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Investigating item bias in some of the scales of the English Version of the South African Substance Use Contextual Risk Instrument (SASUCRI) across a sample of English and isiXhosa mother-tongue learners.

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Declaration

I declare that the study “**Investigating item bias in some of the scales of the English Version of the South African Substance Use Contextual Risk Instrument (SASUCRI) across a sample of English and isiXhosa mother-tongue learners.**” is my own work, that all the sources I have used or quoted have been indicated and acknowledged by means of complete references, and that this work has not been submitted previously in its entirety, or in any part, at any other higher education institution for degree purposes.

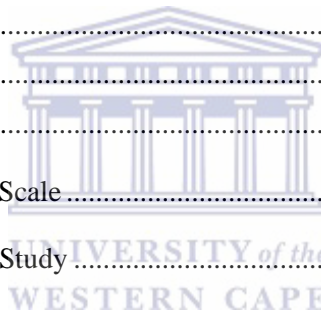
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ABSTRACT

Substance abuse is a global concern, particularly amongst adolescents. Research shows that secondary school learners in the Western Cape are susceptible to substance use due to the ease of access to and constant use of drugs and alcohol by their peers. The use of substances by adolescents has been linked to a number of negative consequences. The South African Substance Use Contextual Risk Instrument (SASUCRI) is an instrument developed for the purpose of identifying factors that lead to adolescent substance use and communities at risk of substance abuse. In the identification of these factors, appropriate interventions can be informed in terms of the areas that need to be focused on when dealing with the reduction of substance use. Two versions of the SASUCRI exist. However, in the investigation of the larger validation study, IsiXhosa mother-tongue learners were found to have responded to the English version of the SASUCRI. A sub-study to the larger study found that certain scales of the English version of the SASUCRI proved to be in-equivalent across the English and isiXhosa mother-tongue speakers. Recommendations were made for a further validation of the instrument by investigating the level of item bias within the in-equivalent scales, to determine the extent to which it measures what it was intended to measure. Using secondary data from the larger study, the current study investigated item bias on the identified in-equivalent scales of the English version of the SASUCRI across the two language groups, using a differential research design and two statistical techniques (Mantel-Haenszel and logistic regression). The theoretical framework was that of Bias and Equivalence. Permission to conduct the study and use the data was granted from various institutions and people: the Western Cape Education Department and school principals, Committees at UWC, and the researcher of the larger study. Results revealed that bias was found in some of these scales which limit its ability to be used for its intended purpose. Therefore, recommendations for the adaptation of the English version were made.

CHAPTER 1: INTRODUCTION

1.1. Adolescent Substance Use

Substance use has been, and still is, a major concern in and around the globe (Morojele, Parry, & Brook, 2009). However, within the context of South Africa, of immediate concern is the use of substances by children and adolescents (Morojele, Parry, Brook & Kekwaletswe, 2012). According to the Bureau of Market Research, University of South Africa [UNISA] (2012), secondary school learners in the Western Cape find themselves in an environment where there is an ease of access to and constant use of drugs and alcohol by some of their peers. The substances commonly used by youth are alcohol and cannabis, with a limited use of methamphetamine [tik] (Bureau of Market Research, UNISA, 2012; Morojele, Parry, & Brook, 2009). Methamphetamine has, however, been identified as a highly used drug within the Western Cape Province, but limited in its use amongst youth (Bureau of Market Research, UNISA, 2012). Most learners -who use/abuse drugs-, use drugs either for stress relief, experimenting, or entertainment, while others use it for enhancing their performance for sport or examinations. Ultimately, drug use and alcohol abuse has many negative consequences for learners, such as missing school, irresponsible behaviour, unprotected sex, etc. (Bureau of Market Research, UNISA, 2012; Carney, Myers, Louw, Lombard, & Flisher, 2013), which makes substance use amongst adolescents an important area of study.

It has been identified that of those countries that undergo major transitions (be it general or socio-economic), changes can be observed in the rise of risk-taking behaviours, such as in the excessive use of drugs (Flisher, Parry, Evans, Muller, & Lombard, 2003). South Africa is a country that has transitioned to and is (in many ways) still transitioning into a liberal, democratic country, governed by a democratic government. A government that promised in its introduction of programmes such as the 1994 Reconstruction and

Development Program (RDP) and Growth, Employment, and Redistribution (GEAR) program to increase in growth in various areas; areas such as housing, job creation, services and social security and the redistribution of land (Özler, 2007). However, these goals proved far-fetched and instead, increases in the levels of unemployment were observed and South Africa's labour market became highly segmented as the market catered more to high-skilled labour than it did to low-skilled labour (Özler, 2007). These inequalities left behind by the apartheid government and further perpetuated by the lack of prioritisation of the democratic government, have left many families within low-socio-economic status areas living in a state of poverty (Özler, 2007).

Research suggests that some of the possible reasons for engaging in substance use in South Africa are one's state of poverty, boredom, living in areas of close proximity to substance users, and living a stressful life (Ramlanga, Peltz, & Matseke, 2010). A substantial number of South Africans live in disadvantaged areas, and are likely unemployed and subsequently living in a state of poverty. This can lead to living lives of high criminal activity, gangsterism (Padayachee & Desai, 2011), as well as the selling and consuming of illegal substances (Peltzer, Ramlagan, Johnson, & Phaswana-Mafuya, 2010). Living conditions of this nature lead governments and researchers to investigate ways in which to prevent adolescents from engaging in these activities, as societal factors are some of the risk factors that can lead to adolescent substance use (Morojele, Parry, & Brook, 2009).

Morojele, Parry, Brook, and Kekwaletswe (2012) have stipulated that adolescent substance use exists in a number of communities and there are various reasons or factors that contribute to its onset. Due to these various factors, it has been pointed out that the use of one approach in the fight against substance use will prove unsuccessful. Thus, initial baseline assessments need to be conducted in order to "determine the particular drugs that are used, the substance-related problems that are of most concern, and the risk and protective factors

that are likely to apply to young people in that community” (Morojele, Parry, Brook, 2009, p.3). By doing this, appropriate interventions can possibly be informed, developed and implemented for those communities.

Literature has pointed towards the possible risk factors for adolescent substance use (Morojele et al., 2012). These factors include but are not limited to the following: Societal/community factors, School and Academic environment, Familial environment, Peers/Friends, and Individual factors. Certain measures, such as the South African Substance Use Contextual Risk Instrument (SASUCRI), have been developed as a means to examine the link between these and other risk factors. Furthermore, such instruments have been developed to examine the extent of substance use amongst adolescents in areas within South Africa that have been identified as having high prevalence rates of substance use, and are considered of a lower economic status. The SAUSCRI is an instrument that has been designed to measure the subjective insight of adolescents on the individual and contextual factors that have been associated with substance use in low-socioeconomic status communities in the Western Cape. In the section to follow

1.2. Overview of the Larger Study

In the larger validation study by Florence (2014), of which this study forms part, the instrument (SASUCRI) was in its initial stages of validation. The SASUCRI was developed to assess the factors that put adolescents at risk of using substances. In the development of the instrument, community members were consulted with regards to their perceptions of the factors that contribute to the use of substances by adolescents within their community. This instrument was created using Bronfenbrenner’s ecological systems theory to capture the contextual realities that adolescents face in their use of substances. The SASUCRI was designed to identify adolescents at risk of using substances as well as the substance use risk factors present within their communities (Rawoot & Florence, 2017). Originally, two

language versions of the instrument were developed, English and Afrikaans (adapted), to be administered to a sample of English and Afrikaans learners during the study. The instrument has undergone various processes of validation, which will be highlighted in Chapter 4. Results have shown that the English version of the SASUCRI has proven to be the most problematic (Bester, 2017).

A study was conducted to test the reliability and validity of the two language versions of the instrument. During this stage, it was discovered that certain scales of the English version of the instrument showed in-equivalence. Recommendations were made for a revision of the SASUCRI, in order to improve its validity. Working from these recommendations, further examination of the larger study found that isiXhosa mother-tongue learners had responded on the English version of the instrument. Recommendations were then made to examine the scalar equivalence of the English version of the SASUCRI across the English and isiXhosa mother-tongue learners. Results of this study indicated that a number of scales proved in-equivalent and thus further recommendations were made to investigate the level of item bias within these in-equivalent scales. Based on this recommendation, the investigation of item bias on the English version of the SASUCRI across the two language groups was thus the focus of the current study.

1.3. Rationale

Tests and instruments such as the SASUCRI have been designed and administered to provide us with details about test takers: information such as the extent of adolescent substance use within low-socioeconomic areas. Unfortunately, certain characteristics of participants may influence their performance on a test item (Abedlaziz, Ismail & Hussin, 2011). When tests are to be developed and administered, it is to be ensured that no form of bias is shown to any person(s) or group(s) and that fairness of the test is maintained throughout (Zumbo, 1999). Weaknesses of a test may prove disadvantageous as contradictory

results for members of dissimilar groups may result, allowing one group to perform better than the other (Beer, 2004). When issues of bias occur at an item level of an instrument, the effectiveness of the instrument is brought into question as it violates the principle of test fairness (Schumacker, 2010). IsiXhosa mother-tongue learners answered on the English version of the SASUCRI. The presence of two dissimilar groups (one being English and the other isiXhosa) thus made it crucial for an investigation of item bias on the English version of the SASUCRI to be conducted. This will ensure that any biased items can be removed or rewritten, and the reliability and validation of the results and instrument can be improved. Furthermore, it may motivate for the possible development of an isiXhosa version of the instrument. Recommendations supplied by the larger study further supported the need for this study.

1.4. Aim and Objectives

The study aimed to investigate item bias on the in-equivalent scales of the English version of the SASUCRI across a sample of English and isiXhosa mother-tongue learners.

Objective 1: To evaluate whether items functioned differently across the two language groups

Objective 2: To identify biased items on the in-equivalent scales of the English version of the SASUCRI

Objective 3: To inform the removal or revision of biased items

CHAPTER 2: LITERATURE REVIEW

2.1. Psychological Assessment in South Africa

Psychological assessment within the context of South Africa is extremely contentious due to the unfair, biased and discriminative use of tests during the colonial and apartheid periods (Laher & Cockcroft, 2014). It is because of this dark past that psychological assessment is viewed with suspicion (Laher & Cockcroft, 2014). Before the onset of apartheid, psychological assessments played a role in the psychological events in the country (Foxcroft & Roodt, 2013; Laher & Cockcroft, 2014). Like most countries, South Africa followed in their footsteps and imported existing European tests and applied them to all areas of society. These tests were originally used with white¹ test takers in mind and thus the functions of these tests were to legitimise a social order based on race; as the perception was that psychological tests produced empirical evidence which supported certain explanations of this order (Foxcroft & Roodt, 2013; Huysamen, 2002). The different results on tests - that measured intellectual ability for instance - between white and black² test-takers were used to reinforce the idea of hierarchical ordering of human societies. Emerging from these different results was a differential treatment of groups in terms of education, employment, and other aspects of economic life (Foxcroft & Roodt, 2013; Laher & Cockcroft, 2014).

It is evident from the above discussion that psychological assessments played a crucial role in the continued support of segregated development, promoted by the then government's racial agenda (Laher & Cockcroft, 2014; Subjee, 2013). The 1980's and early 1990's marked periods in which research and the development of tests, and testing procedures in South Africa, were quite active. This was then followed by significant political tensions within the discipline of psychology and psychological assessment. The negative role

¹ A socially based system of racial classification or ethnicity referring to a human group belonging to people of light-coloured skin, especially from European decent

² A socially based system of racial classification or ethnicity referring to a human group belonging to people of a dark-skinned skin, particularly of an African decent

played by psychological assessments before and during the apartheid era gave the psychology field a negative reputation (Laher & Cockcroft, 2014). During the rise of a democratic government and the transitioning of South Africa, psychological assessments were on the decline in South Africa (Foxcroft, 1997; Laher & Cockcroft, 2014). However, it was not dead (Laher & Cockcroft, 2014).

Cultural appropriateness and the use of psychological assessments were placed in high regard after the publication of the then new Employment Equity Act 55 of 1998 (Department of Labour, 1998; Van De Vijver & Rothmann, 2004). The act had stipulated that psychological tests and any other assessment of a similar nature were not permitted for use unless the test or assessment that was used had been scientifically proven to show characteristics of validity and reliability. Proof of validity and reliability indicated, in other words, that the test could be applied fairly and equally to all employees, and that it does not show bias against any employee or group (Van De Vijver & Rothmann, 2004). Looking at this, it is clear that issues of bias and test fairness had been characteristic of South Africa's past. Therefore, the examination of bias is important to eliminate or rework unfair assessments.

2.2. Cross-cultural Assessments

Interestingly in a multicultural context such as South Africa, practitioners have argued for the need for context appropriate tests that are available in all the eleven official languages (Foxcroft, Paterson, Le Roux, & Herbst, 2004; Haupt & Koch, 2012). Tests in multiple languages ensure that the tests are 'culture-reduced' or 'culture-common' (Haupt & Koch, 2012). In order to ensure the fair and equal use of tests, Van de Vijver and Rothmann (2004) suggested that there should be a focus on cross-culturally applicable tests. The use of tests across diverse groups is referred to as cross-cultural or cross-linguistic testing (Ismail & Koch, 2012), which is known as "the testing of individuals from different language groups

where the tests are available in various languages (multilingual tests) or in one language only (monolingual tests) and used across language groups” (Haupt & Koch, 2012, p. 67). The instrument in the current study qualifies as a cross-cultural test as it was found that a monolingual (English) test was used across two language groups (English and IsiXhosa).

Highlighted above, there has been a call for the increase in multilingual versions of psychological tests (de Klerk, 2008; Silo, 2010), particularly for comparative use across language groups (de Klerk, 2008). The need for multilingual versions of tests has resulted in the adaptation of tests from one language -or culture- to another (such as the Afrikaans adaptation of the English version of the SASUCRI); however, their validity is not instant (de Klerk, 2008; Haupt, 2010). Similar to many other countries, South Africa’s engagement in cross-cultural assessment has brought out one particular issue; that of language having been highlighted as problematic (de Klerk, 2008; Haupt, 2010). Silo (2010) argues that language (e.g. English) is an important variable for consideration when investigating whether a test is biased towards children in South Africa. He continues to argue that this can be attributed to the fact that most children who are considered to speak an African language normally have English as an additional language. Furthermore, they might experience education and/or language difficulties even when their primary education has been in English.

Additional to the issue of language, other factors such as culture can also be a possible factor influencing a test takers performance as well as the appropriateness of a test. De Klerk (2008) argues that culture needs to be taken into consideration when psychological tests are used to assess psychological constructs. The argument for taking culture into consideration is because culture can influence the test – with regards to understanding of constructs and their interpretation -and therefore the constructs have to be evaluated and appropriated to be culturally meaningful in order for the test taker to make sense of the test, and to improve their test performance or scores (de Klerk, 2008; Haupt, 2010). Regarding comparative cross-

cultural studies, it is important that tests are made fair across cultural groups. Thus it has been argued that cross-cultural comparisons have to be made on the same level - i.e. the methods used, the test instruments administered, assessment conditions, etc. have to be the same. Furthermore, the psychological characteristics of the groups have to be the same - to enable an accurate comparison across groups (De Klerk, 2008).

Poortinga (1989) suggested three components that enable the use of tests within different cultural populations. Firstly, it is assumed that in each culture the trait that is being measured by the items of a test have to at least have the same meaning. The test must at least have the same role in the organisation of behaviour, and the resultant scores on the tests have to at least have the same meaning for each test taker despite the differing cultural backgrounds they might come from. Despite the benefits of cross-cultural studies enabling a step towards fair and inclusive tests, Haupt and Koch (2012, p.10) have indicated that studies that are conducted across groups (cross-culturally or cross-linguistically) are marked by various issues. Issues arise particularly when specific measures are used to evaluate individuals within each group. These issues are known as the equivalence of test scores and the possible bias that could arise with the use of tests across groups. The terms bias and equivalence are briefly explained in the theoretical framework section to follow.

2.3. Monolingual Assessments

Monolingual tests, as mentioned above, use only one language for assessment across language groups (Haupt & Koch, 2012). Countries around the globe, including South Africa, have followed the trend of using monolingual tests in their measurement of individuals on a particular aspect (Foxcroft et al., 2004). It is assumed that the use of the same instrument (i.e. questionnaire – SASUCRI) for all groups involved in a study (the English and isiXhosa learners) will produce results that are comparable amongst the groups (Kankaraš & Moors, 2010). Culture, as de Klerk (2008) has stated, can be a possible factor that influences a test

takers performance as well as the appropriateness of a test. Kankaraš and Moors (2010) add to this by stating that different cultural contexts are made up of various factors, attributes, and processes. Therefore, the use of an instrument (consisting of the same questions) across groups might be interpreted differently for people of different cultures; therefore, it might measure different constructs in each culture (Kankaraš & Moors, 2010).

Haupt and Koch (2012) argue that unless a monolingual test is used to assess proficiency in a specific language, then it is indicated (by cross-cultural research, see Foxcroft, Paterson, Le Roux, & Herbst, 2004, and Haupt & Koch, 2012) that tests should be available in all of the eleven official South African languages. Huysamen (2002) argues that if a test's main objective is not to measure language proficiency and is used with test takers that are not proficient in the language of the test, then it is likely that construct-irrelevance will occur. Construct-irrelevance, according to Haupt and Koch (2012), occurs when a construct being measured may be relevant in one group and not another. Language has been identified as a possible source of construct-irrelevance, which has to be considered when measuring a construct cross-linguistically. Another aspect of construct-irrelevance can be attributed to the possibility of the cultural differences that a test might not be designed to measure (Haupt, 2012). Therefore, it is imperative that the same construct(s) are measured across different language groups (Ismail and Koch, 2012), to ensure test fairness and standardisation (Allalouf & Abramzon, 2008).

2.4. Research on Monolingual Assessments

The limitations and issues surrounding the use of monolingual tests in multilingual and multicultural contexts has become an area of interest by numerous researchers around the world. However, research surrounding this issue within South Africa is still in its infancy stage, thus requiring further research (Ismail and Koch, 2012).

Ismail and Koch (2012) are some of these researchers who conducted a study with an overall aim of assessing the scalar equivalence of the adapted English version of the Verbal Analogies (VA) scale of the Woodcock Muñoz Language Survey (WMLS) across English and Xhosa first language speaking groups. Within the study, one of the aims was to assess differential item functioning (DIF) -or bias- on the items of the scale. Results of this assessment indicated that the instrument displayed DIF across the two language groups. Three of the items displayed bias, with two favouring the English first language group, while the other item favoured the Xhosa first-language group. Further results of the overall study showed that the scale continued to appear to measure different constructs across the two groups, therefore scalar equivalence remained a problem. In the Allahouf and Abramzon (2008) study, interest was shown in examining differences on the performance of the Hebrew Proficiency Test (HPT) between Arabic and Russian first-language (L1) speakers. Due to the similarities between Hebrew and Arabic, results of the study indicated that Arabic speakers performed better than their Russian counterparts. The results of the findings concluded that the HPT functioned differently across the two groups.

In a validation study conducted by Roomaney and Koch (2013), they aimed to investigate item and construct bias. In their investigation of item bias, results showed that five of the items displayed differential item functioning. They concluded, unlike the above studies, that the detection and even the removal of biased items (which is one objective of this study) do not result in structural equivalence. In the event that biased items are found in the current study, recommendations for removal may not result in structural equivalence. However, revision of the items is still an available option. Similar to the validation studies discussed above, the study conducted by Florence (2014) also sought to add to the validation of an instrument (the English version of the SASUCRI) that was used for assessment across

two language groups (English and isiXhosa) during the instruments pilot stage. However, validation of the instrument is still ongoing, as issues of language bias have been identified.

2.5. Individual and Contextual Factors associated with Adolescent Substance Use

Previously mentioned, literature has indicated that various factors – within several domains – have been identified to be associated with adolescent problem behaviours (Morojele, et al., 2012; Cleveland, Feinberg, Bontempo, & Greenberg, 2008) such as substance use (Morojele et al., 2012). Due to a vast list of risk factors having been identified as contributing to adolescent substance use, only a handful of factors will be discussed using a select number of South African studies.

Morojele, Brook, and Brook (2016) aimed to quantitatively examine, using the Family Interactional theory, the shared and unshared risk factors for tobacco and alcohol use among adolescents in Johannesburg. In their study, they found that personal factors such as externalising behaviours of self-deviance related to peer influences were positively related to smoking and drinking. Other aspects such as low self-control and the inability to deal with the external environment were also implicated as reasons why adolescents were susceptible to using. The conflict between a parent and child was considered a shared predictor of tobacco and alcohol use, the more distant/conflictive relationships promoted the use of substances. On the other hand, positive parent-child relationships formed a protective factor increasing the likelihood of adolescent not using substances. The effects of the neighbourhood were seen as an unshared factor, and the use of a substance was more related to alcohol use than tobacco use. Age and ethnicity were additional factors evaluated, and results revealed that older youth were more likely to use both substances, and varying results were observed with alcohol and tobacco use among ethnic groups.

In a quantitative study by Morojele et al. (2002), the aim was to measure the risk and protective factors for adolescent substance use. Using the Communities that Care Youth Survey, which will be discussed in more detail in the section to follow, they measured the community, family, school, and peer-individual factors associated with possible tobacco, alcohol, and marijuana use of adolescents in South African high schools. Results revealed that the importance of each factor in its influence in encouraging adolescent substance use was dependent on the drug of interest.

Cleveland, Feinberg, Bontempo, and Greenberg (2008) compared the influence of risk and protective factors across the individual, family, peer, school, and community domains using the social development model. Risk factors were seen as stronger predictors of substance use, compared to protective factors, despite the adolescent's grade level or the drug of interest. More specifically, individual and peer risk factors were seen as more related to lifetime and recent substance use – particularly cigarettes, alcohol and marijuana. Family and community factors were found to be more important for younger adolescents, as compared to peer and individual factors which were important for older adolescents. However, community factors were likely more influential in the initiation stage of substance use as opposed to the progression stage.

2.6. Measures of Substance Use

An effective prevention intervention is one that addresses risk and protective factors in a variety of social-ecological domains (Glaser, Van Horn, Arthur, Hawkins, & Catalano, 2005). As highlighted above, there are multiple risks and protective factors that have been identified. Therefore, it is important that multiple risk and protective factors are measured across the different domains influencing adolescent's substance use, to assess whether there is a need for a prevention intervention and what kind is needed.

2.6. 1. Youth Risk Behaviour Survey

The Youth Risk Behaviour Survey is one such measure that was designed with the intent to assess and present representative data on the prevalence of risky behaviours among school-going adolescents (Reddy et al., 2013; Shilubane, Ruiter, van den Borne, Sewpaul, James, & Reddy, 2013). The behaviours it assesses include intentional and unintentional injury, sexual behaviour, nutrition and weight perception, physical activity and hygiene, as well as substance use (Reddy et al., 2013). The South African Youth Risk Behaviour Survey is one that draws its inspiration from the Centre for Disease Control and Prevention's (CDC) Youth Risk Behaviour Survey System (YRBSS). However, due to the YRBSS not being relevant to the South African context there were varying degrees of adaptation, additions, alterations, and revisions to the questionnaire to make it more relevant to the context, and understandable in the 11 South African official languages.

Although, as Florence (2014) noted, the instrument was constructed to measure risk behaviours, both individual and contextual, its focus is more on various risk behaviours, such as sexual behaviours, and not specifically on substance use. The psychometric properties of the YRBS have not been commented on, therefore it is difficult to establish the validity and reliability of this instrument without the appropriate tests and results having been made and reported on. Furthermore, the specific individual and contextual factors which make up the focus of the SASUCRI are not focused on in this instrument.

2.6.2. Communities that Care Youth Survey

The communities that care youth survey, unlike the youth risk behaviours survey, measures various peer, individual, family, school and community domain risk and protective factors for adolescents substance use and other risk behaviours (Glaser et al., 2005; Morojele et al., 2002). This self-report instrument was developed using the social development model and was designed to be administered in a school setting with adolescents ranging from the

age of 11 to 18 (Glaser et al., 2005). A study conducted by Morojele et al. (2002) tested the validity of the communities that care youth survey with a sample of private school adolescents. The results of their study showed that most of the items and sub-scales of the instrument were useful for assessing risk and protective factors for the sample. However, a number of the items seemed to lack face validity and thus a recommendation for context appropriate questions was made. Overall, it was concluded that the instrument can be used for high school students in South Africa, provided some modifications to some items are made.

Despite this recommendation, Florence (2014) argued that the instrument was not necessarily appropriate. This is because demographics of the sample used in Morojele et al's (2002) study were not similar to those of the previous, and current, study's sample demographics – as the participants are from low-socioeconomic backgrounds. Furthermore, more studies testing the validity of this instrument would have to be done to fully advocate the usefulness and appropriateness of the instrument to adolescents of various backgrounds.

2.7. Conclusion

Psychological assessment in South Africa has, previously, been painted in a negative light due to their use during and post-apartheid. However, during the country's transition to a democratic state, the call for more fair and unbiased tests arose. This shift gave rise to talks and developments of culturally appropriate tests – whether monolingual or multilingual. A number of authors, however, argue for the development of multilingual tests that are available in the eleven official languages, so as to ensure the cultural appropriateness of tests. In this regard, cultural appropriateness has been heavily emphasised and thus issues of culture and language have to be considered in the development of tests.

It is in this instance that the issues of bias and equivalence have been highlighted, and a number of studies have attempted to investigate the issue of bias by investigating its

existence in a number of assessments. Various factors had been identified to contribute to adolescent substance use – both individual and contextual. Furthermore, various instruments (although limited) have been developed and adapted to be used in the South African context to measure the risk factors to adolescent substance use in particular – the SASUCRI being one, although it is undergoing further validation. The problem found in the SASUCRI leads us to the concept of bias and equivalence, particularly bias, which was a focus of this study. Therefore, it formed the theoretical framework to be discussed in the section to follow.



CHAPTER 3: THEORETICAL FRAMEWORK

3.1. Introduction

When dealing with the question of whether test scores obtained from groups of different backgrounds can be compared, bias and equivalence have been considered the points of reference (Van de Vijver & Tanzer, 2004). The term bias refers to disruptive factors in the comparisons of scores in cross-cultural studies. Whereas equivalence seems more associated with measurement level issues in the comparison of scores in cross-cultural studies (Rawoot & Florence, 2017; Van de Vijver & Tanzer, 2004). In a multicultural context such as South Africa, bias and equivalence are considered of crucial importance in the application of psychological tests (Meiring, Van de Vijver, Rothmann, & Barrick, 2005). These two terms are not referred to as intrinsic properties of an instrument; however, they are thought of as characteristics of cross-cultural comparisons of an instrument (Van de Vijver & Tanzer, 2004). To get an understanding of how these two terms are considered characteristic of cross-cultural assessments, as well as form the framework of this study, the section to follow will begin with a discussion of what bias is and the taxonomy of bias that can be encountered. To follow this, a discussion on equivalence and what it is defined as, together with the types of equivalence that exist will conclude the discussion.

3.2. Bias and the Taxonomy of Bias

Aspects of an instrument may be found to be biased; however, it does not mean that as a whole the instrument is biased. Rather, the instrument shows biased characteristics when used in a specific comparison (Meiring, Van de Vijver, Rothmann, & Barrick, 2005); the same can be said in regards to the SASUCRI. The focal issue in cross-cultural assessments such as those between the English and isiXhosa mother-tongue learners, for comparative purposes, is obtaining an equivalent measure (i.e. the English version of the SASUCRI). If comparisons between groups culminate in unequal scores, then valid comparisons across

groups will be impossible. Cross-cultural comparisons are increasing in their popularity, thus the issue of bias and the detection of it is also on the rise (Van de Vijver & Poortinga, 1997). According to Van de Vijver and Tanzer (2004, p.1), bias occurs when differences in the scores of people of different groups on the indicators of a particular construct, the risk factors of substance use for instance, do not correspond with the measured trait/ability for generalisation (Kamata & Vaughn, 2004). Bias is said to occur at three levels, namely: *Construct bias, method bias, and item bias* - also known as *differential item functioning* (Van de Vijver & Poortinga, 1997; Van de Vijver & Tanzer, 2004).

Construct bias occurs when a concept or idea that is being measured is not the same in meaning or understanding across cultural groups (Van de Vijver & Poortinga, 1997; Van de Vijver & Tanzer, 2004) or “when behaviours that characterise the construct are not identical” across cultural groups (Meiring, Van de Vijver, Rothmann, & Barrick, 2005, p.2; Roomaney & Koch, 2013). When intelligence tests of western origins are used, for example, in multicultural contexts such as South Africa, they do not take into consideration other versions of intelligence. Reasoning, acquired knowledge and aspects such as memory are often the focal points in the measurement of intelligence instead of other (social) aspects of intelligence (Van de Vijver & Tanzer, 2004).

Method bias differs from construct bias in that it refers to the issues that may be produced depending on the way in which an assessment has been conducted [method-related issues] (Ismail & Koch, 2012; Meiring, Van de Vijver, Rothmann, & Barrick, 2005). Three types of method bias have been outlined: firstly, the inability to compare sample groups on factors other than the main aspect being measured can lead to method bias (sample bias); secondly, the problems that may arise from the make-up of the instrument (instrument bias). The third and final form of method bias is when issues arise due to the way in which an

assessment is administered (administration bias) (Meiring, Van de Vijver, Rothmann, & Barrick, 2005).

Item bias is the last level of bias, which is also referred to as differential item functioning, and refers to irregularities of an instrument that occur at an item (question) level (Ismail & Koch, 2012; Van de Vijver & Poortinga, 1997). Van de Vijver and Poortinga (1997) further elaborate and state that an item is considered biased when individuals from differing groups with the same score on a construct, which is often seen as the total score on the instrument, do not have the same expected score(s) on an item.

3.3. Equivalence and the Hierarchy of Equivalence

Equivalence is considered the opposite of bias. In cross-cultural assessment, equivalence is considered a prerequisite to ensure the valid comparison of scores across cultural groups (Van de Vijver & Tanzer, 2004). Like bias, equivalence can be divided into three hierarchical distinctions, namely: *Construct equivalence, measurement unit equivalence, and scalar or scale equivalence.*

Construct equivalence, unlike construct bias, refers to when **the same** concept or idea is measured across all cultural groups, regardless of whether or not the measurement of the construct is based on identical instruments across all cultures (Van de Vijver & Tanzer, 2004, p. 121), Tanzer and Sim (1999) add to this by saying that it is when the definition and structure of the concept is generalizable across the interest groups.

Measurement unit equivalence is said to be obtained when two metric measurements are considered to have the same measurement unit (e.g., temperature) however differ in origin [e.g., Kelvin and Celsius scales] (Ismail & Koch, 2012). The two scales (Kelvin and Celsius scales) have the same unit of measurement but their origins are different by 273 degrees. With such scales, the scores that are obtained using these scales cannot be compared unless

their origin or offset is known and then their scores can be converted to make them comparable (Van de Vijver & Tanzer, 2004). When it comes to measurement unit equivalence in cross-cultural studies, direct comparison between scores across cultural groups cannot be made unless the origin/offset is known (which is unlikely. However, differences that are observed within each group can still be compared across the groups (Van de Vijver & Tanzer, 2004, p.122).

Scalar equivalence is considered the highest level of equivalence (Roomaney & Koch, 2013; Van de Vijver & Tanzer, 2004) and is also known as full scale equivalence. Scalar equivalence is obtained when two metric measures are considered to have **the same measurement unit and the same origin**. For instance, if the temperature of both the IsiXhosa and English learners was taken using a Celsius scale, the differences in temperature would then be comparable between these two groups, in this way scalar equivalence is obtained (Van de Vijver & Tanzer, 2004).

3.4. Application of Theory

In the evaluation of monolingual and cross-cultural assessments, the aspects of bias and equivalence came to the fore. Indicated earlier, equivalence is not a requirement of assessments; however, it has become a characteristic of cross-cultural comparisons (He & Van de Vijver, 2012). Bias is considered a threat to the validity of cross-cultural studies as it can lead to in-equivalence. As the literature argues, monolingual instruments such as the English Version of the SASUCRI used for cross-cultural comparisons have been suggested to show bias. The framework has indicated the types of bias and equivalence that could be expected. This theoretical framework has been considered a useful guideline to observe whether an instrument displays the necessary characteristics that make it suitable for cross-cultural comparisons (Van de Vijver, 2012). Consultation of the theory has shown that the presence of scalar in-equivalence, as highlighted by the previous study, might indicate the

presence of bias in the instrument. The usefulness of the theory as a guideline has supported the objective of this study to investigate whether any items function differently across the two language group. The more equivalent an assessment is, the more equipped it is to increase the validity of conclusions regarding cross-cultural similarities and differences (He & Van de Vijver, 2012). Investigating item bias is considered one of the aspects that can challenge or threaten scalar equivalence (Van de Vijver & Tanzer, 2004), therefore by doing this, the study will be able to determine whether the instrument is valid for comparing the language groups.

3.5. Conclusion

In cross-cultural studies, the aim is to obtain scores for one group or groups for comparing against another or others. It is expected that cross-cultural assessments have to exhibit equivalence in order to ensure the valid comparison of scores across groups. However, differences in scores at different levels of an assessment may indicate sources of bias thereby limiting the validity and reliability of an instrument for a specific comparison. Bias and equivalence, although different in their definitions and purpose, go hand in hand. It is due to this relationship that these two terms form the theoretical framework of this study and enable the shedding of light on any findings in the analysis of the data.

CHAPTER 4: METHODOLOGY

4.1. Introduction

This study has contributed to the validation of the SASUCRI by focusing on the investigation of biased items on a number of scales identified to exhibit in-equivalence across language groups. The methodology chapter will commence with a discussion of the selected research design used for this study, the participants that made up the sample of the study, a description of the data collection instrument that was used, the procedure that was followed to collect the sample of participants for the study, followed by a description of the data analysis process. To conclude, the ethical considerations taken as well as the significance of the study will be discussed.

4.2. Research Design

The current exploratory quantitative study formed part of the larger study and used a differential research design. The study aimed to investigate whether the performance of participants who come from two different language groups was in anyway affected by their existing differences (i.e. their language ability). The study also aimed to investigate to what extent the items gave an advantage to one group over the other. To do this, a differential research design had to be used, as such a design aims to simply compare pre-existing groups (English and isiXhosa) that are defined by a particular trait (their languages) – a trait that is not manipulated or imposed by the researcher as they are present before the study began - thus no manipulation is involved in this design (Gravetter & Forzano, 2012). Due to the aim of this design, it was appropriate for application in this study. The study was considered an exploratory one as the study aimed to gain an understanding of the issue of item bias, so as to determine whether the items did show any form of bias across the two groups which differ according to their languages (Babbie, 2007).

4.3. Sampling and Participants

The current study utilised secondary data, which is the data collected in the larger study making up the English mother-tongue learners and isiXhosa mother-tongue learners. A non-probability purposive sampling technique was used to select schools from three districts in the Western Cape (i.e. Metro central, Metro North, and Winelands) for the larger study. The SASUCRI was available in only Afrikaans and English, thus Afrikaans and English mother-tongue speakers from low socio-economic backgrounds were recruited for the larger study. Only those learners who answered on the English version of the instrument were used for the investigation of the English version of the SASUCRI. Although the instrument was originally administered to English speaking learners, a number of the learners, however, identified as isiXhosa mother-tongue learners at the English medium schools and had English as an additional language.

A non-probability sampling technique was also used to select schools that catered for an additional sample of isiXhosa mother-tongue speakers as a first language from low-socioeconomic backgrounds. This sample was recruited to add to the smaller sample of isiXhosa mother-tongue speakers that were initially discovered in order for the investigation of the validity of the English version for isiXhosa learners. The initial sample for the larger study consisted of 674 English and isiXhosa mother-tongue learners who answered on the English version of the SASUCRI. Learners from grades 8-12, sampled using convenience sampling, were used in order to ensure that the variety of age groups were represented in the study (of which 186 + the 68 additional respondents made up the isiXhosa learners, and 420 made up the English respondents). Upon removal of missing data, the final sample for the larger study consisted of 420 English respondents and 247 isiXhosa respondents. Table 1 below displays the number of learners according to age, language and gender. The total sample size was 667. However, only 642 learners mentioned their age.

Table 1

The final sample of English and isiXhosa learners

	Language group						Total
	English sample			isiXhosa sample			
Age	Female	Male	Missing	Female	Male	Missing	Total
12					1		1
13	17	10		9	1		37
14	39	36		28	14		117
15	56	43	1	38	26		164
16	61	37		33	20		151
17	39	23		21	13	1	97
18	17	18		12	7		54
19	1	4		7	4		16
20		1		4			5
Missing	5	11	1	3	4	1	25
Total	235	183	2	155	90	2	667

In the table above, the sample of male and female English and IsiXhosa mother-tongue learners were broken up according to their ages, which ranged from 12 to 20. A majority of the English and IsiXhosa male and female learners were between the ages of 14 to 16, with the total number of learners ranging from 117 (aged 14), 151(aged 16), and 164 (aged 15). A substantial amount of both male and female English and isiXhosa mother-tongue learners were aged 13 (N=37), 17 (N=17), 18 (N=54), and 19 (N=16). Only 1 of the male IsiXhosa learners was 12 and 5 (1 male and 4 female) of the English and isiXhosa


learners were 20 years old. A total of 25 learners across the language groups did not indicate their ages.

4.4. Data Collection Instrument

The SASUCRI was developed to be used in low-socioeconomic status communities in South Africa to measure (contextual and individual) factors associated with adolescent substance use. The goal of this instrument was to identify the contextual and individual factors associated with adolescents substance use, and ultimately to work towards informing the creation of prevention programmes for adolescents and communities at risk. The SASUCRI consisted of 147 items within 23 scales, which were reduced to 131 items within 20 scales after the initial validation. These scales are displayed in table 2 below:

Table 2

Revised scales according to Bronfenbrenner’s ecological theoretical framework



Systems level	Scale
Individual systems level	Social identity
	Sense of belonging
	Self-efficacy
	Effects of drugs
	Religiosity
Micro (family) systems levels	Family functioning
	Communication and social support
	Parental monitoring
	Economic pressure in family
Micro (community) systems levels	Peer support
	Peer influence
	School as a support
	School as a stressor
	Neighbourhood
Meso-systems levels	Contradictions

	Mixed messages
Macro-systems levels	Tolerance for child and adolescent drug use
	Tolerance for soft drugs
Chrono-systems levels	Hopelessness individual
	Hopelessness community
	Hope for the future

During the validation process, an additional scale was added to improve construct representation. The instrument was developed using Bronfenbrenner's ecological theoretical framework thus the dimensions that were created to make up the scales of the instrument were constructed to be in line with this framework. Most of the items were positively phrased so that high scores represented high functionality of the adolescent in the construct represented by the item. The items that were negatively phrased were reverse scored. An option of "not applicable" was added to 7 of the items, particularly to questions referring to substance use.

Responses to items of the scales were made up of four response categories, namely "always" – defined as 100% of the time, "often" – defined as more than 50% of the time, "seldom" – define as less than 50% of the time, and "never"- defined as 0% of the time. Initially, the instrument was developed in English and later adapted into Afrikaans. Upon investigation, six scales had been found to be in-equivalent across the two language versions in the larger validation study by Rawoot and Florence (2017) and DIF analysis was recommended for these in-equivalent scales. The in-equivalent scales were investigated for item bias; bias was found and recommendations were made for the rewriting/revising or removal of the biased items to improve validity and reliability of the scales in both the English and Afrikaans versions of the measure (Rawoot & Florence, 2017).

The sample of isiXhosa learners proved to limit the initial validation of the English version of the SASUCRI, and thus recommendations for an investigation of scalar

equivalence was made by Florence (2014). During this recommended investigation, 12 of the 20 scales were found to be in-equivalent.

Following this, recommendations were made for an investigation of the 80 problematic items from these in-equivalent scales to improve the English version's validity (Masiza, 2016). The section to follow includes a description of some of the psychometric properties of both the English and Afrikaans versions of the instrument, including a current description of the available results of the validation of the English version of the instrument across the two languages.

4.4.1. Psychometric Properties of the SASUCRI

Content validity is the extent to which the content or items of an instrument represent the construct designed to be measured (Cook & Beckman, 2006). An initial evaluation conducted by Carels (2012) determined that the factors making up the dimensions of the instrument were valid. Following Carels (2012) evaluation, Florence (2014) continued testing for content validity and piloted the instrument. Adolescents from the pilot showed understanding and relatability to the items. Minor changes were made to the structuring and rewording of items, instructions and response categories. For the structural evidence, various theoretically based techniques were used to determine structural validity in terms of the selection and inclusion of the items. External evidence results indicated some significant differences between users and non-users with regard to the revised scales.

Further external evidence was required on the English version of the instrument, as the isiXhosa sample from the initial study limited the validation of the instrument (as it showed language bias) and the instrument proved to be more problematic compared to the Afrikaans version. Results indicated a significant difference between the two language groups with regard to the revised scales (Masiza, 2016).

Scalar equivalence for the English version of the instrument was displayed using two techniques – Cronbach alpha - to show internal consistency. The results of the Cronbach's alpha for 19 of the 21 scales that were investigated showed acceptable internal consistency that ranged from 0.61 to 0.90 for the English sample, and 0.44 to 0.97 for the isiXhosa sample, with no significant differences between the alphas. Two of the scales - Hopelessness individual, and Hope for the future- resulted in low internal consistency, with Cronbach alphas ranging from .54 to .44, and .62 and .51 for the English and isiXhosa samples, respectively. Significant differences between these Cronbach alphas were found. Due to this, the two scales (Hopelessness individual and Hope for the future) proved to be in-equivalent across the English and isiXhosa language groups.

The Tuckers Phi coefficients indicated that an additional 10 scales (Social identity, Sense of belonging, Self-efficacy, Effect of drugs, Religiosity, Family functioning, Communication and social support, School as a stressor, Contradictions, and Mixed messages) were not equivalent across the two language groups, with coefficients ranging from a low of .11 to .67.

Although a number of the scales proved to indicate good psychometric properties, those scales that have been found in-equivalent were recommended to be investigated to further add to the validation of the English version of the SASUCRI. Investigation of possible language bias in the items of the problematic scales was the focus of this study.

4.5. Procedure

Indicated previously, the current study utilized secondary data. Therefore, permission to conduct the study was obtained during the larger study by Florence (2014) from the following institutions: the Western Cape Education Department, the District Managers of the three selected districts (Metro Central, Metro North and Winelands), as well as the University

of the Western Cape's Senate Higher Degree's Committee. Permission from the school principals of the selected schools was requested and received to conduct the research within the schools as well as collect data from the participants using the SASUCRI. Permission to collect data from an additional isiXhosa speaking sample was also granted by the Western Cape Education Department and Ethics clearance was granted by the University of the Western Cape's Senate Higher Degree's Committee.

During a primary visit for the larger study, learners were informed about the study and were given information letters (see Appendix D) outlining what the study entailed. Information letters, as well as consent forms, were handed out for the parents (see Appendix E), and the consent forms were required to be signed and returned. Learners were also required to sign assent forms (see Appendix F) which were provided to them prior to participating. Only those learners who returned their signed consent and assent forms were allowed to participate. The instrument was then administered to the learners from the selected schools in the three districts. During the administration of the instrument (which was during the normal class time), the study and instrument were explained to the learners. They were informed of the purpose of the study, as well as the value of their responses. The researcher and trained fieldworkers were the only administrators of the instrument. Educators were asked to leave the classroom, and non-participating learners were asked to find work to keep them quiet and busy, so as not to disturb the participants as well as maintain confidentiality for the answers of the participants. The same procedure above was implemented in the data collected from the additional isiXhosa speaking sample.

In order to reduce any missing values, caused by issues such as fatigue, three formats of the English versions of the instrument were printed and administered randomly to participants, each with a different order. Each version given to the participants was documented. Permission to use the data of the larger study in the current study was obtained

from the researcher of the larger study (see Appendix B). Permission to use the additional data was also obtained. A proposal for the current study was submitted to the University of the Western Cape. Ethics approval was applied for and obtained to conduct the current study. Permission to collect additional isiXhosa participants in the schools was granted by the Western Cape Education Department and Ethics clearance was granted by the University of the Western Cape's Senate Higher Degree's Committee.

4.6. Data Analysis

As indicated above, existing or secondary data from the larger study was used to conduct statistical tests using the Statistical Programme for Social Sciences (SPSS) version 24. The aim of this study was to investigate item bias in the in-equivalent scales of the English Version of the SASUCRI across the English and isiXhosa mother-tongue learners. Two types of bias or differential item functioning have been identified, Uniform and Non-uniform (Penfield & Camilli, 2006). Two statistical techniques were used to test the hypothesis of this study, so as to cross validate the results of each technique. The hypothesis and statistical technique used to establish whether there are any biased items and identify them is as follows:

H₀: There are no items functioning differently across the English and isiXhosa mother-tongue learners in the in-equivalent scales of the English version of the SASUCRI

4.6.1. Statistical technique 1: Logistic regression.

Logistic regression was one of the chosen methods of analysis for this study. Logistic regression is based on estimating the probability of scoring correctly on an item based on one's group membership (i.e. reference group – English mother tongue learners; focal group – IsiXhosa mother-tongue learners) and a criterion variable such as the total score (Zumbo, 1999). Support for the use of Logistic regression is evident in the statement given by

Shumacker (2010) which states that while the Mantel-Haenszel technique is popular currently the logistic regression approach is more supported. The advantage of using logistic regression as a Differential Item Functioning (DIF) technique over other methods such as the Mantel-Haenszel method is because the need to categorize a continuous variable is not considered necessary; both uniform and non-uniform DIF can be modelled, offering a more robust solution under both uniform and non-uniform DIF conditions (Shumacker, p.1, 2010); and the binary logistic regression model can be used with ordinal item scores (Zumbo, 1999). Non-uniform bias is considered present when the odds of scoring successfully on an item is greater for one group (uniformly) over all trait levels. Uniform bias on the other hand is present when the odds of scoring successfully is different for both groups at all trait levels (Penfield & Camilli, 2006; Rogers & Swaminathan, 1993).

An ordinal logistic regression was performed over a binary logistic regression because items on the SASUCRI are scored according to an ordinal scale which is Likert-type, instead of in a binary format (Zumbo, 1999). Thus the specific technique was more suited for this analysis.

As hinted above, the use of an ordinal logistic regression has the advantage of using the same modeling strategy for binary and ordinal item scores (Zumbo, p.23, 1999). Therefore the probability of a correct response to an item can be calculated using the following ordinal logistic regression model for DIF detection:

$$\left[\frac{P_i}{(1-P_i)} \right] = b_0 + b_1 X_1 + b_2 X_2 + b_3 (X_2 X_2), \quad (1)$$

Where:

$\left[\frac{P_i}{(1-P_i)} \right]$ is the log-odds ratio. P_i is the probability of an individual to get an item correct b_0

is the intercept parameter. b_1 , b_2 and b_3 are the coefficients of the first second and third

predictors X_1 (total scale score), X_2 (group membership/language group), and X_1X_2 (interaction between total scale score and language group) respectively. Group membership or language group was dummy coded, with the reference group (English mother-tongue learners) coded as 0, and the focal group (isiXhosa mother-tongue learners) coded as 1.

Using logistic regression for analysis has a natural hierarchical way in which variables are entered into the model (Zumbo, 1999). Firstly (step 1 – model 1), the conditioning variable (i.e. total test score) is entered and then considered. Secondly (step 2), the group membership/language variable is entered and then the model is reanalysed (2nd model). Lastly (Step 3), the interaction variable is entered and then the model is reanalysed (3rd model) (Kamata & Vaughn, 2004). For each of the models, a Chi-square statistic is produced based on the quantity called log-likelihood ratios. Following the first process, testing for the statistical significance of DIF is done.

Testing for statistical significance for DIF is done by computing the quantity χ^2_{DIF} .

This is computed as:

$$\chi^2_{DIF} = \chi^2_{3rd\ model} - \chi^2_{1st\ model} \quad (2)$$

The equation above indicates the difference between the two Chi-square statistics from the 3rd and 1st models (Kamata & Vaughn, 2004). The results of the difference between the two Chi-squares can then be compared to its distribution function with 2-degrees ($df=2$) of freedom. “The resulting two-degree of freedom Chi-square test is a simultaneous test of uniform and non-uniform DIF.” (Zumbo, p. 26, 1999). If the test is not significant, then the item does not show either uniform or non-uniform DIF, and the opposite is the result if the test is significant - i.e. either uniform or non-uniform DIF or both is shown (Kamata & Vaughn, 2004; Zumbo, 1999). An item is considered to show DIF when the 2-df Chi-square test had a p-value less than or equal to 0.01 (i.e. when a chi-square statistic is greater than the critical value of 9.21). A rejection of the null hypothesis would indicate the presence of DIF.

Following this process, the magnitude of DIF is calculated using the same procedure as demonstrated for testing for statistical significance. However, instead of using the Chi-square, the R^2 values are used at each step. The effect size was categorised into three categories, as used by Jodoin and Gierl (2001):

1. Negligible DIF: $R^2\Delta < 0.035$
2. Moderate DIF: $0.035 R^2\Delta \leq 0.070$
3. Large DIF: $R^2\Delta > 0.070$

The final step of the procedure is determining the direction of the DIF. This is determined by looking at the sign of the Beta value. The English group (reference group) was coded 0 and the isiXhosa group (focal group) was coded 1. Uniform DIF is considered present if the sign of the β_2 is negative, then the focal group is favoured. However, if the sign of β_2 is positive, then the reference group is favoured. Non-uniform DIF is present if β_3 is greater than 0, then the high ability people in the reference group and low ability people in the focal group are favoured. If β_3 is less than 0, then the low ability people of the reference group and high ability people of the focal group are favoured (Cuevas & Cervantes, 2012). Although there is adequate support for the logistic regression technique, there are a number of disadvantages to the technique as it may be affected by aspects such as the difference in sample sizes of the two different groups. To help validate the results of the logistic regression, the mantel-haenszel technique was used in this study as well.

4.6.2. Statistical technique 2: Mantel-haenszel.

The Mantel-haenszel procedure is, like the logistic regression procedure, commonly used to detect DIF. However, it is less sensitive to detecting non-uniform DIF compared to the logistic regression procedure which has good power to detect both uniform and non-uniform DIF (Güler & Penfield, 2017; Rogers & Swaminathan, 1993). The Mantel-Haenszel procedure involves the process of comparing the reference and focal group's item

performance, whose group members had been matched on a dichotomously scored test item (Padilla, Hidalgo, Benítez, & Gómez-Benito, 2012). This may prove disadvantageous as the items on the SASUCRI were polytomous items, and to accommodate the use of the Mantel-Haenszel procedure the items had to be converted into dichotomous items.

This disadvantage shall be discussed in the discussion chapter. The analysis of DIF using the Mantel-Haenszel (MH) method involves the production of a contingency table that gives an account of correct (1) and incorrect responses (0). These counts are divided according to the group indicators and the matching criterion, i.e. the total test score (Kamata & Vaughn, 2004). In the normal application of the procedure, an item is said to show uniform DIF if the odds of answering correctly on an item (*i*) at a given score level *j* is different for the two groups at some level *j* of the matching variable (Padilla, Hidalgo, Benítez, & Gómez-Benito, 2012, p. 137). The contingency table and its associated notions are presented in Table 3 below.

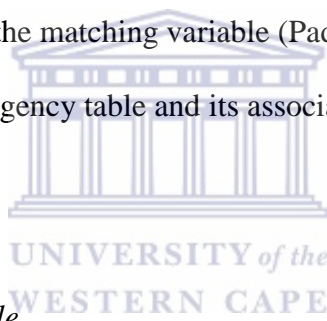


Table 3
Mantel-Haenszel contingency table

	Responses to item	Correct (1)	Incorrect (0)	Total
Group	Reference	A _j	B _j	N _{Rj}
	Focal	C _j	D _j	N _{Fj}
	Total	N _{1j}	N _{0j}	N _j

Where:

A_j, B_j, C_j, and D_j are the responses to the items,

j is the *j*th category in the matching criterion (total test score)

N_j is the number of participants in the *j*th category

The MH statistic for detecting DIF in an item is expressed as:

$$MH = \frac{[\sum_{j=1}^K A_j - \sum_{j=1}^K E(A_j)] - 0.5}{\sum_{j=1}^K Var(A_j)}^2 \tag{3}$$

Where:
$$Var(A_j) = \frac{N_{Rj} N_{Fj} N_{1j} N_{0j}}{N_j^2 (N_j - 1)} \text{ and } E(A_j) = \frac{N_{Rj} N_{Rj}}{N_j} \tag{4}$$

The Mantel-Haenszel chi-square statistic, under the null hypothesis, is distributed as a χ^2 statistics with one degree of freedom [df=1] (Padilla et al., 2012). The null hypothesis is rejected for any $MH\chi^2$ value greater than 3.84 - a critical value for χ^2 with the $df = 1$ and 0.5 significance level. It is important to note that the Mantel-Haenszel chi-square test is sensitive to sample size, therefore other measures can be used to identify DIF. These other measures or values are produced by the Mantel-Haenszel test. One of these values is known as the *common-odds ratio*. This ratio is calculated to determine the effect size [or magnitude of the DIF] (Sireci & Allalouf, 2003). The estimate for the common odds ratio for an item is obtained using the following equation:

$$\hat{a}_{MH_i} = \frac{\sum_j^S A_j D_j / N_j}{\sum_j^S B_j C_j / N_j} \tag{5}$$

When no difference is observed between the reference and focal groups (by controlling for the level of the matching criterion) then \hat{a}_{MH_i} will be equal to 1 (Dorans & Kulick, 2006; Kamata & Vaughn, 2004). A better performance by the reference group on an item will result in a \hat{a}_{MH_i} statistic smaller than one. A common odds value smaller than one is an indication of possible bias against the focal group. A common odds ratio greater than 1 indicates possible bias against the reference group (Kamata & Vaughn, 2004). One other measure produced by the Mantel-Haenszel test to detect DIF is the signed index(β_{MH_i}) which is a scale of log-odds ratio. When the common odds ratio is smaller than 1, the β_{MH_i} value is positive. On the other hand when the \hat{a}_{MH_i} value is equal to 1, then β_{MH_i} is equal to 0 (Kamata & Vaughn, 2004).

A further transformation of β_{MH_i} will assist in determining and evaluating the magnitude of the DIF – although this step is not a requirement for this procedure. This

transformation involves the converting of the β_{MHI} value in a statistic called the MH-DIF \hat{D}_i (Kamata & Vaughn, 2004):

$$\hat{D}_i = -2.35 \beta_{MHI} = -2.35 \ln(\hat{\alpha}_{MHI}) \quad (6)$$

A positive MH-DIF \hat{D}_i value indicates possible bias against the focal group, while a negative value indicates possible bias against the reference group (Dorans & Kulick, 2006; Kamata & Vaughn, 2004; Padilla et al., 2012). Items are classified into three categories, according to the degree of DIF. An item is classified as an “A” item (Negligible), if its MH-DIF \hat{D}_i value is not statistically significantly different from 0 or the absolute value is less than 1.0. An item is classified as a “C” item (Large), if the MH-DIF \hat{D}_i value is greater than 1.5 in absolute value and also statistically significantly larger than 1.0 in absolute value. All other items falling outside of the A and C classification range are “B” items (Moderate) (Dorans & Kulick, 2006; Kamata & Vaughn, 2004). Statistical significance can be determined by looking at the 95% confidence intervals for signed index β_{MHI} , which are produced by SPSS. The confidence intervals, like the β_{MHI} value, are transformed to assess the level of significance for the MH-DIF \hat{D}_i value .

4.7. Ethical Considerations

As the study uses secondary data, the voluntary and informed consent that was utilised is that obtained in the larger study (see Appendix E and F). Ethical clearance was received by the researchers of the larger study from the University of the Western Cape Research Grants and Ethics Committee. Permission was granted by the Western Cape Education Department to conduct the research. Participants were not approached directly within the study but confidentiality and anonymity of the participants were maintained during the analysis of the data. Permission was requested from the researcher of the larger study to use the data for analysis. The data for the larger study was and still is stored in a safe and

secure place. The researcher ensured that the anonymity of the schools is maintained throughout.

4.8. Significance of Study

In the larger study, in-equivalent scales were identified and recommendations were made for further investigation of these scales to ensure the validity of the items of the SASUCRI being able to measure what they are intended to measure. In measuring item bias, it enabled the identification of those items that contributed to the in-equivalent nature of the instrument as a whole. Identifying these items has enabled the removal or rewriting of the problematic items. Identification of these items will ensure that equivalence can be reached and that the process of validation - which the instrument is undergoing- can progress towards allowing the instrument to accurately identify those factors leading adolescents (across all language groups) to engage in substance use. Additionally, it will be able to identify those communities at risk of substance use. By identifying these factors, it will help inform the creation of target-specific prevention interventions for these and similar communities that will reduce the use of substances by adolescents.

CHAPTER 5: RESULTS

5.1. Introduction

This chapter reports on the results as these address the overall aim of the study, which is to contribute to the scalar equivalence of the SASUCRI. This contribution shall be made by investigating whether any bias exists in the items of the 12 identified scales of the English version across the English and isiXhosa mother-tongue learners, namely: Social Identity, Sense of belonging, Self-efficacy, Effect of drugs, Religiosity, Family functioning, Communication and social support, School as a stressor, Contradictions, Mixed messages, Hopelessness Individual, and Hopelessness community. This aim was investigated using two statistical procedures that can be used for investigating differential item functioning (DIF). These procedures are known as the logistic regression (ordinal) and the Mantel-Haenszel technique. Two techniques were utilised so as to cross-validate the results presented for each of the procedures. Resonating from this aim, the following hypothesis was tested in the current study:

H₀: There will be no items functioning differently across the English and isiXhosa mother-tongue learners on the 12 in-equivalent scales.

The hypothesis was rejected in cases where the items displayed moderate or large DIF. Tables 4, 5 and 6 present the DIF results of the logistic regression analysis and Mantel-Haenszel.

5.2. Logistic Regression

Table 4 below presents the results of the logistic regression analysis (the steps followed for this procedure are detailed in section 4.5) of the items presenting with and without DIF, as well as their effect sizes (negligible, moderate, or large) -which were determined by the R^2 statistics of model 3 minus model 1. To determine whether an item

presented with DIF (uniform and/or non-uniform), the statistically significant change of the chi-square statistic (at $p < 0.01$, df: 2, critical value of 9.21) - χ^2 statistics of model 3 minus model 1 - was used.

Table 4

Results of Ordinal Logistic Regression Analysis: Test of Uniform and Non-uniform DIF

Scales	Item	Chi-square statistic (χ^2)	DIF (Yes/No)	R ² statistic	Effect size (DIF size)
Social Identity	1	6.483	No	0.008	Negligible
	2	3.844	No	0.004	Negligible
	3	0.303	No	0.001	Negligible
	4	1.777	No	0.002	Negligible
	5	1.772	No	0.002	Negligible
	6	9.296*	Yes	0.012	Negligible
	7	3.641	No	0.004	Negligible
	8	2.309	No	0.003	Negligible
	9	3.058	No	0.004	Negligible
Sense of belonging	10	28.713*	Yes	0.041	Moderate
	11	6.089	No	0.006	Negligible
	12	8.552	No	0.008	Negligible
	13	0.582	No	0	No effect
	14	5.495	No	0.008	Negligible
	15	2.42	No	0.003	Negligible
	16	1.398	No	0.002	Negligible
	17	20.24*	Yes	0.018	Negligible
	18	2.427	No	0.003	Negligible
	19	0.847	No	0	No effect
	20	0.799	No	0.001	Negligible
	21	7.778	No	0.008	Negligible
Self-efficacy	22	5.867	No	0.007	Negligible
	23	0.223	No	0	Negligible
	24	5.687	No	0.006	Negligible
	25	0.553	No	0.001	Negligible

	26	4.613	No	0.006	Negligible
	27	35.682*	Yes	0.044	Moderate
	28	15.826*	Yes	0.015	Negligible
	29	0.465	No	0.001	Negligible
	30	9.266*	Yes	0.009	Negligible
	31	16.825*	Yes	0.021	Negligible
	32	10.055*	Yes	0.012	Negligible
Effect of drugs	33	8.43	No	0.008	Negligible
	34	8.468	No	0.002	Negligible
	35	2.911	No	0.001	Negligible
	36	0.308	No	0	No effect
	37	3.644	No	0.001	Negligible
	38	0.152	No	0	No effect
Religiosity	39	1.226	No	0.001	Negligible
	40	1.023	No	0.001	Negligible
	41	0.796	No	0.004	Negligible
	42	0.55	No	0.001	Negligible
	43	0.125	No	0	No effect
Family functioning	44	0.157	No	0	No effect
	45	38.753*	Yes	0.045	Moderate
	46	1.176	No	0.001	Negligible
	47	4.618	No	0.004	Negligible
	48	0.875	No	0	No effect
	49	14.499*	Yes	0.011	Negligible
	50	8.61	No	0.007	Negligible
Communication and social support	56	2.739	No	0.003	Negligible
	57	3.246	No	0.004	Negligible
	58	1.285	No	0.001	Negligible
	59	1.877	No	0.002	Negligible
	60	5.902	No	0.004	Negligible
	61	2.084	No	0.001	Negligible
	62	0.521	No	0.001	Negligible

	63	5.753	No	0.006	Negligible
School as a stressor	90	3.333	No	0.003	Negligible
	91	8.455	No	0.008	Negligible
	92	38.183*	Yes	0.035	Moderate
	93	7.6	No	0.007	Negligible
	94	7.178	No	0.008	Negligible
	95	9.83*	Yes	0.001	Negligible
Contradictions	102	2.165	No	0	No effect
	103	2.409	No	0.001	Negligible
Mixed messages	104	0.885	No	0.001	Negligible
	105	8.462	No	0.005	Negligible
	106	30.596*	Yes	0.030	Negligible
	107	4.81	No	0.005	Negligible
	108	3.55	No	0.003	Negligible
	109	1.58	No	0.001	Negligible
Hopelessness Individual	110	0.589	No	0	No effect
	119	5.957	No	0.005	Negligible
	120	4.529	No	0.004	Negligible
Hopelessness community	121	4.57	No	0.004	Negligible
	122	0.104	No	0	No effect
	123	13.436*	Yes	0.011	Negligible
	124	0.51	No	0	No effect
	125	2.953	No	0.002	Negligible

Note. Significant at *p <0.01

The statistically significant result ($p < 0.01$) in the change in the chi-square value from model 1 to model 3 shows that fourteen out of eighty items were identified as presenting with DIF. Sixty-six of the items did not present statistically significant results ($p > 0.01$). Due to the items resulting in a non-significant result, the null hypothesis was not rejected as these items did not present with DIF. Of the fourteen items considered to present with DIF, the R^2 was calculated to determine the effect size. The fourteen items identified showed effect sizes that were between negligible and moderate, with only four items showing a moderate size. As

the effect size was negligible for ten of the fourteen items, the effect present is not considered large enough to be considered for further analysis. However, because of the negligible effect size, a rejection of the null hypothesis was still applicable. The null hypothesis was, however, rejected for four of the fourteen items that presented with a moderate effect size. These four items were considered further to determine the direction in which the DIF went.

The four items presented with moderate effect sizes and were further assessed, using the same procedure to determine statistical significance – for a detailed discussion of the steps followed refer to section 4.5 in the previous chapter, for the type and direction of the DIF of the items. Table 5 below presents the type and direction of the DIF for each biased item.

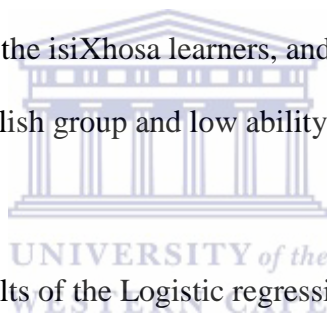
Table 5

Type and Direction of DIF for ordinal logistic regression analysis

Scale	Item	Model 1 to 2		Model 2 to 3		Beta (β)	Type	Direction
		X ²	R ²	X ²	R ²			
Sense of belonging	10	28.697*	0.041	0.016	0	.737	Uniform	Favours the English learners
Self-efficacy	27	30.542*	0.038	5.14	0.006	-.997	Uniform	Favours the isiXhosa learners
Family functioning	45	38.753*	0.045	0	0	.980	Uniform	Favours the English learners
School as a stressor	92	24.871*	0.023	13.312*	0.012	-.795	Mixed DIF	Favours the isiXhosa learners

						.167		Favours high ability people from the English learners and low ability people from isiXhosa learners
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Items 10 of Sense of belonging, 27 of self-efficacy, and 45 of Family functioning all present uniform DIF. However, items 10 and 45 favour the English learners, whereas item 27 favours the isiXhosa learners. Item 92 differed as it presented both uniform and non-uniform DIF, with uniform DIF favouring the isiXhosa learners, and the non-uniform favouring the high ability learners from the English group and low ability learners from the isiXhosa group.



5.3. Mantel-Haenszel

To cross-validate, the results of the Logistic regression analysis were supported by employing a second analysis – the Mantel-Haenszel technique. The results of this analysis are displayed below.

Table 6

Results of Mantel-Haenszel analysis

Scales	Item	X ² (Chi-square)	DIF (Yes or No)	\hat{D}_i (MH-DIF statistic)	95% confidence interval for \hat{D}_i (Lower and Upper)		ETS Classification	Direction
Social identity	1	5.062*	Yes	- 1.076	- 1.810	- 1.969	B item	Favours isiXhosa group

	2	3.170	No	.888	1.812	.035	B item		
	3	.042	No	-.150	.801	1.102	A item		
	4	.156	No	.306	1.455	-.844	A item		
	5	.675	No	-1.050	1.387	.494	B item		
	6	3.483	No	-1.246	0.033	2.458	B item		
	7	.912	No	.496	-1.424	0.430	A item		
	8	1.076	No	.531	1.448	0.385	A item		
	9	1.302	No	.740	.414	-1.894	A item		
Sense of belonging	10	23.63	No	2.484	3.473	-1.495	C item		
	11	.395	No	-0.371	0.609	9.814	A item		
	12	2.914	No	0.947	1.960	-0.066	A item		
	13	.011	No	.125	-1.398	3.553	A item		
	14	.911	No	-3.410	-.663	2.411	A item		
	15	.862	No	.555	0.486	1.593	A item		
	16	.088	No	.244	1.387	.898	A item		
	17	.117	No	-.301	.928	-1.528	A item		
	18	.626	No	-.395	.479	-1.271	A item		
	19	.446	No	-.355	.555	-1.262	A item		
	20	.212	No	-.259	1.161	-0.646	A item		
	21	8.525**	Yes	-1.462	-.503	-2.421	B item	Favours isiXhosa group	
Self-efficacy	22	.241	No	-.461	.947	-1.868	A item		
	23	.627	No	.541	1.687	-.606	A item		
	24	.015	No	-1.667	1.088	-1.424	A item		
	25	.096	No	-.254	.898	-1.408	A item		
		26	5.055*	Yes	1.135	2.087	.183	B item	Favours English group
	27	4.165	No	-1.497	-.143	2.851	B item		
	28	1.812	No	-.912	.313	-2.134	A item		
	29	.005	No	.033	1.206	-1.140	A item		

	30	10.515**	Yes	-1.711	-.691	-2.731	B item	Favours isiXhosa group
	31	.638	No	.442	1.398	-.515	A item	
	32	8.724**	Yes	1.530	2.515	.543	B item	Favours English groups
Effects of drugs	33	.035	No	.035	1.943	- 1.332	A item	
	34	.193	No	-.613	1.262	-2.491	A item	
	35	1.388	No	1.236	3.006	-.531	B item	
	36	.001	No	-.371	2.075	2.818	A item	
	37	.744	No	-1.123	.900	-3.149	B item	
	38	.005	No	-.120	1.704	1.943	A item	
Religiosity	39	1.281	No	-.815	.442	-2.075	A item	
	40	1.300	No	1.074	2.67	-.529	B item	
	41	.034	No	.226	1.567	-1.116	A item	
	42	.402	No	.042	1.488	-1.405	A item	
	43	.002	No	-.066	1.234	-1.363	A item	
Family functioning	44	.263	No	-.479	.928	-1.887	A item	
	45	13.749**	Yes	2.120	3.208	1.029	C item	Favours English group
	46	.068	No	.223	1.365	-.917	A item	
	47	.000	No	-.132	1.429	-1.690	A item	
	48	.031	No	-.226	1.147	-1.600	A item	
	49	2.500	No	-1.119	.155	-2.392	B item	
	50	4.142*	Yes	-1.412	-.146	-2.681	B item	Favours isiXhosa group
Communication and social support	56	.930	No	.573	1.617	-.468	A item	
	57	.116	No	-.261	.846	-1.368	A item	
	58	.001	No	-.103	1.130	-1.337	A item	

	59	2.901	No	-1.344	.071	-2.761	B item	
	60	2.160	No	-.987	.233	-2.207	A item	
	61	.002	No	-.099	1.034	1.231	A item	
	62	.179	No	.298	1.382	-.785	A item	
	63	3.224	No	1.337	2.728	-.054	B item	
School as a stressor	90	1.153	No	-.590	.385	-1.565	A item	
	91	10.645**	Yes	1.812	2.883	.740	C item	Favours English group
	92	23.713**	Yes	-2.442	-1.455	-3.426	C item	Favours isiXhosa group
	93	4.279*	Yes	1.109	2.108	.110	B item	Favours English group
	94	.183	No	-.230	.639	-1.100	A item	
	95	2.802	No	.879	1.847	-.092	A item	
Contradictions	102	.239	No	.684	2.599	-1.234	A item	
	103	.239	No	.684	1.234	-2.599	A item	
Mixed messages	104	.044	No	-.197	.959	-1.356	A item	
	105	4.012	No	1.257	2.423	-.092	B item	
	106	19.970**	Yes	-10.103	-1.356	-3.426	C item	Favours isiXhosa group
	107	5.199*	Yes	1.220	2.223	.214	B item	Favours English group
	108	.640	No	.545	1.737	-.646	A item	
	109	.010	No	-.024	1.227	-1.276	A item	
	110	.607	No	-.576	.660	-1.812	A item	
Hopeless individual	119	.303	No	.416	1.617	-.785	A item	
	120	.000	No	.099	1.504	-1.309	A item	
	121	.573	No	.262	.733	-1.967	A item	

Hopelessness community	122	1.594	No	-.776	.322	-1.871	A item	
	123	5.500*	Yes	1.516	2.717	.317	B item	Favours English group
	124	.066	No	.204	1.285	-.874	A item	
	125	1.262	No	-.639	.378	-1.654	A item	

Note. Significant at *p<0.05, **p<0.01

Using the chi-square statistic, MH-DIF, and classification system, items presenting with DIF were identified – together with their magnitude. Thirteen items across the Social identity, Sense of belonging, Self-efficacy, Family functioning, School as a stressor, Mixed messages and Hopelessness community scales had chi-square statistics that were greater than the critical value (3.84, df = 1, p<0.05). For the items with large chi-square statistics, a stringent criterion value of p<0.01 (df = 1) was used to indicate significance so as not to over-identify DIF. Due to the inclusion of the stringent criterion value, we, therefore, rejected the null hypothesis for these thirteen items and state that there is DIF present in thirteen items of seven scales in the English version of the SASUCRI.

Sixty-four items across the Social identity, Sense of belonging, Self-efficacy, Effects of drugs, Religiosity, Family functioning, Communication and social support, School as a stressor, Contradictions, Mixed messages, Hopeless individual; and Hopelessness community had chi-square values that were not greater than the critical value. Therefore, the null hypothesis was not rejected for the items, as they did not show any significant or present bias. Three items (27, 10, and item 105) had significant chi-square values. However, their Di values were not significantly different from 0, therefore the null hypothesis was also not rejected for these three items.

For the items identified as showing bias, seven items showed favour towards the isiXhosa mother-tongue learners, and bias against the English mother-tongue learners. Six

items showed favour towards the English mother-tongue learners, and bias against the isiXhosa mother-tongue learners. Items 1, 21, 26, 30, 32, 50, 93, 107, and 123 are classified as “B” items and therefore considered suspicious items presenting with possible DIF, although further investigation is necessary to confirm DIF. Items 45, 91, 92, and 106 are classified as “C” items and therefore considered to show large DIF.

5.4. Logistic regression and Mantel-Haenszel analysis – comparison of DIF items

Across the two analyses, items 10 of Social Identity, 27 of Self-efficacy, 45 of Family functioning, and 92 of School as a stressor scales presented with DIF. However, the Mantel-Haenszel technique flagged 10 additional items as presenting with DIF. These items were 1 of Social identity, 21 of Sense of belonging, 26, 30 and 32 of Self-efficacy, 50 of Family functioning, 91 and 93 of School as a stressor, 105, 106, and 107 of Mixed messages, and 123 of Hopeless community. Although the mantel-haenszel technique was used to cross-validate the results of the logistic regression, it appears that there was some inconsistencies present between the two analyses. Initially, both analyses identified items 10 and 27 as having significant chi-square values and being identified as DIF items. However, under the mantel-haenszel analysis, their D_i values were not significantly different from 0; therefore they had to be reconsidered as not showing bias. Of the additional items such as items 10, 45 and 92, 91 and 106 are recommended for further investigation as they were flagged with large DIF.

CHAPTER 6: DISCUSSION AND CONCLUSION

6.1. Introduction

This chapter serves as the discussion section of the study. In summary, the aim of the study was to investigate item bias in the identified scales of the English version of the SASUCRI across English and IsiXhosa mother-tongue learners using two statistical techniques. Two analysis procedures, ordinal logistic regression and Mantel-Haenszel, were employed to investigate this aim which identified a number of biased items. Ultimately, the exploration of item bias can contribute to the understanding of the scalar equivalence of the SASURCI. A discussion of the results and the literature that applies to the results will be made. To conclude this chapter, the implications for this study with regard to the results will be discussed, as well as the recommendations for future investigations.

6.2. Discussion of Results

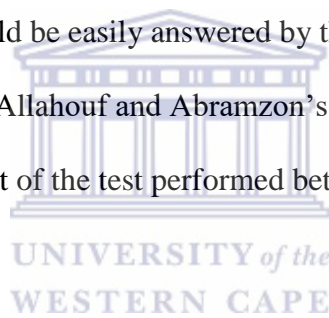
The main aim of this study was evaluated using two statistical procedures: Firstly, the ordinal logistic regression and secondly, the Mantel-Haenszel procedure. Two procedures were used so that the results of one procedure can be cross-validated with the results of the second procedure. Results of the ordinal logistic regression revealed that fourteen items across the identified scales presented with DIF. However, of the fourteen items, nine had negligible effect sizes; therefore, a further analysis of the direction of their DIF was not considered for these items. The null hypothesis however, was still rejected for these items. For the four items investigated further, two items (item 10 of Sense of belonging and item 45 of Family functioning) showed bias towards the isiXhosa learners, and one item (item 27 of Self-efficacy) showed bias towards the English learners. Item 92 of School as a stressor was the only item to show bias towards both the English and isiXhosa learners, with the bias being more towards the isiXhosa group (in particular the low ability isiXhosa learners) and the high ability learners of the English group. The results of the Mantel-Haenszel group

showed that thirteen items presented with DIF, of these thirteen items four items had large DIF as they were labelled as “C” items. Of the four “C” items, bias was shown equally towards both the English mother-tongue learners and the isiXhosa mother-tongue learners.

The remaining nine items were labelled as “B” items and therefore had moderate DIF. The direction of the bias of the nine items was directed more towards the isiXhosa group, as six out of the nine “B” items favoured the English group whereas only three items favoured the isiXhosa group. The results of the biased items, particularly those biasing the isiXhosa learners are not beyond what is expected. This is likely because the instrument is – of course – in English and therefore would be expected to be in favour of the English mother-tongue learners. The isiXhosa mother-tongue learners had English as their second or additional language and thus their understanding of the items may have been complicated. This complication could be explained by the argument made by Silo (2010) who stated that language is an important variable to consider for test bias investigation towards South African children. This is likely because children who have an African language (such as isiXhosa) as their first language and English as their second language can experience educational or even language difficulties.

The bias presented by some of the items revealed that the use of a monolingual assessment does not always produce results that are comparable across groups, although the idea is that it should (Kankaraš & Moors, 2010). The bias of the items shown towards the isiXhosa group can further be attributed to the cultural background of the isiXhosa learners, as it may have influenced their test performance (in terms of understanding and interpretation), as well as the appropriateness of the test (De Klerk, 2008) as it may be measuring different constructs (Kankaraš & Moors, 2010). Therefore, the biased items, across either of the groups, may have been showing signs of construct-irrelevance as the items may have been measuring constructs that are identifiable for one group and not the

other (Haupt & Koch, 2012). The construct-irrelevance may also be attributed to the fact that the items are not taking into consideration the cultural differences of the learners, thus resulting in biased scores. The language and cultural differences present could have resulted in item bias as there could have been a number of reasons at play. The items may, for instance, have been phrased in a way that was misunderstood by the learners. Furthermore, the unfamiliarity of terms which may or may not be found within a particular language could contribute to the misunderstanding of items. In other instances it may be that items answered by some learners may not have been of relevance to them due to the differences in cultural practices that in turn influence behaviour. Surprisingly, the items that biased the English mother-tongue learners were not what was expected. One would assume that the constructs being measured by the items would be easily answered by the learners proficient in the language of the instrument, as in Allahouf and Abramzon's (2008) who found that speakers who had a similar language to that of the test performed better on it, however this was not the case.



The items that have presented with bias across the groups may have been caused by a number of reasons. Van de Vijver and Poortinga (1997, p.34; Van de Vijver & Tanzer, 2004, p.124) have indicated that some of the reasons that cause item bias include the “poor item translation, inadequate item formulation, one or a few items may invoke additional traits or abilities, incidental differences inappropriateness of the item content”. However, it should be noted that there are causes of differences between groups that may be resulting in bias of items that are beyond the items themselves (Van de Vijver & Poortinga, 1997; Van de Vijver & Tanzer, 2004), and these, unfortunately, cannot always be picked up through bias analysis. The identification of the bias does tell us that there are obvious cultural differences between the learners, particularly their languages. Furthermore, the unbiased items may also indicate to us the similarities between groups; however, this is not certain. Ultimately, in order to

make valid comparisons across cultures, the equivalence of the instrument is necessary (Van de Vijver and Poortinga, 1997). Overall, the null hypothesis of the study is rejected as there were biased items on some of the scales of the English version of the SASUCRI across the English and isiXhosa mother-tongue learners.

6.3. Implications of the study

The discovery of biased items in the English version of the SASUCRI indicates that the full ability for such a tool to adequately identify adolescents and communities at risk of substance use is hindered. The instrument would, therefore, be unable to adequately measure that which it was intended to measure. Therefore, the creation of effective, accurately informed interventions that are tailor-made for low-socioeconomic status communities cannot be done. Ultimately, this would mean that the problem that is adolescent substance use and abuse will continue, further putting a strain on the South African health system, and the possibility of crime and other risk behaviours adolescents engage in growing. With this being said, the SASUCRI and other similar instruments need to be extensively validated, especially for every context in which they are applied, so as to accurately assess that which is intended to be assessed. Proper validation will allow for the accurate use of instruments so that their contribution and impact into the field of substance use/abuse is quite significant. As they will help lay the foundation upon which interventions can be developed.

6.4. Limitations

The sample size of the isiXhosa learners can be considered a limitation of the study, particularly in the calculation of the chi-square values, as they were far less than the English learners. Thus, there may have been causes of DIF over identification because of this. Two statistical procedures were used to cross-validate the results. However, because the procedures dealt with two different types of data formats (one being polytomous – analysed by the Ordinal logistic regression, and the other being dichotomous – analysed by the Mantel-

Haenszel) comparisons between the two might not be accurate. The analysis tool used, SPSS, further limited the analysis abilities of the Mantel-Haenszel as it only allowed for the items to be analysed as dichotomous and not polytomous variables as with the ordinal logistic regression. The use of the Mantel-Haenszel was also limiting as it was only able to identify uniform DIF and not non-uniform DIF. Additionally, the changing of the polytomous items into dichotomous items limits an accurate identification (either over-identification or under identification) of biased items by the procedure.

Applying stringent criteria when conducting statistical techniques may serve the purpose of trying to disable the over-identification of bias, however over-identification is not totally immune even with these applied. Therefore, further preventative measures need to be put in place, or other alternatives need to be selected. As mentioned previously, an additional sample of isiXhosa mother tongue learners had to be added to the sample as it was considered too small. However, the additional isiXhosa learners were taken from an isiXhosa medium school, as opposed to those in the original sample who were from an English medium school. This too may appear as a limitation to the study as the understanding of English for both sets of isiXhosa groups may not be the same – thus putting one group at an advantage over the other, and further compromising the validity of the scores on the items.

6.5. Recommendations

With the discovery of biased items, literature often recommends a removal of said items as their inclusion in the instrument may contribute to the in-equivalence of the instrument, particularly its scalar in-equivalence. However, the inclusion or removal of items may interfere with the equivalence of the instrument, therefore bias and equivalence investigation will always be necessary, particularly when instruments are used for cross-cultural comparisons. A better recommendation for future work, particularly with the English version of the SASUCRI, is an adaptation or translation of the instrument into an isiXhosa

version. This is because the results of the study, and previous studies, show that the issue of drug use cuts across cultures, particularly amongst adolescents in the Western Cape. The inclusion then of an isiXhosa version will enable an appropriate comparison across the two cultural groups. The availability then of tests that are in more than one of the South African languages allows for the development of tests that are ‘culture-reduced’ or ‘culture-common’ (Haupt & Koch, 2012).

In doing this type of comparative work, appropriate sample sizes -in future- would be efficient as it would allow for the production of more significant results, or perhaps the use of statistical techniques that are, at the same time, able to handle unequal sample sizes and produce valid results. Further work then, using an isiXhosa adapted version of the instrument will allow for the significant identification of risk factors. Therefore, the informing of appropriate preventative interventions can be made, using context-specific information that will help in the fight against substance use amongst adolescents. Ultimately this may promote change in other problem areas. The success of one will help inform the steps to improving other versions of the instrument, which can then be further adapted and validated for other contexts beyond the Western Cape.

The use of SPSS only allowed for the analysis of the items in a dichotomous format (using the Mantel-Haenszel technique). Therefore, it would be more beneficial if the procedure was performed on a statistical programme that allowed for an analysis of polytomous items using the Mantel-Haenszel on programmes such as R or Mplus. This will allow researchers to make accurate comparisons between results without the manipulation of datasets. Ultimately, alternative techniques such as Item response theory (IRT) can be used to identify DIF, as they can identify both uniform and non-uniform DIF for dichotomous and polytomous items (Zhang, 2015). Furthermore, reliance on conducting the Mantel-Haenszel analysis on SPSS is mainly due to time constraints and familiarity with the programme. If

time allowed, R would have been the most appropriate programme to use; however structured training on how it is used was needed. Across the two procedures, the Effects of drugs, Religiosity, Communication and Social support, Contradictions, and Hopelessness individual scales had no items identified as biased. An investigation looking into why these scales did not produce biased items, although they were identified as in-equivalent, should be conducted.

6.6. Conclusion

Psychological assessments have a negative history within South Africa, and because of this certain laws and measures were put in place to prevent the misuse and misappropriation of data obtained from assessments. When it comes to the use of monolingual measures, the topic of bias and equivalence is often considered, as measures are expected to be culturally fair. The aim then of this study was to investigate whether bias was present in the items of the scales identified to be in-equivalent in the English version of the SASURCI – across the English and isiXhosa mother-tongue learners. Ultimately, bias was found in some of these scales and recommendations for the adaptation of the English version were made. This adaptation may allow for better cross-cultural comparisons and also ensure the validity of the scores obtained by the analysis techniques applied. The improvement of the English version of the SASURCI will enable it to become an assessment that could be used for its intended purpose of identifying at-risk adolescents and communities, as well as ultimately informing interventions or prevention programmes.

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Appendix A: Examples of Items per Scale

Systems levels	Scales	Number of items	Example of an items In the last 30 days
Individual	Social identity	9	.....I was comfortable with the traditions that my community practises.
	Sense of belonging	7	.....I felt left out of things that others in my community were doing.
	Self-efficacy	11	.....I was in control of all my actions.
	Effects of drugs	6	.....I considered using drugs to improve my functioning.
	Religiosity	5	..... I was active in my faith or church.
	Family functioning	7	.....everyone in my family understood the family rules.
Micro-systems level	Communication and social support	8	.....my family could talk to each other about how we feel.
	School as a stressor	6	.....children at school made fun of me.
	Mixed messages	7	.....the people in my community sent the wrong message to young people by selling drugs.
Chrono-systems levels	Hopeless individual	3	..... that people in my community who are addicted to drugs could not help becoming addicted
	Hopeless community	4	.....I felt that serious attention was given to uplifting my community.

Appendix B: Permission to Conduct Study**UNIVERSITY *of the* WESTERN CAPE****DEPARTMENT OF PSYCHOLOGY**

Private Bag X 17, Bellville 7535, South Africa, Telephone: (021) 959-2283/2453
Fax: (021) 959-3515 Telex: 52 6661

13 March 2016

TO WHOM IT MAY CONCERN

RE: Permission to conduct study

I hereby grant permission to Akhona Nkwanyana to do secondary data analysis on data collected for a project title “Adolescent substance abuse: The development and validation of a measure of perceived individual and contextual factors” – registration number 10/8/14. The study by Ms Nkwanyana is titled “Investigating item bias in some of the scales of the English version of the South African Substance Use Contextual Risk Instrument across the English and isiXhosa mother tongue speakers” and forms part of the validation of an instrument to measure the factors associated with adolescent substance use in low socio-economic status communities. The analysis to be conducted by Ms Nkwanyana is based on a recommendation from the larger study and is a continuation of the process of validating the instrument.

Yours sincerely



M.A. Florence

mflorence@uwc.ac.za

Appendix C: Information Sheet (Parents)



UNIVERSITY OF THE WESTERN CAPE

Private Bag X17, Bellville 7535

Tel: 021-959 2283, Fax: 021-959 3515

Title of Research Project: Adolescent substance use: The development and validation of a measure of perceived individual and contextual wellness factors.

What is this study about?

This research is being conducted by Maria Florence of the Psychology Department at the University of the Western Cape. This project has been approved by the University of the Western Cape's Senate Research and Ethics Committee. Your child has been invited to participate in the research because s/he is between the ages of 13 and 18 years and living in the Western Cape. The purpose of this research is to develop a questionnaire that will help us find out what factors in the community could lead to drug and alcohol use amongst young people. This will contribute to a better understanding of the problem in this area of the Western Cape, and could lead to better programmes being implemented.

What will your child be asked to do if s/he agrees to participate?

Your child will be asked to answer questions on a questionnaire. The kind of questions that will be asked is, for example, "How often have you felt like you are able to improve your own situation?" Your child will be given the questionnaire by trained researchers during class time (previously arranged with teachers and the school principal), and s/he will be given a chance to fill in the questionnaire and hand it back during that session. Participation in the research is NOT a requirement of the class that s/he would have attended in this slot.

Would my child's participation in this study be kept confidential?

We will ensure that your child's personal information is kept confidential. We will need to record information like his/her age and gender, but his/her name will not appear on the questionnaire or the record that will be kept of the information. The researchers will be the only people who will have access to the results. If we write a report or article about this research, your child's identity (as well as the name of the school and community) will be protected.

What are the risks of this research?

There are no known risks associated with participating in this research. We are not doing research on your child as a person or to affect her/him in any way. Your child is filling in this questionnaire so that we can collect information about drug and alcohol use in general. At this stage we are only interested in the development of the questionnaire so the information that will be collected will be used to ensure that it is a valid questionnaire.

Does my child have to be in this research and may s/he stop participating at any time?

If your child decides to participate in this research, s/he may stop at any time. If your child decides not to participate in this research (or you decide not to grant permission for

him/her to participate in the research) or if s/he stops participating at any time, there will not be any consequences.

Is any assistance available if my child is negatively affected by participating in this study?

Should your child be negatively affected by this research, you can contact Maria Florence who will do everything possible to refer you for support and assistance. **What if I have questions?**

If you have any questions about the research itself, please contact **Maria Florence (021-9592827) mflorence@uwc.ac.za**. Should you have any questions regarding this research and your child's rights as a research participant or if you wish to report any problems you have experienced related to the research, please contact:

Head of Department:
Dr. Michelle Andipatin
Department of Psychology
mandipatin@uwc.ac.za

OR

Dean of the Faculty of Community and Health Sciences:
Prof José Frantz
University of the Western Cape
Private Bag X17
Bellville 7535
chs-deansoffice@uwc.ac.za



Appendix D: Information Sheet (Learners)**UNIVERSITY OF THE WESTERN CAPE**

Private Bag X17, Bellville 7535
Tel: 021-959 2283, Fax: 021-959 3515

Title of Research Project: Adolescent substance use: The development and validation of a measure of perceived individual and contextual wellness factors.

What is this study about?

This research is being conducted by Maria Florence of the Psychology Department at the University of the Western Cape. This project has been approved by the University of the Western Cape's Senate Research and Ethics Committee. You have been invited to participate in the research because you are between the ages of 13 and 18 years and living in the Western Cape. The purpose of this research is to develop a questionnaire that will help us find out what factors in the community could lead to drug and alcohol use amongst young people. This will contribute to a better understanding of the problem in this area of the Western Cape, and could lead to better programmes being implemented.

What will you be asked to do if you agree to participate?

You will be asked to answer questions on a questionnaire. The kind of questions that will be asked is, for example, "How often have you felt like you are able to improve your own situation?" You will be given the questionnaire by trained researchers during class time (previously arranged with teachers and the school principal), and you will be given a chance to fill in the questionnaire and hand it back during that session. Participation in the research is NOT a requirement of the class that you would have attended in this slot.

Would your participation in this study be kept confidential?

We will ensure that your personal information is kept confidential. We will need to record information like your age and gender, but your name will not appear on the questionnaire or the record that will be kept of the information. The researchers will be the only people who will have access to the results. If we write a report or article about this research, your identity (as well as the name of the school and community) will be protected.

What are the risks of this research?

There are no known risks associated with participating in this research. We are not doing research on you as a person or to affect you in any way. You are filling in this questionnaire so that we can collect information about drug and alcohol use in general. At this stage we are only interested in the development of the questionnaire so the information that will be collected will be used to ensure that it is a valid questionnaire.

Do I have to be in this research and may I stop participating at any time?

If you decide to participate in this research, you may stop at any time. If you decide not to participate in this research or if you stop participating at any time, there will not be any consequences.

Is any assistance available if I am negatively affected by participating in this study?

Should you be negatively affected by this research, you can contact Maria Florence who will do everything possible to refer you for support and assistance.

What if I have questions?

If you have any questions about the research itself, please contact **Maria Florence (021-9592827) mflorence@uwc.ac.za**. Should you have any questions regarding this research and your rights as a research participant or if you wish to report any problems you have experienced related to the study, please contact:

Head of Department:

Dr. Michelle Andipatin

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OR

Dean of the Faculty of Community and Health Sciences:

Prof José Frantz

University of the Western Cape

Private Bag X17

Bellville 7535

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Appendix E: Consent Form (Parents)

UNIVERSITY OF THE WESTERN CAPE



Private Bag X17, Bellville 7535
Tel: 021-959 2283, Fax: 021-959 3515

Title of Research Project: Adolescent substance use: The development and validation of a measure of perceived individual and contextual wellness factors.

The research has been described to me in language that I understand and I freely and voluntarily give permission for my child to participate. My questions about the research have been answered. I understand that my child’s identity will not be disclosed and that s/he may withdraw from the research at any time without giving a reason and this will not negatively affect him/her in any way.

Participant/child’s name.....

Parent/guardian’s signature.....

Date.....

Witness’ name.....

Witness’ signature.....

Date.....



Should you have any questions regarding this research or wish to report any problems you have experienced related to the research, please contact the research coordinator:

Research Coordinator’s Name: Maria Florence

University of the Western Cape

Private Bag X17, Bellville 7535

Telephone: (021)959-2283/2453/2827

Fax: (021)959-3515

Email: mflorence@uwc.ac.za

Appendix F: Assent form (Minor)



UNIVERSITY OF THE WESTERN CAPE

Private Bag X17, Bellville 7535
Tel: 021-959 2283, Fax: 021-959 3515

Title of Research Project: Adolescent substance use: The development and validation of a measure of perceived individual and contextual wellness factors.

The research has been described to me in language that I understand and I freely and voluntarily agree to participate. My questions about the research have been answered. I understand that my identity will not be disclosed and that I may withdraw from the research at any time without giving a reason and this will not negatively affect me in any way.

Participant’s name.....

Participant’s signature.....

Date.....

Witness’ name:

Witness’ signature:

Date:



Should you have any questions regarding this research or wish to report any problems you have experienced related to the research, please contact the research coordinator:

Research Coordinator’s Name: Maria Florence

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