Vrou

**3. Etniese Groep**

Swart   
 Kleurling   
 Indiër/Asiër   
 Blanke   
 Ander  
 (spesifiseer asseblief) \_\_\_\_\_

**4. Huistaal:**

Afrikaans	1
Engels	2
Ndebele	3
Xhosa	4
Zoeloe	5
Noord-Sotho (Sesotho sa Leboa)	6
Suid-Sotho	7
Tswana	8
Swati	9
Venda	10
Tsonga	11
Ander (spesifiseer asseblief)	_____

**5. Hoogste voltooide kwalifikasie**

Graad 8	1
Graad 9	2
Graad 12 (Matriek)	3
Universiteitsgraad	4
Diploma	5
Sertifikaat	6



Ander (spesifiseer asseblief) \_\_\_\_\_

6. Wat is jou ma/voog se vlak van opvoeding? \_\_\_\_\_

7. Wat is jou pa/voog se vlak van opvoeding? \_\_\_\_\_

8. Wat is jou ma/voog se werk? \_\_\_\_\_

9. Wat is jou pa/voog se werk? \_\_\_\_\_

10. Is jy tans 'n geregistreerde student aan 'n universiteit/universiteit van tegnologie/kollege/ens?

Ja  1  
 Nee  2

11. Indien jy “ja” geantwoord het by Vraag 6, aan watter instelling is jy tans geregistreer?

Universiteit  1  
 Universiteit van Tegnologie  2  
 Kollege  3  
 Ander (spesifiseer asseblief) \_\_\_\_\_

12. Indien jy tans 'n student is, dui asseblief aan vir watter akademiese jaar jy geregistreer is:

Eerste <input type="checkbox"/> 1	Vierde <input type="checkbox"/> 4
Tweede <input type="checkbox"/> 2	Honneurs <input type="checkbox"/> 5
Derde <input type="checkbox"/> 3	Meesters/Doktoraal <input type="checkbox"/> 6
Ander (spesifiseer asseblief) _____	

13. Indien jy tans 'n student is, dui asseblief aan by watter fakulteit jy geregistreer is:

Kuns, ontwerp en argitektuur  1  
 Ekonomiese en finansiële wetenskappe  2  
 Onderwys  3  
 Ingenieurswese en die bou-omgewing  4  
 Gesondheidswetenskappe  5  
 Geesteswetenskappe  6  
 Regte  7

Bestuurswetenskappe  
Natuurwetenskappe  
Ander

8
9

---

**14. Staan jy in 'n voltydse beroep?**

Ja  
Nee

1
2

**15. Waar het jy grootgeword? (Kies asseblief die mees korrekte opsie)**

Stadsgebied  
Plattelandse dorp  
Afgeleë nedersetting  
Plaas  
Geen van die bogenoemde

1
2
3
4
5

<b>Ikhawudi:</b>	S	1	4	2				
------------------	---	---	---	---	--	--	--	--

<b>Imibuzo Ngobuni Bakho</b>
------------------------------

Nceda ugcaliso iinkcukacha zakho apha ngaphantsi, phambi kokuba uphendule imibuzo

**1. Iminyaka yobudala**

--	--

**2. Isini**

Indoda

Ibhinqa

1
2

**3. Uhlanga**

Umnyama

Uxubile

Indiya/ Uli-Asia

Umhlophe

Olunye

1
2
3
4

**4. Ulwimi lwasekhaya:**

Isibhulu

IsiNgesi

IsiNdebele

IsiXhosa

IsiZulu

Sesotho sa Leboa

Sesotho

Setswana

siSwati

Tshivenda

Xitsonga

Olunye

1
2
3
4
5
6
7
8
9
10
11

**5. Ibanga lemfundo eliphezulu oliphumeleleyo**

Ibanga lesi-8

Ibanga lesi- 9

Ibanga le-10

Isidanga saseYunivesithi

1
2
3
4

I-Diploma  
Isatifikethi  
Olunye

5
6

---

**6. Ntoni imfundo kamama?**

---

**7. Ntoni imfundo katata?**

---

**8. Ntoni umsebenzi kamama?**

---

**9. Ntoni umsebenzi katata?**

---

**10. Ingaba ungumfundi eYunivesithi okanye e-college?**

Ewe  
Hayi

1
2

**11. Ukuba uvumile ngasentla, ufunda kweyiphi indawo?**

E-Yunivesithi  
E-Tek'nikon  
E-Kholeji  
Olunye

1
2
3

---

**12. Ukuba ungumfundi, ndicela ubhale ukuba ufunda omphi unyaka:**

Owokuqala  
Owesibini  
Owesithathu  
Olunye

1
2
3

Fourth  
li-Onazi  
li-Masitazi/ Ubugqirha

4
5
6

---

**13. Ukuba ungumfundi, ndicela ubhale ukuba ukweyiphi i-Faculty:**

Ukuzoba, Ukuyila nokucebisa izakhiwo  
linzululwazi zoqoqosho nezemali  
Ezemfundo  
Injineli kunye nobume bemeko yokwakha  
Ezempilo  
Izifundo ngabantu  
Izifundo zomthetho  
Izofundo ngokuphatha

1
2
3
4
5
6
7
8

Inzululwazi  
Olunye

9
---

---

**14. Ingaba unaye na umsebenzi  
osisigxina?**

Ewe  
Hayi

1
2

**15. Ukhulelephi? Ndicela ukhethe impendulo ezantsi**

Edolophini

1
---

Idolophu esezilalini

2
---

Ezilalini

3
---

Efama

4
---

Ayikho kwezi ziphezulu

5
---

## Appendix F: Participant assent form



### DEELNEMER INLIGTINGSBLAD EN INSTEMMINGSFORM

11 April 2016

#### TITEL VAN DIE NAVORSINGSPROJEK:

Gender and racial differences on the South African Career Interest Inventory among secondary school students

#### NAVORSER SE NAAM:

Stephan Rabie

#### ADRES:

Huis de Villiers  
Neethling street  
Stellenbosch  
7602

#### KONTAK NOMMER:

021 808 2857

#### Wat is NAVORSING?

Navorsing is iets wat ons doen om nuwe kennis te kry oor die manier waarop dinge (en mense) werk. Ons gebruik navorsingsprojekte om ons te help om meer uit te vind meer kinders en tieners en die dinge wat hulle lewens, hulle skole, hul families en hul gesondheid affekteer . Ons doen dit om die wêreld 'n beter plek te maak!

#### Waaroor gaan hierdie navorsingsprojek?

Hierdie navorsingsprojek ondersoek of daar verskille is in die loopbaan belange van Graad 9 studente op die South African Career Interest Inventory (SACII). Die SACII is 'n vraelys wat

bestaan uit 143 aktiwiteite wat uitgevoer word in verskillende beroepe en word gebruik om jou loopbaan belange te bepaal.

### **Hoekom is ek uitgenooi om deel te neem aan hierdie studie?**

Jy is uitgenooi om deel te neem in hierdie navorsingsprojek, want jy is `n Graad 9 student wat in Wes-Kaap Wynland Distrik woon.

### **Wie doen hierdie navorsing?**

Stephan Rabie, `n Meestergraadstudent aan die Universiteit van Stellenbosch, sal hierdie navorsing doen.

### **Wat sal met my gebeur as ek deel neem in hierdie studie?**

Indien jy deel neem aan hierdie studie, sal jy gevra word om die South African Career Interest Inventory in Afrikaans te voltooi. Hierdie vraelys vra vrae oor jou gunsteling beroep.

### **Kan enige iets sleg met my gebeur?**

Niks sleg kan met jou gebeur nie.

### **Kan enige iets goed met my gebeur?**

Jy sal blootgestel word aan verskillende loopbaan keuses wat in die wêreld van werk beskikbaar is. Jy sal ongelukkig nie persoonlike terugvoering ontvang nie.

### **Sal enige iemand weet ek neem deel aan hierdie projek?**

Alle inligting verwant aan hierdie studies al vertroulik en totaal anoniem hanteer word. Slegs die primêre navorser, Stephan Rabie en sy studieleier, Professor Tony Naidoo, sal toegang hê tot hierdie inligting. Die data sal gestoor word op `n wagwoord-beskermdre rekenaar.

### **Met wie kan ek praat oor hierdie projek?**

Indien jy enige vrae het, kan jy gerus die volgende mense skakel:

Stephan Rabie (die persoon wie die navorsing voltooi)

021 808 2857

Prof. Anthony Naidoo (die persoon wie die projek oorsien)

021 808 3461

**Wat as ek nie wil deel neem aan hierdie projek nie?**

Jy het die reg om enige tyd te onttrek uit hierdie studie. Indien jy nie wil deel neem nie, sal daar geen gevolge wees nie en jy sal nie in die moeilikheid wees nie.

Verstaan jy hierdie navorsingsprojek en is jy gewillig om deel te neem?

 JA NEE

Het die navorser al jou vrae beantwoord?

 JA NEE

Verstaan jy dat jy enige tyd kan ophou om deel te neem?

 JA NEE

\_\_\_\_\_  
Handtekening van kind

\_\_\_\_\_  
Datum





IDYUNIVESITHI ISTELENBOSCH

## **IPHETSHANA ELINEENKCUKACHA ZALOWO UTHATHA INXAXHEBA NEFOMU YESIVUMELWANO**

**ISIHLOKO SENKQUBO SOPHANDO:** Gender and racial differences on the South African Career Interest Inventory among secondary school students

**AMAGAMA OM(ABA)PHANDI:** Stephan Rabie

**IDILESI:** Huis de Villiers  
Neethling street  
Stellenbosch  
7602

**INOMBOLO YOMNXEBA:** 0799065484

### **Yintoni UPHANDO ?**

Uphando yinto esiyenzayo ukufumana **ULWAZI OLUTSHA** ngendlela izinto (nabantu) ezisebenza ngayo. Sisebenzisa uphando okanye izifundo ukusinceda sazi banzi ngabantwana nolutsha nezinto ezichaphazela ubomi babo, izikolo zabo, iintsapho zabo nempilo yabo. Senza oku ukuzama nokwenza ilizwe ibe yindawo engcono!

### **Imalunga nantoni na le projekthi yophando?**

Esi fundu sizakuphanda ukuba ukhona na umahluko kwiminqweno yemisebenzi yabafundi bebakala le9 abakwi South African Career Interest Inventory (SACII). I-SACII liphetshana lemibuzo elinemibuzo elinamibuzo eliquka izenzo engama 143 ezenziwa kwimisebenzi eyahlukileyo kwaye isetyenziselwa ukwazi ukuba ithini iminqweno yakho yomsebenzi

### **Kutheni ndimenyiwe ukuba ndithathe inxaxheba koluphando?**

Umenywa ukuba uthabathe inxaxheba koluphando ngokuba ungumfundi webakala lethoba kwisikolo esisentshona koloni.

### **Ngubani owenza uphando?**

Igama lomphandi nguStephan Rabie, ofunda iMasters kwiPsychology kwidyuniversity yaseStellenbosch

**Kuza kwenzeka ntoni kum kwesi sifundo?**

Ukuba uyavuma ukubathatha inxaxheba koluphando, uzakuphendula imibuzo yeSouth African Career Inventory. Lemibuzo imalunga nomsebenzi funa ukuwenza xa sele ukhulile. Lemibuzo iyakuphendulwa ngexesha lesikolo. Umhla nexesha uyakuwaziswa ngutitshala wakho.

**Ikhona into embi enokwenzeka kum?**

Akho nto imbi enokwenzeka kuwe ngokuthabatha inxaxheba koluphando.

**Ikhona into entle enokwenzeka kum?**

Uyakufumana ulwazi ngamathuba amaninzi engqesho nemisebenzi. Kodwa ke awuyi kufumana ziphumo zemibuzo oyiphenduleyo.

**Ukhona na umntu oza kundazi ukuba ndikwesi sifundo?**

Ingcombolo neenkukacha ezikoluphando ziyimfihlo ngokugqibeleleyo. Iyakuba ngumphandi uStephan Rabie kunye nomphathi wakhe uProf Anthony Naidoo kuphela abayakubona ezinkukacha. Yonke lengcombolo iyakukhuselwa kwigumbi elitshixiweyo ekungenwa kulo ngamanani ayimfihlo ekumpyutha.

**Ngubani endinokuthetha naye ngesi sifundo?**

Ukuba unayo imibuzo malunga noluphando, ungaqhakamishelana nomphandi uStephan ku 079 906 5484 okanye nomphathi wakhe uProf. Anthony Naidoo ku 021 808 3461

**Kuza kwenzeka ntoni ukuba andifuni kukwenza oku?**

Unalo ilungelo lokwala ukuthabatha inxaxheba koluphando okanye uyeke ohakathi xa ungasafuni. Ukuba awufuni ukuthabatha inxaxheba koluphando, awuyi kubasengxakini okanye kubekho ngxaki.

Uyasiqonda na esi sifundo sophando kwaye unomdla na wokuthabatha inxaxheba kuso?

EWE

HAYI

Ingaba umphandi uyiphendule yonke imibuzo yakho?

EWE

HAYI

Uyayiqonda na into yokuba UNGAYEKA ukuthabatha inxaxheba kwesi sifundo nanini na?

EWE

HAYI

Utyikityo loMntwana

Umhla

## Appendix G: Research Ethics Committee Approval Letter



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jou kennisvennoot • your knowledge partner

### Approved with Stipulations

#### Response to Modifications- (New Application)

11-Mar-2016

Rabie, Stephan S

#### Proposal #: SU-HSD-000640

**Title: Investigating gender and ethnic differences on the South African Career Interest Inventory among high school students**

Dear Mr. Stephan Rabie,

Your **Response to Modifications - (New Application)** received on **01-Mar-2016**, was reviewed by members of the **Research Ethics Committee: Human Research (Humanities)** via Expedited review procedures on **10-Mar-2016**.

Please note the following information about your approved research proposal:

Proposal Approval Period: **11-Mar-2016 -10-Mar-2017**

The following stipulations are relevant to the approval of your project and must be adhered to: **The researcher may proceed with the envisaged research provided that the following stipulations, relevant to the approval of your project are adhered to or addressed.**

- 1) **The REC acknowledges the changes made to the invitation letter, informed assent form and informed consent form. The user friendliness of these documents can, however, still be improved by removing some of the academic jargon. For example: do the learners or their parents really need to know that the current study is a “quantitative” study; that they need to complete a “demographic” questionnaire; and that the scale will be a 5-point “Likert-type” scale? Consider rephrasing “vocational” interests into words the readers will understand.**

- 2) **In the researcher’s response letter, he mentions that “The SACII will be administered by a psychometrist (independent practice) who received training in the administration of career assessment and is registered with the Health Professions Council of South Africa.” Is this person the researcher or will someone else visit to schools to administer the questionnaires? If the latter, the principals of the participating schools should be made aware of this fact.**
- 3) **The word “ethnic group” is still used in the biographical questionnaire. Please rephrase this or use an alternative. If an alternative cannot be found, the concept should be defined (grounded in existing literature).**

Please provide a letter of response to all the points raised IN ADDITION to HIGHLIGHTING or using the TRACK CHANGES function to indicate ALL the corrections/amendments of ALL DOCUMENTS clearly in order to allow rapid scrutiny and appraisal.

Please take note of the general Investigator Responsibilities attached to this letter. You may commence with your research after complying fully with these guidelines.

Please remember to use your **proposal number (SU-HSD-000640)** on any documents or correspondence with the REC concerning your research proposal.

Please note that the REC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

Also note that a progress report should be submitted to the Committee before the approval period has expired if a continuation is required. The Committee will then consider the continuation of the project for a further year (if necessary).

This committee abides by the ethical norms and principles for research, established by the Declaration of Helsinki and the Guidelines for Ethical Research: Principles Structures and Processes 2004 (Department of Health). Annually a number of projects may be selected randomly for an external audit. National Health Research Ethics Committee (NHREC) registration number REC-050411-032.

We wish you the best as you conduct your research.

If you have any questions or need further help, please contact the REC office at 218089183.

Sincerely,

Clarissa Graham  
REC Coordinator  
Research Ethics Committee: Human Research (Humanities)

**Appendix H: Descriptive statistics for the SACII items**

Items	N	Mean	Median	SD	Skewness	Kurtosis
R 1	628	2.71	3.00	1.508	.271	-1.367
R 2	628	2.16	2.00	1.335	.863	-.482
R 4	628	2.23	2.00	1.378	.804	-.660
R 7	628	2.39	2.00	1.375	.603	-.896
R 8	628	2.36	2.00	1.404	.639	-.935
R 9	628	2.22	2.00	1.339	.842	-.488
R 10	628	2.31	2.00	1.417	.729	-.815
R 11	628	2.29	2.00	1.453	.762	-.848
R 13	628	2.05	2.00	1.336	1.099	-.062
R 14	628	2.34	2.00	1.394	.658	-.878
R 15	628	2.41	2.00	1.393	.587	-.928
R 16	628	2.80	3.00	1.503	.195	-1.384
R 17	628	2.23	2.00	1.383	.822	-.623
R 18	628	2.36	2.00	1.315	.570	-.836
R 20	628	2.04	2.00	1.213	1.033	.086
R 21	628	1.97	1.00	1.241	1.176	.319
R 23	628	2.25	2.00	1.301	.761	-.536
R 24	628	2.03	1.00	1.295	1.058	-.094
R 25	628	2.09	2.00	1.311	1.021	-.152
R 26	628	2.26	2.00	1.445	.803	-.790
R 27	628	2.17	2.00	1.323	.879	-.433
R 28	628	2.12	2.00	1.321	.912	-.404
I1	628	2.78	3.00	1.430	.170	-1.290
I10	628	2.99	3.00	1.478	-.025	-1.387
I11	628	2.47	2.00	1.347	.529	-.907
I12	628	2.88	3.00	1.470	.053	-1.386
I13	628	2.49	2.00	1.380	.495	-.996
I16	628	2.76	3.00	1.519	.217	-1.415

I17	628	2.50	2.00	1.417	.454	-1.126
I19	628	2.55	2.00	1.434	.469	-1.099
I2	628	2.73	3.00	1.510	.263	-1.384
I20	628	2.47	2.00	1.436	.512	-1.086
I21	628	2.76	3.00	1.460	.209	-1.334
I22	628	2.42	2.00	1.336	.540	-.889
I23	628	2.97	3.00	1.490	-.006	-1.405
I24	628	2.61	2.00	1.431	.363	-1.207
I25	628	2.52	2.00	1.421	.484	-1.084
I26	628	2.65	2.00	1.478	.288	-1.357
I4	628	3.15	3.00	1.552	-.140	-1.495
I5	628	2.56	2.00	1.397	.417	-1.094
I6	628	2.85	3.00	1.458	.115	-1.363
I8	628	2.56	2.00	1.438	.428	-1.170
I9	628	2.44	2.00	1.355	.564	-.853
A1	628	2.75	3.00	1.520	.256	-1.388
A2	628	2.57	2.00	1.466	.454	-1.182
A10	628	2.83	3.00	1.452	.117	-1.353
A23	628	2.91	3.00	1.490	.069	-1.403
A20	628	2.50	2.00	1.453	.462	-1.195
A6	628	2.75	3.00	1.519	.234	-1.419
A25	628	2.82	3.00	1.507	.159	-1.425
A7	628	2.91	3.00	1.549	.054	-1.504
A29	628	2.53	2.00	1.418	.399	-1.204
A27	628	2.32	2.00	1.328	.654	-.761
A8	628	2.62	3.00	1.488	.347	-1.281
A21	628	2.83	3.00	1.504	.151	-1.402
A9	628	2.59	2.00	1.448	.424	-1.170
A4	628	2.50	2.00	1.503	.508	-1.204

A13	628	3.04	3.00	1.583	-.047	-1.541
A5	628	2.84	3.00	1.540	.158	-1.462
A22	628	2.55	2.00	1.504	.448	-1.252
A28	628	2.72	3.00	1.549	.273	-1.433
A19	628	2.68	3.00	1.479	.230	-1.356
A16	628	2.75	3.00	1.406	.181	-1.248
A30	628	2.48	2.00	1.451	.512	-1.121
A18	628	2.63	2.00	1.495	.358	-1.300
A26	628	2.64	2.00	1.491	.307	-1.340
A11	628	3.04	3.00	1.581	-.038	-1.546
A15	628	2.59	2.00	1.429	.389	-1.164
A24	628	2.52	2.00	1.443	.483	-1.101
S22	628	2.79	3.00	1.541	.190	-1.474
S26	628	2.59	2.00	1.420	.365	-1.222
S25	628	2.76	3.00	1.478	.217	-1.358
S24	628	3.38	4.00	1.461	-.396	-1.216
S5	628	3.47	4.00	1.483	-.505	-1.175
S11	628	3.25	3.00	1.534	-.258	-1.419
S12	628	2.93	3.00	1.584	.074	-1.543
S27	628	2.99	3.00	1.433	-.029	-1.308
S7	628	2.87	3.00	1.508	.125	-1.417
S23	628	3.11	3.00	1.518	-.145	-1.431
S28	628	2.51	2.00	1.386	.430	-1.078
S10	628	3.25	3.50	1.564	-.274	-1.446
S15	628	2.99	3.00	1.535	-.040	-1.480
S18	628	2.92	3.00	1.557	.093	-1.500
S4	628	3.18	3.00	1.515	-.166	-1.418
S2	628	2.94	3.00	1.515	.053	-1.424
S6	628	3.33	4.00	1.505	-.328	-1.334



S20	628	3.08	3.00	1.499	-.107	-1.406
S16	628	2.60	2.00	1.419	.366	-1.187
S3	628	2.96	3.00	1.479	.019	-1.389
S8	628	2.89	3.00	1.488	.107	-1.401
S17	628	2.94	3.00	1.492	.049	-1.396
E22	628	2.18	2.00	1.218	.787	-.393
E27	628	2.89	3.00	1.437	.059	-1.329
E17	628	2.64	2.00	1.439	.396	-1.181
E2	628	2.43	2.00	1.385	.544	-1.001
E3	628	2.42	2.00	1.346	.618	-.805
E24	628	3.32	3.00	1.491	-.301	-1.328
E11	628	3.38	4.00	1.511	-.362	-1.331
E16	628	2.42	2.00	1.364	.571	-.895
E7	628	2.93	3.00	1.456	.029	-1.347
E19	628	3.03	3.00	1.477	-.040	-1.382
E14	628	2.73	3.00	1.459	.292	-1.263
E25	628	2.63	2.00	1.432	.357	-1.193
E28	628	2.61	2.00	1.440	.409	-1.191
E1	628	2.61	2.00	1.447	.394	-1.196
E18	628	2.34	2.00	1.339	.605	-.846
E10	628	2.69	3.00	1.448	.277	-1.279
E9	628	2.50	2.00	1.434	.498	-1.082
E12	628	3.36	3.00	1.487	-.317	-1.314
E5	628	2.53	2.00	1.396	.443	-1.080
E8	628	2.54	2.00	1.395	.435	-1.101
E21	628	2.67	3.00	1.440	.332	-1.212
E15	628	2.72	3.00	1.455	.240	-1.298
E13	628	2.51	2.00	1.391	.501	-.993
E20	628	2.38	2.00	1.365	.630	-.836

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E23	628	2.66	2.00	1.446	.343	-1.231
C29	628	2.31	2.00	1.316	.659	-.740
C18	628	2.33	2.00	1.309	.653	-.764
C26	628	2.66	3.00	1.433	.273	-1.264
C14	628	2.40	2.00	1.310	.562	-.839
C12	628	2.36	2.00	1.371	.650	-.830
C2	628	2.47	2.00	1.371	.523	-.974
C19	628	2.68	2.00	1.446	.320	-1.251
C17	628	2.59	2.00	1.424	.407	-1.173
C15	628	2.49	2.00	1.454	.516	-1.103
C20	628	2.31	2.00	1.298	.731	-.571
C22	628	2.76	3.00	1.426	.207	-1.297
C16	628	2.54	2.00	1.412	.466	-1.073
C7	628	2.63	2.00	1.491	.406	-1.274
C5	628	2.11	2.00	1.223	.944	-.058
C25	628	2.45	2.00	1.357	.525	-.904
C8	628	2.52	2.00	1.422	.405	-1.179
C27	628	2.63	2.00	1.448	.368	-1.214
C9	628	2.53	2.00	1.454	.459	-1.171
C3	628	2.30	2.00	1.341	.739	-.625
C28	628	2.28	2.00	1.369	.762	-.644
C11	628	2.23	2.00	1.254	.697	-.603
C21	628	2.60	2.00	1.495	.416	-1.243
C24	628	2.46	2.00	1.394	.523	-.994
C1	628	2.43	2.00	1.341	.513	-.911
C4	628	2.83	3.00	1.556	.165	-1.492

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**Appendix I: Component loadings of the SACII**

Item	C1	C2	C3
I1	.324	-.136	.090
I2	.354	-.170	.114
I3	.303	.124	-.137
I4	.461	.032	.143
I5	.408	-.233	.045
I6	.459	-.005	-.166
I7	.526	-.232	-.046
I8	.462	.027	.172
I9	.370	-.012	.171
I10	.548	-.080	-.142
I11	.362	.387	-.081
I12	.392	-.065	-.325
I13	.471	-.037	-.305
I14	.493	-.019	.073
I15	.495	.036	-.155
I16	.338	.339	-.077
I17	.462	-.082	-.352
I18	.411	-.161	.152
I19	.421	-.150	.105
I20	.464	-.158	-.244
I21	.510	-.045	-.342
I22	.437	.145	.250
I23	.559	-.084	-.364
I24	.537	.217	.175
I25	.410	.185	.267
I26	.578	-.049	-.230

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I27	.486	-.176	-.109
I28	.512	.365	-.095
I29	.547	-.019	-.256
I30	.512	.103	-.146
I31	.450	-.308	.190
I32	.511	-.098	-.336
I33	.489	-.355	.091
I34	.525	-.118	-.349
I35	.343	.063	.342
I36	.377	.100	.357
I37	.505	-.074	-.134
I38	.502	.378	.005
I39	.401	.221	.224
I40	.547	-.111	.270
I41	.452	-.316	.183
I42	.481	-.154	.149
I43	.383	-.263	.061
I44	.462	.065	.347
I45	.369	-.211	.105
I46	.503	-.020	-.466
I47	.459	.348	-.021
I48	.373	.544	-.066
I50	.493	-.118	.221
I51	.396	-.060	-.172
I52	.562	-.072	.086
I53	.514	.031	-.177
I54	.384	-.027	-.253
I55	.576	.053	-.162
I56	.579	-.080	-.273

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I57	.536	-.123	.256
I58	.523	.384	-.005
I59	.556	-.219	-.063
I60	.545	-.288	.134
I61	.531	-.062	-.397
I62	.548	-.039	-.460
I63	.558	-.246	-.031
I64	.590	.189	-.106
I65	.594	-.185	-.070
I66	.619	-.285	.077
I67	.574	-.091	-.241
I68	.410	.173	.231
I69	.489	.414	.035
I70	.537	-.197	.184
I71	.523	-.040	-.289
I72	.483	.064	.289
I73	.420	-.197	.166
I74	.614	-.072	-.101
I75	.397	-.233	.279
I76	.448	-.160	.294
I77	.499	-.203	.159
I78	.487	.173	.371
I79	.511	-.047	.274
I80	.412	-.076	.242
I81	.434	.507	-.001
I82	.496	-.133	.079
I83	.366	.556	-.027
I84	.547	-.086	.143
I85	.408	.228	.263

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I86	.563	-.059	-.311
I87	.490	.129	.205
I88	.493	-.077	.187
I89	.498	-.332	.106
I90	.542	-.043	-.328
I91	.632	-.160	-.184
I92	.479	.317	.138
I93	.430	.489	.037
I94	.491	.305	.171
I95	.441	.283	.263
I96	.488	.478	.080
I97	.517	.417	.088
I98	.519	-.393	.230
I99	.444	-.306	.144
I100	.608	-.144	-.264
I101	.589	.051	-.196
I102	.541	.306	-.056
I103	.530	-.113	.240
I104	.641	-.139	-.121
I105	.502	.336	.146
I106	.466	.383	.039
I107	.564	-.371	.090
I108	.578	-.067	.184
I109	.563	.246	.054
I110	.502	.467	.062
I111	.613	-.122	-.150
I112	.528	-.332	.088
I113	.492	.366	-.019
I114	.436	-.083	-.063

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I115	.625	-.044	-.227
I116	.528	-.343	.163
I117	.573	.017	.222
I118	.629	-.001	-.188
I119	.522	.061	-.161
I120	.458	.021	.258
I121	.549	-.207	.310
I122	.402	-.054	.255
I123	.598	.066	-.176
I124	.544	-.379	.124
I125	.553	.071	-.381
I126	.503	.497	-.040
I127	.576	-.120	.111
I128	.444	.240	.352
I129	.611	-.138	-.070
I130	.580	.008	-.171
I131	.502	.389	.012
I132	.488	.500	.004
I133	.564	.088	-.053
I134	.582	-.019	-.215
I135	.607	.004	-.123
I136	.541	-.360	.037
I137	.528	.295	.130
I138	.506	-.276	.121
I139	.520	.037	.341
I140	.482	-.254	.161
I141	.451	-.065	.166
I142	.591	-.051	-.088
I143	.548	.005	-.390

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**Appendix J: Angular locations and Commuality estimates of the SACII**

Item	Angular Location	Commuality
1	147	0.03
2	146	0.04
3	312	0.03
4	77	0.02
5	169	0.06
6	268	0.03
7	191	0.06
8	81	0.03
9	94	0.03
10	241	0.03
11	348	0.16
12	259	0.11
13	263	0.09
14	105	0.01
15	283	0.03
16	347	0.12
17	257	0.13
18	137	0.05
19	145	0.03
20	237	0.08
21	263	0.12
22	60	0.08
23	257	0.14
24	39	0.08
25	55	0.11
26	258	0.06



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27	212	0.04
28	345	0.14
29	266	0.07
30	305	0.03
31	148	0.13
32	254	0.12
33	166	0.13
34	251	0.14
35	80	0.12
36	74	0.14
37	241	0.02
38	1	0.14
39	45	0.10
40	112	0.09
41	150	0.13
42	136	0.05
43	167	0.07
44	79	0.12
45	154	0.06
46	268	0.22
47	357	0.12
48	353	0.30
50	118	0.06
51	251	0.03
52	130	0.01
53	280	0.03
54	264	0.06
55	288	0.03
56	254	0.08

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57	116	0.08
58	359	0.15
59	196	0.05
60	155	0.10
61	261	0.16
62	265	0.21
63	187	0.06
64	331	0.05
65	201	0.04
66	165	0.09
67	249	0.07
68	53	0.08
69	5	0.17
70	137	0.07
71	262	0.09
72	78	0.09
73	140	0.07
74	235	0.02
75	130	0.13
76	119	0.11
77	142	0.07
78	65	0.17
79	100	0.08
80	107	0.06
81	360	0.26
82	149	0.02
83	357	0.31
84	121	0.03
85	49	0.12

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86	259	0.10
87	58	0.06
88	112	0.04
89	162	0.12
90	263	0.11
91	229	0.06
92	24	0.12
93	4	0.24
94	29	0.12
95	43	0.15
96	10	0.23
97	12	0.18
98	150	0.21
99	155	0.11
100	241	0.09
101	285	0.04
102	350	0.10
103	115	0.07
104	221	0.03
105	23	0.13
106	6	0.15
107	166	0.15
108	110	0.04
109	12	0.06
110	8	0.22
111	231	0.04
112	165	0.12
113	357	0.13
114	217	0.01

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115	259	0.05
116	155	0.14
117	86	0.05
118	270	0.04
119	291	0.03
120	85	0.07
121	124	0.14
122	102	0.07
123	291	0.04
124	162	0.16
125	281	0.15
126	355	0.25
127	137	0.03
128	56	0.18
129	207	0.02
130	273	0.03
131	2	0.15
132	0	0.25
133	329	0.01
134	265	0.05
135	272	0.02
136	174	0.13
137	24	0.10
138	156	0.09
139	84	0.12
140	148	0.09
141	111	0.03
142	240	0.01
143	271	0.15

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