

**A comparison of WISC-IV test performance for Afrikaans,
English and Xhosa speaking South African Grade 7 learners.**

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ABSTRACT

This study builds on South African cross-cultural research which demonstrated the importance of careful stratification of multicultural/multilingual normative samples for quality of education in respect of English and African language (predominantly Xhosa) speaking adults and children tested with the WAIS-III and WISC-IV, respectively. The aim of the present study was to produce an expanded set of preliminary comparative norms on the WISC-IV for white and coloured Afrikaans, white English and black Xhosa speaking Grade 7 children, aged 12 to 13 years, stratified for advantaged versus disadvantaged education. The results of this study replicate the findings of the prior South African cross-cultural studies in respect of quality of education, as groups with advantaged private/former Model C schooling outperformed those with disadvantaged former DET or HOR township schooling. Furthermore, a downward continuum of WISC-IV IQ test performance emerged as follows: 1) white English advantaged (high average), 2) white Afrikaans advantaged and black Xhosa advantaged (average), 3) coloured Afrikaans advantaged (below average), 4) black Xhosa disadvantaged (borderline), and 5) coloured Afrikaans disadvantaged (extremely low). The present study has demonstrated that while language and ethnic variables reveal subtle effects on IQ test performance, quality of education has the most significant effect – impacting significantly on verbal performance with this effect replicated in respect of the FSIQ. Therefore caution should be exercised in interpreting test results of individuals from different language/ethnic groups, and in particular those with disadvantaged schooling, as preliminary data suggest that these individuals achieve scores which are 20 – 35 points lower than the UK standardisation.

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ABBREVIATIONS

Adv	Advantaged
DET	Department of Education and Training (Government department for management of Black education system pre-1994)
Disad	Disadvantaged
FSIQ	Full Scale IQ
HOR	House of Representatives (Former 'Coloured' House of Parliament that also managed Coloured schooling)
HSRC	Human Sciences Research Council
PIQ	Performance IQ
POI	Perceptual Organisation Index
PRI	Perceptual Reasoning Index
PSI	Processing Speed Index
SD	Standard Deviation
VIQ	Verbal IQ
VCI	Verbal Comprehension Index
WAIS-III	Wechsler Adult Intelligence Scale – Third Edition
WISC-IV	Wechsler Intelligence Scale for Children – Fourth Edition
WISC-IV ^{UK}	Wechsler Intelligence Scale for Children – Fourth UK Edition (United Kingdom standardisation)
WMI	Working Memory Index
X	Mean

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This research project has been greatly challenging, but has ultimately proven rewarding. Already the usefulness of the data for clinical practice has been apparent in that clinicians have enquired about the findings and applied them to their cases. It has been a privilege to contribute to the data base of knowledge and to know that this work is timeous and relevant for use in clinical practice.

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CHAPTER 1. LITERATURE REVIEW

1.1. Objective

The objective of this study was to provide preliminary cross-cultural normative data with respect to performance of South African children on the Wechsler Intelligence Scale for Children-Fourth Edition (WISC-IV). The intention was not to produce a new standardisation of the WISC-IV for the South African context, but rather to generate cross-cultural normative data that would provide a pragmatic indication of WISC-IV test performance for use within *clinical settings* in South Africa. The need for cross-cultural norms that take into account additional demographic variables, besides age, was recognised in light of considerable evidence from intelligence and language research that suggest a significant ethnic variable, including access to differing quality of education, on test scores in children. Seeking to include Afrikaans speaking Grade 7 children, this study extended preliminary normative data for performance on the WISC-IV generated by Van Tonder (2007) in relation to English and Xhosa speaking Grade 7 children.

1.2. Wechsler Intelligence Scales

The Wechsler Intelligence Scales have led the way in assessment of intelligence in adults and children for almost seven decades, since the release of the original Wechsler-Bellevue Intelligence Scale (W-B) in 1939 (Saklofske, Weiss, Beal, & Coalson, 2003). They are widely used in many countries, are available in a number of languages, have been extensively researched and have contributed much to the understanding of cognition over the years (Ardila, 1996; Saklofske, et al., 2003; Wechsler, 2004). Wechsler defined intelligence as "the aggregate or global capacity of the individual to act purposefully, to think rationally and to deal effectively with his environment" (Wechsler, 2004, p. 3) and asserted that intelligence is both a *global* entity relating to the individual's behaviour as a whole (represented by the Full Scale IQ score or FSIQ) and also *specific*, consisting of different distinct abilities. He thus assumed a theory of general intelligence, while also recognising other types of intelligence such as verbal and performance intelligence (Ardila, 1996). The Wechsler Intelligence Scales make use of various subtests, which are divided broadly into verbal and non-verbal abilities. Index scores measuring various modalities (verbal comprehension, perceptual organisation, working memory and processing speed) and IQ scores (including verbal – VIQ, performance – PIQ, and FSIQ) are derived from composite subtest scores and together yield an effective measure of intelligence (Saklofske, et al., 2003; Wechsler, 2004).

Over years of study, the Wechsler Intelligence Scales have been shown to be valid and reliable measures of intelligence (Saklofske, et al., 2003). The Wechsler Intelligence Scales have gone through constant revisions which have contributed to their reputation of being well designed and robust (Ardila, 1996). The W-B was revised and released as the W-B II in 1946 – both these scales included norms for ages 10 to 59 years (Saklofske, et al., 2003). Currently, the Wechsler tests are widely used as standardised measures for individual testing of children and adults and cover the age range from 2.5 to 89 years. The Wechsler Adult Intelligence Scale (WAIS) which covers the upper age ranges was first released in 1955 and has since been revised twice (WAIS-R, 1981; WAIS-III, 1997). A scale for use with preschool children which covers the youngest age groups, the Wechsler Preschool and Primary Scale of Intelligence (WPPSI), was released in 1967, and has also been revised twice (WPPSI-R, 1989; WPPSI-III, 2002). The intermediate age ranges are catered for by the Wechsler Intelligence Scale for Children (WISC) which was first released in 1949, and this marked the division of the Wechsler Intelligence Scales into separate tests for children and adults (Saklofske, et al., 2003; Strauss, Sherman, & Spreen, 2006).

The WISC has gone through two previous revisions (WISC-R, 1974; WISC-III, 1991) to the current version WISC-IV released in 2003. The WISC-IV is intended for use with children aged 6 years to 16 years 11 months (Saklofske, et al., 2003; Strauss, et al., 2006). This test is a versatile instrument used in research, clinical assessments, and other types of assessments such as neuropsychological assessments. It is also anticipated that the WISC-IV will pick up where its forerunners left off as the dominant tool for assessment of intellectual functioning of children (Prifitera, Weiss, Saklofske, & Rolfhus, 2005). The current version of the test was revised to keep up with changes in norms as population scores become inflated over time (known as the Flynn effect), as well as to ensure that test items remain current and unbiased (Prifitera, et al., 2005). It also encompasses a fundamental theoretical shift as it was designed with current trends in factor analysis theories in mind, and incorporated this with the traditional Wechsler approach. This is believed to introduce stronger psychometric properties (Baron, 2005). Strauss, et al. (2006, p. 311) describe the WISC-IV as a "first-generation hybrid". However, the test remains a good measure of *g* (the general intelligence factor) and consistently measures the same constructs across age groups 6 to 16 (Keith, Fine, Taub, Reynolds, & Kranzler, 2006).

The WISC-IV's main departure from the traditional Wechsler model is that it boasts four domain index scores. These are the Verbal Comprehension Index (VCI), the Perceptual Reasoning Index (PRI), the Working Memory Index (WMI), and the Processing Speed Index (PSI). These index scores replace Verbal IQ (VIQ) and Performance IQ (PIQ) scores

characteristic of the older Wechsler tests. The test still boasts a Full Scale IQ (FSIQ) which is derived from the four domain index scores, thus representing a general composite score for the entire scale (Baron, 2005; Prifitera, et al., 2005; Strauss, et al., 2006). The VCI was designed to replace the VIQ and measures "verbal knowledge, reasoning and conceptualisation"; the PRI was designed to replace the PIQ and measures "interpretation, reasoning, an organisation of visually presented nonverbal information"; the WMI and PSI are new indices and measure "attention, concentration, and working memory for verbal material" and "speed of mental and graphomotor processing", respectively (Strauss, et al., 2006, p. 311). The test consists of a core battery of ten subtests, used to calculate composite scores and forming the basis of the FSIQ, including: Vocabulary, Similarities, Comprehension which contribute to the VCI score; Block Design, Picture Concepts, Matrix Reasoning which contribute to the PRI score; Digit Span, Letter-Number Sequencing which contribute to the WMI score; and Coding, Symbol Search which contribute to the PSI score (Wechsler, 2004).

The WISC-IV has been standardised on an American population, as well as, being adapted and standardised for use in Canada, the United Kingdom, France and Belgium, the Netherlands, Germany, Austria and Switzerland, Sweden, Lithuania, Slovenia, Greece, Japan, South Korea, and Taiwan (Van de Vijver, Mylonas, Pavlopoulos, & Georgas, 2003). To date there has been no attempt at a South African standardisation. WISC-IV test differences were found between ethnic groups within the American population (Sattler & Dumont as cited in Strauss, et al., 2006; Prifitera, et al., 2005) and furthermore preliminary WISC-IV research in South Africa (Van Tonder, 2007) has also revealed significant effects for ethnicity in association with differing quality of education. Due consideration needs to be given therefore, to the use of a test such as the WISC-IV for individuals who do not relate to the standardisation sample, and particularly in cross-cultural settings. Relevant literature pertaining generally to the application of cognitive tests will be reviewed, with particular consideration given to the application of the WISC-IV test, as well as issues specific to cognitive testing in the South African context.

1.3. General issues in cognitive testing

Standardised, norm-referenced tests pertain to very specific groups, and the norms serve as a standard against which a person's performance can be evaluated (Lezak, Howieson, & Loring, 2004; Manly & Echemendia, 2007; Mitrushina, Boone, Razani, & D'Elia, 2005). However, individuals do not necessarily come from a homogenous group. It is therefore

necessary to exercise care when selecting tests and interpreting norms as one cannot assume, even within a certain race/ethnic/culture or language group that individuals would have acquired the same knowledge and developed the same characteristics (Harris & Llorente, 2005; Sattler, 1992). Mitrushina, et al. (2005, p. 18) argue that "all normative data are of limited use" as performance typical of a specific group is the *norm* for that group and each group represents its own norm. Norms are therefore useful only for those groups who have similar characteristics to the normative sample. However, whilst raw scores obtained on a test can vary for groups that differ according to certain characteristics, the standard normalized scores are comparable (Ardila, 1996). Sattler (1992) highlights the importance of norm-referenced tests for clinical and psycho-educational assessment as a means to ensure accurate placement and diagnosis. Appropriate norms are also essential for neuropsychological assessment, aiding in appropriate neurocognitive classification (Anderson, 2001). Strauss, et al. (2006) in turn emphasise that use of appropriate norms is as important as test selection, due to the fact that considerable importance is attached to scores for making an appropriate diagnosis, and for taking decisions for treatment and placement. At times scores also have implications for financial compensation. The problem is that when inadequate norms are used, healthy individuals may mistakenly be deemed cognitively impaired. Such misdiagnosis may lead to needless treatment or therapeutic neglect (Anderson, 2001; Mitrushina, et al., 2005; Skuy, Schutte, Fridjhon, & O'Carroll, 2001; Strauss, et al., 2006).

A particularly pertinent concern with regard to testing in South Africa therefore, is questionable generalisability of commonly employed westernised tests due to the fact that many tests have not been standardised and normed for cross-cultural use. Available norms are more appropriate for use with the white population (Kanjee, 1999). In addition, a number of variables, such as the subject characteristics of age, gender, IQ and education have also been found to impact on psychological test performance. This necessitates the use of norms that account for these variables when evaluating and interpreting test scores (Adams, Boake, & Crain, 1982; Lezak, et al., 2004). Within the South African context, Anderson (2001) argues for the use of "demographically-sensitive normative data" (p. 31) representative of the group to which the testee belongs and which compensate for subject characteristic variables. Anderson (2001) asserts that selection of appropriate norms is essential in order to avoid disparity when concluding what is deemed normal for one group and problematic for another. However, obtaining appropriate locally derived equivalent norms for psychological test commonly used in South Africa would be a considerable challenge due to both South Africa's cultural diversity and the impact of this country's apartheid legacy (Anderson, 2001).

Clinical practice is situated within a political, social and historical context (Claassen as cited in Meiring, Van de Vijver, Rothmann, & Barrick, 2005; Kanjee, 1999) and this point is well illustrated in the South African situation. Psychological tests were imported from abroad in the early 1900s for use essentially with the white population (Van de Vijver & Rothmann, 2004). Separate test development concentrated on Afrikaans and English speaking groups (the official languages during the apartheid era) while excluding African language speakers (Stead, 2002). Cross-cultural issues came to the fore in the 1920s, 1940s and 1950s when testing was used to determine the extent to which black South Africans could be educated and trained (Meiring, et al., 2005). With the caveat that test scores should be interpreted with caution, tests normed on the white population were also used with other ethnic groups (Stead, 2002). Rashid Ahmed (in Kanjee, 1999, p. 292) asserts that clinical practice has a role to play in "reproducing unequal power relations that lead to discrimination and the exploitation of economically and politically marginalised groups". This was evidenced in South Africa as tests were used to validate exploitation of black labourers, to deny black individuals access to education, as well as limiting black individuals from gaining access to economic resources. Psychological testing and IQ tests in particular, were also used to promote white supremacy and to claim genetic inferiority of black individuals. As a result of past biases, discriminatory testing practices and the negative impact of testing on the lives of many South Africans, assessment remains a contentious activity in South Africa – in particular because of past misuse of psychological testing in support of racist policies of segregation under the apartheid government (Kanjee, 1999; Stead, 2002).

After South Africa's first democratic elections in 1994, the country adopted a new constitution which guaranteed basic human rights and equality. Van de Vijver and Rothmann (2004) have pointed out that this has also impacted on psychological assessment practice in South Africa as test users now need to be more cognisant of test bias and discriminatory test practices, as this has now been legislated against. The Ethical Rules of Conduct for Practitioners registered under the Health Professionals Act 56 of 1974, Annexure 12, Section 48 (Government Gazette, 2006), requires sensitivity with regard to cultural diversity and stipulates that any psychologist using assessment methods should not only be familiar with the reliability and validity of a test, but also with standardisation procedures and the proper application and uses of such tests. Furthermore, a psychologist should recognise the predictive limitations of tests with regard to individuals from different linguistic, cultural and socio-economic backgrounds, and should make "every effort to identify situations in which particular assessment methods or norms may not be applicable or may require adjustment in administration, scoring and interpretation" because of various demographic, cultural and socio-economic factors which are known to impact on test performance. Psychologists are

further governed by the Employment Equity Act 55 of 1998, Section 8 (Government Gazette, 1998), which makes explicit that psychological testing and assessment methods used should "be applied fairly to all employees" and should not be "biased against any employee or group".

Therefore, when choosing appropriate norms, the relevance of the norms should be carefully considered. For some purposes a broadly representative sample or nationally relevant norms may be most appropriate, while at other times a specific subgroup sample (defined by demographic criteria such as gender, education, ethnicity, socioeconomic status, etc.) particular to a segment of the population, is more appropriate. Other considerations pertaining to relevance of norms include sample size and composition, date of norming, as well as subject specific characteristics (Sattler, 1992; Strauss, et al., 2006).

Sample size

The common assumption is that a large sample size (N) results in norms being more representative of the general population and therefore increases the reliability and stability of the resulting scores (Sattler, 1992; Strauss, et al., 2006). Strauss, et al. (2006) offers a 'rule-of-thumb' estimate of at least 200 subjects for representative and reliable norms. Sattler (1992) recommends at least 100 subjects per subgroup, while Mitrushina, et al. (2005) assert that a sample size of 50 should be adequate. There seems to be no clear agreement on what constitutes a sufficient sample size, however Strauss, et al. (2006, p 45) assert that "even large normative sets yield small cell sizes when scores are divided into demographically defined subgroups according to variables such as age, gender, and education". These authors also argue that using a "smaller, homogenous normative dataset comprised only of individuals from a similar demographic subgroup" yields statistically more powerful data that are a better demographic fit than more generic population norms.

Date of norming

Leading authors in the field of assessment have flagged the date of norming as a very important consideration in choosing and interpreting test scores (Sattler, 1992; Mitrushina, et al., 2005; Strauss, et al., 2006). This, it is argued, is due to the Flynn effect in which there is a "trend towards increased IQ scores over time with each subsequent generation", and therefore the average 'lifespan' of a normed test is estimated at 15 to 20 years (Strauss, et al., 2006, p. 45). Flynn demonstrated that test scores, particularly for intelligence measures, increase by on average 0.3 IQ points per annum. In light of this, more recently collected norms should always be used in preference over older data sets, as long as the normative sample is adequately matched to the testee. New norms should therefore be generated for

tests to ensure they remain current and to correct for the Flynn effect (Mitrushina, et al., 2005; Nell, 1994). The reason for rising scores is not clear. However Mitrushina, et al. (2005, p. 19) propose that greater access to information over time may increase the "fund of knowledge" of the individual. Cocodia, et al. (2003) provided evidence for the Flynn effect in Australia, Singapore and Korea and proposed that IQ gains were linked to factors such as industrialisation, better diet and health, more stimulation and better education. Husén and Tuijnman (1991) demonstrated the Flynn effect in the Netherlands and showed that IQ gains were linked to environmental factors, the most important of which was formal schooling.

Subject characteristics

A number of factors have been identified as impacting on cognitive test performance. These include subject characteristics such as age, gender, race/ethnicity/culture, language, socio-economic status, parental IQ and level of education, learned abilities/formal schooling, test taking attitudes and test-wiseness, and education (both level and quality of education, with the latter sometimes being measured indirectly in terms of reading level). It is difficult to clearly separate the relative impact of each factor as they are interconnected and at times exercise reciprocal effects. However, it is important to have an awareness of these influences when assessing individuals from cultural, language, socio-economic and educational backgrounds that differ from those of the sample for which tests were normed, in order to avoid making claims that are biased or incorrect. Both international and Southern African studies covering 30 years of research were reviewed for the purposes of the present study. More detailed discussion of the subject characteristics of culture in general, and specific interrelated factors of socio-economic status, language and education follow.

1.4. Culture-specific issues

'Ethnicity', 'culture' and 'race' are terms which are often substituted for each other in the literature (Lezak, et al., 2004; Strauss, et al., 2006). Ardila, Rosselli, and Puente (as cited in Strauss, et al., 2006) offer a useful way to separate these terms: ethnicity and culture are viewed as being characterised by a common language, by customs, heritage or nationality, while race is seen to be linked to genetic traits. These terms are also often associated with distinctions between a minority and a majority group (Lezak, et al., 2004; Strauss, et al., 2006) and in the international literature, the term 'minority group' is frequently used to isolate other-than-white groups considered to be socio-economically and educationally disadvantaged from a white majority group which is more advantaged. For example, in the United States, the African American and Hispanic groups are referred to as minorities while

the white group constitutes the majority. However, this terminology needs to be applied differently in South Africa which has a black African majority which for many years was marginalised and discriminated against by a politically and economically more powerful white minority.

Numerous studies document lower performance on cognitive tests in the other-than-white populations, amongst these: Jensen in his 1969 article reported a 12 point IQ differential between Blacks and Whites (as cited in Amante, VanHouten, Grieve, Bader, & Margules, 1977); Jensen and Reynolds (1982) reported a disparity of 1 SD (15 or 16 points) between Blacks and Whites on intelligence tests; Kramer, Allen, and Gergen (1995) demonstrated race differences on cognitive tests with highest scores among white children, intermediate scores among Hispanic children and lowest scores achieved by black children; and Prifitera, et al. (2005) also found persistent group differences between African Americans, Hispanics and Whites in the WISC-IV standardisation sample, despite matching of the sample for a number of subject characteristics, including age, gender, geographic region, socio-economic status and level of education. With regard to the WISC-IV in particular, white children achieved higher IQ scores than their African American (by 11.5 point) and Hispanic (by 10 points) peers when children were matched for parental education. The differences observed between these groups on individual index scores varied, but PSI and WMI scores showed the least variation between groups (Sattler & Dumont as cited in Strauss, et al., 2006; Prifitera, et al., 2005). Differences between ethnic groups tended to increase with age and Strauss, et al. (2006) attribute this to the negative environmental influences which have a cumulative effect on development of cognitive abilities, especially in groups consisting of largely disadvantaged individuals. Furthermore, with regard to Southern African research, Rushton and Jenson (2003) reported that in South Africa, race differences exist between groups tested on the Raven's which has resulted in a ranking in terms of scores with Whites scoring the highest, followed by Indians, Coloureds and Blacks (who score the lowest); Zindi (1994) demonstrated a 25 point IQ differential between black Zimbabwean children and white British children matched for social class on the WISC-R and demonstrated almost the same magnitude of difference on the Raven's.

Ardila (1996) notes that while for many years score variations were explained through postulated genetic differences between races, differences may be better explained by examining aspects of cultural learning. Cultural environment exerts an influence on the development of cognitive abilities in that "culture dictates what is and what is not situationally relevant" as well as prescribing "what should be learned and at what age" (Ardila, 1996, pp. 239-240). Thus, while cognitive processes are considered to be universal across cultures,

their expression varies in different cultures as different cultural environments encourage development of different ability patterns (Harris & Llorente, 2005). Ardila (1996) also argues that acceptance of testing does not happen with the same ease in all countries and for all cultures, and therefore, culture impacts on test performance in that it shapes test taking attitudes. Whilst testing assumes that testees will be motivated to perform well, this cannot be taken for granted.

According to Lezak, et al. (2004) the influence of 'culture' and attitudes towards testing, which is a function of learning and experience acquired through social interaction, should be taken into account when assessing all individuals. Mitrushina, et al. (2005) advise that focussing on ethnicity/race differences alone may lead to faulty claims with regard to test performance, as cultural influences such as acculturation to the predominant culture amongst others, may better account for these differences. There is growing support for level of acculturation, literacy and English fluency, quality of education, and socio-economic status as an explanation for variance in test scores, rather than the broader concepts of ethnicity or race (Ardila, 1996; Harris & Llorente, 2005; Manly, Byrd, Touradji, & Stern, 2004; Manly, Jacobs, Touradji, Small, & Stern, 2002; Shuttleworth-Edwards, Donnelly, Reid, & Radloff, 2004). Further consideration with respect to variables of culture and acculturation is warranted, in that this has specific relevance for test selection and norming in the South African context.

Due to the legacy of apartheid in South Africa, test users need to acknowledge that race is a mediator of the quality of education, economic opportunities, urbanization and socio-economic status of many South Africans (Nell, 1994), and as such, cultural issues are likely to impact on test performance. Van de Vijver and Rothmann (2004) therefore assert that research is needed to determine whether South African assessment methods are non-discriminatory and free from bias. Two papers have reviewed different solutions to this problem in light of the multicultural nature of the South African context (Stead, 2002; Van de Vijver & Rothmann, 2004). Firstly, some have argued that non-indigenous American and European tests should not be used in South Africa due to questionable validity of test scores among black South Africans (for example, Sehlapelo and Terre Blanche, as cited in Stead, 2002). They have called for the development of tests specific to the South African context based on the argument that tests currently used in this country have not been developed with this context in mind and are therefore inherently problematic. Also, given past uses of assessment in South Africa, they question whether tests that have not been standardised for black South Africans will be reliable measures or have true predictive validity. Secondly, Stead (2002) cites Shuttleworth-Jordan (1996) who has argued in favour of another position,

suggesting that modification and standardisation of existing tests would be sufficient to allow for their use with some previously disadvantaged black South Africans. Shuttleworth-Jordan (1996) does not dispute that cultural differences in test scores exist, but again draws attention to the impact of acculturation, making strong arguments in favour of the position that apparent cultural effects on test performance may be better accounted for in terms of socio-economic status and education factors. Shuttleworth-Jordan (1996) further states that many black South Africans have been part of an acculturation process, including moving from rural to urbanised conditions, having had opportunities to access westernised education and obtain literacy in English. As acculturation is a powerful mediator of test performance, it would be considered appropriate clinical practice to continue using internationally recognised cognitive tests with urbanised, westernised and highly educated groups.

While Shuttleworth-Jordan (1996) made a convincing case for the use of internationally recognised cognitive tests with certain groups involved in an acculturation process, it would also be important to consider which of the westernised tests should be standardised and normed for the South African context. Nell (1994) argued for norming of newer versions of tests, making a case with reference to the SAWAIS which was adapted from the 1939 version of the Wechsler-Bellevue Adult Intelligence Scale. Nell (1994) stated that norms for the SAWAIS were outdated even for use with the white population as they did not reflect educational and socioeconomic changes with regard to the South African population. Nell used the research of Verster and Prinsloo (1988) which demonstrated the effect of acculturation on the white population norms over time to illustrate his point. Verster and Prinsloo (1988) followed trends for English and Afrikaans speaking white South Africans over a 30 year period. These researchers found that the gap between test scores of English and Afrikaans speaking white South Africans narrowed due to a process of acculturation amongst the Afrikaans group.

More specifically, a summary of the Verster and Prinsloo (1988) literature review and findings is as follows. Over many years, it has been well established that there is a performance gap between the white South African English and Afrikaans groups. The Afrikaans population is descended from Dutch, German, Belgian and French Huguenot immigrants who arrived in this country between 1650 and 1800, and forged an independent national character exemplified in their own unique language. This group has historically been more conservative, come from an impoverished rural base, and emphasised their separateness from other groups. While the English population is largely descended from British settlers who arrived from 1820 onwards and who retained strong cultural ties with the wider English speaking world – this group has historically been wealthier and has adopted more liberal-

democratic views. Over recent generations, the test performance gap between English and Afrikaans speakers in South Africa has been shrinking from about 10 IQ points in the 1950s to only 5 IQ points in the 1980s. This is attributed to progressive acculturation of the Afrikaans speaking group towards adopting more westernised English values, moving from rural to urban areas, accessing improved quality of education and gaining material wealth. Accordingly Verster and Prinsloo (1988) demonstrated how the gap between English and Afrikaans white South Africans has decreased with cultural convergence. Differences between these groups, however, appear to remain with regard to performance measures (which represent abstract, nonverbal reasoning), while differences in terms of verbal measures (which represent school curriculum learning) have decreased.

In light of the above-cited research, Nell (1994) argued that old norms can be problematic in that they inflate scores, with the implication that someone may appear 'average' despite being severely impaired. For this reason, Nell (1994) called for norming of the most recent Wechsler test for use with adults in South Africa.

1.4.1. Socioeconomic status

Numerous studies have investigated the effects of socio-economic factors on cognitive test performance. In the 1970s Amante, et al. (1977) demonstrated that when groups of similar socio-economic status are compared, black and white score differences decrease (although they are not totally eradicated). Hale, Raymond, and Gajar (1982) also examined the impact of socio-economic status on IQ scores. Kramer, et al. (1995) noted that cognitive development was linked to environmental, social and hereditary factors, with lower intellectual functioning proving to be associated with minority status and socio-economic status. In the United States, it has been shown that children from lower income families are mostly black and have parents with lower education levels – this also impacts on poverty levels, and such children are more likely to experience health problems and poor nutrition. Recently, Prifitera, et al. (2005) found a substantial correlation between socio-economic status and IQ with regard to the WISC-IV standardisation sample. When this WISC-IV sample was stratified for socio-economic status, a performance continuum effect was noted in the direction of lower scores in relation to lower socio-economic status of a group. These researchers comment that a similar effect was noted on the WISC-III.

It was noted that comparatively poorer performance on the WISC was generally found for individuals from ethnic minorities, which was related to lower socio-economic status of this group, as well as representivity of the normative sample (Harris & Llorente, 2005). Lezak, et al. (2004) also draw attention to the fact that when a group has been socio-economically

disadvantaged, these factors should be considered in test score interpretation. This also pertains to the African American group, which has been disadvantaged in the past and continues to be so. In South Africa Skuy, et al. (2001) demonstrated that children from Soweto scored lower on tests of cognitive ability than their American counterparts and that socio-economic status needs to be considered in explaining this outcome, due to the legacy of apartheid in South Africa. Under apartheid, the African majority were denied equal opportunities, which has perpetuated adverse social conditions, including high levels of unemployment, limited educational opportunities, unsatisfactory living conditions and poor nutrition. In order to obtain a representative normative sample, IQ test developers stratify socio-economic status within racial/ethnic groups. According to Prifitera, et al. (2005) the implication of this practice is that other-than-white subgroups may consist of a larger proportion of lower socio-economic status individuals as this most often reflects this population subset's characteristics. Therefore, direct comparisons between Whites and other-than-white groups will not take into account the impact of socio-economic status differences which could impact on scores for a particular group. Marcopulos, McLain, and Giuliano (1997) noted that distinguishing between direct effects and interactions of variables such as ethnicity/race and socio-economic status on test performance is difficult. This is due to the fact that American minority groups are often socio-economically disadvantaged – and in South Africa it is the black majority which was, and largely remains, underprivileged.

1.4.2. Language

Leading neuropsychological texts of Lezak, et al. (2004) and Mitrushina, et al. (2005), comment on the importance of language with regard to effects on cognitive test scores. Lezak, et al. (2004) further comment on the need to develop instruments written in the testee's language and call for standardised tests for specific cultural and language groups. This they consider preferable to the use of interpreters. Mitrushina, et al. (2005) highlight difficulties associated with translating tests into other languages, and state that even when tests can be administered in English, biculturalism and bilingualism can impact on test performance. These mechanisms are not yet clearly understood.

Ardila (1999) highlights the importance of language in moderating test performance. In South Africa (which has adopted 11 official languages, nine of which are African languages) development of tests can prove problematic. These groups are not culturally homogeneous and even within these official language groups there are differences in language use. There are also socio-economic status differences within the black African groups which can lead to varying levels of English language competency. Ardila, Rosselli, Matute, and Guajardo (2005) comment that poverty impacts on language skills and children from impoverished

communities were found to have lower verbal skills when compared to both the general population as well as their own cognitive abilities. As a large proportion of the South African population are black and impoverished, language issues become a potentially serious problem.

Sattler (1992) also draws attention to the fact that language differences may impact on knowledge acquisition, which further exaggerates test performance differences. Skuy, et al. (2001) presented evidence in favour of language having considerable effect on cognitive test performance when black South African children performed very poorly on many verbal tasks. They link this finding to the fact that this group of children are being educated in a language which is not their first language. Furthermore, Ceci (1991) states that, the language used in teaching is more formal and may differ a great deal from the child's first language. The language used in IQ tests is often similar to that of formal schooling and therefore children are able to understand the questions of the tests. While most children are taught in English in South Africa, English is the first language of only 8.2% of the country (according to Stats SA, 2001). English competency varies widely and can therefore be a complicating factor when westernised tests are used.

English however remains the main language of assessment in South Africa, as previously mentioned, and whilst some test norms are available for Afrikaans speakers, few tests are available in any of the other nine African languages (Stead, 2002). Fleisch (2007) reviewed several studies pertaining to the state of Foundation and Intermediate Phase schooling in South Africa and offered valuable comment on the language situation in South African schools. According to Fleisch (2007), although the majority of South African children are taught and assessed in English by the time they complete Grade 3, the level of English language proficiency among the majority of black South Africans cannot be considered equivalent to that of English first language individuals. An interesting phenomenon, however, is that despite English not being their first language, the majority of South Africans prefer for their children to be educated in English. This is because English has become the language with the most status. It is the language of political, economical and intellectual power, as well as being the language of international relations. Furthermore, the legacy of apartheid language policies led to the devaluation of the status of African first languages. This trend is also observed amongst Afrikaans first language speakers who prefer for their children to attend English-medium schools (Broom, 2004). This phenomenon has implications in that the majority of South African children are being educated in a language that they do not speak at home or in their community, and it has led to a complex multilingual situation in most schools (advantaged and disadvantaged).

Fleisch (2007) also comments that research has shown that most children assessed in a language other than their first language perform far worse on tests than those who receive the test in their first language, though they are being educated in the same school and receiving the same quality of education. Furthermore, Fleisch (2007) comments that research has shown that the performance of children attending advantaged schools is much better than their same language peers in township schools, which can be accounted for by the fact that children in advantaged English-medium schools are immersed in the language, are taught by teachers proficient in English, and generally have greater access to English language books. It is therefore evident that the language situation in South Africa is complex and assessment presents many challenges in a context where English language proficiency cannot be assumed.

Consequently, possibly the most pivotal challenge in the South African context revolves around the decision whether or not to translate tests. One option is to translate tests into the testee's first language, while the other is to present tests in English. Nell (1994) commented on the challenges associated with deciding which option is better and asserts that language is the most important intermediary of test performance. The test language can either allow a non-native speaker of that language to access concepts that are unavailable to them in their first language, and conversely may deny the testee access to the language with which they are most familiar and which has mediated their knowledge acquisition or experience. Language therefore may introduce test bias when tests (such as intelligence tests which are usually developed for use with English speakers) are administered to testees with a different first language. As such, a test administered in English may hinder an individual who is not an English first language speaker from understanding the instructions or from adequately expressing themselves. Stead (2002) proposes two strategies towards solving this problem. The first would be to develop norms for tests which correct for education level and English language proficiency, while the second would entail developing norms in the testee's home language. Stead (2002) however argues that South African test users need to take cognisance of the possible implication of test translation in order to ensure linguistic equivalence with the original test, as well as conceptual equivalence. Furthermore, test users need to evaluate available normative data to ensure that they are appropriate and will not disadvantage the testee.

The most recent tendency in South Africa has been to norm tests in English only, rather than to go the route of translating the tests, for example, the Human Sciences Research Council WAIS-III standardisation for English speaking South Africans conducted by Claassen, Krynauw, Paterson, and Mathe (2001). This decision was made on the basis of complexity

associated with multiple translations that would be required for the various official languages and the variety of specific dialects within designated African language groups. Therefore, the large scale norming project, undertaken by the HSRC group, chose to norm the WAIS-III only for English speaking South Africans, reasoning that the majority of South Africans are currently educated through the medium of English from Grade 4 onwards and that even those learners who attend Afrikaans-medium schools study English as a subject at school (Claassen, et al., 2001). The test was also administered to a comparison group in order to obtain data on how the test could be applied to non-English first language speakers. The comparison group consisted of African language speakers and Afrikaans speakers with "considerable exposure to English" in that they "spoke English at work/school most of the time ", as well as a group with limited English competency, in this case "Afrikaans speakers with poor exposure to English" whose first language was Afrikaans and "who spoke Afrikaans at work/school most of the time " (Claassen, et al., 2001, p. 11). The HSRC standardisation of the WAIS-III found that "subjects with Afrikaans as language of learning scored disproportionately poorly in the verbal subtests as well as in tests loading on working memory when the tests were presented in English" (pp. 72-73). They concluded that people who are trained in Afrikaans would be better catered for in providing an Afrikaans translation of the WAIS-III. While an Afrikaans translation of the WAIS-III was done, the test was not normed for administration in languages other than English.

The HSRC standardisation of the WAIS-III was heavily criticised by Nell (1999) who considered this standardisation to be flawed, due to the fact that the HSRC group did not control for quality of education. Especially since quality of education is a pertinent issue within the South African context and has far reaching implications with regard to representativeness of norms for groups (for example black African first language individuals), with vastly differing educational exposure.

1.4.3. Education, including quality of education

Various education factors have been linked to IQ performance across a number of studies, including parental education level, access to formal education and effects of schooling, level of education, and quality of education. Parental education level has been known to impact upon children's cognitive development and test scores (for example, Ardila, et al., 2005) with the effects of parental education level evident on most IQ tests. This was also found to be the case for the WISC-IV where the mean FSIQ of children whose parents had tertiary education qualifications compared to those whose parents had less than nine years of education, was on average 20 points higher (Sattler and Dumont as cited in Strauss, et al., 2006). This is

likely due to the fact that parents with higher educational levels are apt to provide more intellectual stimulation and foster a culture of learning within their families.

Other studies have shown that formal education, in and of itself, impacts on test performance. Nell (2000) highlighted issues which had already been identified by Kendall, Verster, and Von Mollendorf (1988) in their review of various studies which illustrated that formal education impacts markedly on test performance and a strong positive relationship was found between amount of formal schooling across various Southern African studies and test performance. These researchers attributed effects of schooling, in part, to test-wiseness and test sophistication, as formal schooling develops familiarity with test procedures and materials, including using a pencil, being familiar with booklets, letters and numbers, paying attention and following instructions, and examination situations.

Ardila (1996) emphasizes level of education as a highly significant variable of neuropsychological test performance. Ardila (1999) found that educational attainment correlates significantly with scores on intelligence tests. In particular, education shows a high level of correlation with verbal intelligence subtests (specifically Vocabulary) and this is explained by the fact that many educational systems are biased in favour of verbal ability. As intelligence tests were initially designed to predict school performance, this is not surprising. Brody (1997) supported Ardila's argument stating that the relationship between intelligence test scores and educational achievement are reciprocal. Brody (1997) as well as Byrd, Jacobs, Hilton, Stern, and Manly (2005) also showed that scores on intelligence tests are positively correlated, not only with level of education (grades achieved), but also with performance on reading comprehension and mathematical knowledge i.e., subjects closely linked with curriculum content. Byrd, et al. (2005) go on to conclude that while educational level has been documented to be a strong predictor of performance on intelligence tests, their research has shown that reading level and literacy are more accurate reflections of academic achievement than years of education. They related this to reading achievement being a measure of quality of education. While groups may have reached the same level of education, the quality of their educational experience may differ. Such differences in quality of education have been observed amongst elderly African Americans from the South and North of the United States as some were more likely to have had lower quality of education due to segregated schooling (Manly, et al., 2004). Recent cross-cultural literature and research in the South African context has also highlighted quality of education as an important factor, even when samples have been matched in terms of educational level (Nell, 1999; Shuttleworth-Edwards, Kemp, Rust, Muirhead, Hartman, & Radloff, 2004; Van Tonder, 2007).

At one time, the dominant belief was that intelligence could not be altered by years of schooling completed but was in itself a predictor of how far one could progress in schooling (Ceci, 1991). This view has largely been contested. Ardila, Rosselli, and Rosas (1989) have argued that school is a culture in its own right as those who access formal education are trained in terms of particular cognitive abilities. Therefore, cognitive abilities are learned and, due to the fact that intelligence tests were designed to tap into these particular abilities, those with formal training will usually outperform those without. This view is supported by Ostrosky-Solís, Ramirez, and Ardila (2004) who comment that education reinforces acquisition of certain cognitive skills. Kaufman, Mclean, and Reynolds (1988) also found that increased educational levels corresponded with increased mean scores across age groups. Intelligence is largely a measure of cumulative learning (Ceci, 1991; Husén & Tuijnman, 1991). However, according to Ceci (1991) intelligence is also influenced by differences in schooling as the higher grade level an individual attains, the higher the IQ score. Education is consequently an "aptitude development program" and intelligence in turn is "an aptitude for learning in education and a primary product of learning in education" (Snow & Yalow, 1982). Mitrushina, et al. (2005) recognised that those with low intelligence scores usually have not completed much education, and identify two groups with low education: those with low cognitive ability who could not manage the demands of schooling, and those who were not afforded the opportunity to complete schooling but who could have benefited from further education. They comment that it would be appropriate to correct test scores for the latter group only.

South Africa's racialised past has left a legacy of educational inequality that sets ethnic groups apart. A negative effect on educational achievement is most clearly evidenced for the underprivileged black group (Fleisch, 2007). Prior to the desegregation of South African schools in 1991, white learners, as well as, a minority of other race groups who had the financial means, attended privately funded Independent (hereafter private) schools or government funded Model C schools run by various provincial Departments of Education. These children enjoyed access to more than 75% of available resources (Broom, 2004; Claassen, et al., 2001). Private and former Model C schools remain well-resourced and children educated in these schools achieve academic competency, perform in the upper range and comprise the majority of university entrants and graduates (Fleisch, 2007). Conversely, black learners attended schools run by the Department of Education and Training (DET) and coloured learners attended schools run by the House of Representatives (HOR), the coloured house of parliament. These children attended vastly under-resourced schools and were mostly taught by under-qualified teachers (Broom, 2004; Claassen, et al., 2001). The vast majority of black and coloured South African children (those from working-class and poor families) – and approximately 80% of all learners in South Africa – are still

attending former DET or HOR (hereafter township) schools (Broom, 2004; Claassen, et al., 2001; Fleisch, 2007). Although township schools are generally referred to as "previously disadvantaged", many continue to be relatively ill-resourced or resources may be underutilised. These schools often lack basic supplies, books or even desks. They also receive only basic government funding, there is absenteeism from the classroom (for teachers and learners), ineffective teaching methods are used, there are higher teacher-learner ratios in township schools, and teachers are often under-qualified or have weak subject knowledge and do not understand the demands of the new curriculum. All these factors therefore, contribute to a poorer quality of education in township schools (Cooper, 2004; Fleisch, 2007; Matomela, 2008a & 2008b; Nell, 1999).

Besides commenting on the language situation in South African schools, Fleisch (2007) also reviewed literature on both large- and small-scale studies covering the past decade and pertaining to reading and mathematics achievement. As scholastic achievement, particularly reading ability and mathematics achievement is considered to be a good indicator of quality of education and correlates with performance on IQ tests (Brody, 1997; Manly, et al., 2004), consideration of Fleisch's findings are pertinent to this discussion. According to Fleisch (2007) the main impact of segregated development of education in South Africa was that schools differed with regard to the quality of education offered to their learners. Current research supports a bimodal distribution pattern of achievement, and points towards the existence of two education 'systems' in South Africa – one advantaged and the other disadvantaged, as discussed above. Although children were free to move between schools after desegregation, the pattern of school attendance has not shifted significantly. Currently, private and former Model C schools still cater largely for the elite and white middle classes. More recently however, the emerging black middle class have also sent their children to these schools. Children from poorer socioeconomic groups still cannot afford to attend former Model C or private schools as these school fees are higher. Therefore, the inequality in the South African education system continues, especially in the poorer Eastern Cape Province (Cull, 2001; Fleisch, 2007; Shuttleworth-Edwards, Donnelly, et al., 2004).

Fleisch (2007) goes on to comment that township schools are doomed to fail in attempts to try and transform learners' underperformance, as children attending these inadequate schools bring a variety of health, socioeconomic, family and community problems with them to school. Therefore, at the start of formal schooling an achievement gap develops which continues to some extent for the rest of formal schooling. The reality of township schooling is that after seven years, most learners in these schools will have acquired only the most basic numeracy and very limited functional level of literacy, while a small minority is benefiting from

attendance at privileged schools and are achieving the required academic competency levels. Fleisch also contends that South African children who do not achieve the required level of reading and numeracy, gain learning that "remains context-bound and non-generalisable" (Fleisch, 2007, p. 30).

As quality of education impacts on IQ test performance, comparisons should be made between individuals who have remained in disadvantaged schools and those who have accessed better quality education. It is possible to make this comparison between those black and coloured South African children who have gained access to better quality education in more advantaged schools and those who remain in the relatively underprivileged schools characterised by poorer quality of education (Shuttleworth-Edwards, Donnelly, et al., 2004). In this regard, Shuttleworth-Edwards, Kemp, et al., 2004 took up the challenge of developing cross-cultural norms for the WAIS-III, heeding Nell's (1999) criticism of the HSRC standardisation (as previously discussed) in respect of addressing the issue of quality of education.

Shuttleworth-Edwards, Kemp, et al. (2004) generated preliminary normative data for South African adults tested with the WAIS-III in respect of a sample that was stratified for white English first language and black African first language, level (Grade 12 and graduate) *and* quality of education (advantaged private/former Model C schooling versus disadvantaged township schooling). The results of the Shuttleworth-Edwards, Kemp, et al. (2004) study revealed significant effects for both level and quality of education in the direction of poorer performance for Grade 12s versus graduates across both black African and white English first language groups, and for disadvantaged schooling in relation to advantaged schooling in the black African first language group. In the black African first language group, the effects of quality of education were more pronounced than for level of education. There was a significant lowering of both VIQ and PIQ scores for the black African first language group for Grade 12s versus graduates, and disadvantaged versus advantaged education. There was a significant lowering only with regard to the VIQ (and specifically the VCI) score for the white English first language group for low level Grade 12 education versus high level graduate education. The Vocabulary subtest revealed the most significant lowering when a low level and poor quality of education co-occurred.

With regard to the graduate sample, the mean FSIQ score of the white English advantaged group was 123.00 while the black African advantaged group had a mean FSIQ score of 113.40 (lower by 9.60 points). There was a more substantial lowering observed between the mean scores of the white English advantaged and black Xhosa disadvantaged group with the

latter obtaining a mean FSIQ score of 94.90 (lower by 28.1 points). When the graduate black African groups were compared, the black African advantaged group mean FSIQ score differed from the black African disadvantaged score showing a lowering of 18.5 points. With regard to the Grade 12 sample, the mean FSIQ score of the white English advantaged group was 106.57 while the black African advantaged group had a mean FSIQ score of 99.90 (lower by 6.67 points). There was a more substantial lowering observed between the mean scores of the white English advantaged and black Xhosa disadvantaged group with the latter obtaining a mean FSIQ score of 74.40 (lower by 32.17 points). When the Grade 12 black African groups were compared, the black African advantaged group mean FSIQ score differed from the black African disadvantaged score showing a lowering of 25.5 points (Shuttleworth-Edwards, Kemp, et al., 2004). Shuttleworth-Edwards, Kemp, et al. (2004) concluded that quality of education plays a highly significant role in IQ performance of adults when tested with the WAIS-III, over and above effects of level of education. They also demonstrated the importance of stratifying samples in respect of both level and quality of education.

Building on the research done by Shuttleworth-Edwards, Kemp, et al. (2004) in providing cross-cultural norms for use with adults on the WAIS-III in South Africa, Van Tonder (2007) generated preliminary normative data for South African children tested with the WISC-IV. Van Tonder's sample was stratified for white English first language and black Xhosa first language, and quality of education (advantaged private/former Model C schooling versus disadvantaged township schooling), while level of education was controlled for and limited to Grade 7. Findings of the Shuttleworth-Edwards, Kemp, et al. (2004) study were broadly replicated by Van Tonder (2007) in that trends with regard to ranking of scores were largely the same as for the adult Grade 12 sample with the white English advantaged group scoring highest, the black Xhosa advantaged scoring intermediate, and the black Xhosa disadvantaged groups scoring the lowest. Therefore, Van Tonder's results also revealed significant effects for quality of education in the direction of poorer performance for learners with disadvantaged education, with the black Xhosa speaking children with disadvantaged education performing significantly lower on the WISC-IV than both white English and black Xhosa speaking children with advantaged education. Van Tonder (2007) concluded that quality of education plays a highly significant role in IQ performance of children (selected to represent a non-clinical sample of normal intelligence) when tested with the WISC-IV. And, on the basis of large differences between the VCI scores across the three groups, Van Tonder stated that the verbal index, in particular, is culturally biased. It is of note that unlike Shuttleworth-Edwards, Kemp et al. (2004), van Tonder did not apply Bonferroni's adjustment

for the multiple comparisons in the analysis of the WISC-IV test results, and this limits the ability to make fine comparisons between the two studies in terms of significant differences.

1.5. Rationale for the present study

From the above review of South African cross-cultural research conducted so far in respect of the adult and child Wechsler Intelligence Scales, it is evident that the focus has been exclusively on black versus white South Africans, whereas there appears to be no research in respect of Afrikaans speaking white or Afrikaans speaking coloured individuals. As with any test data this severely limits the clinical use of this internationally renowned test in respect of this large sector of the South African population. According to the principal of a coloured township school, these schools were also historically disadvantaged and remain under-resourced (M. Meiring, personal communication, January 22, 2008). Therefore it would seem feasible to suggest that former HOR schools would be subject to the same quality of education expectations as the former DET schools (also refer to discussion on page 17 above). It should thus be a matter for concern that there is a paucity of literature with regard to coloured children when there is a potential for IQ testing to be influenced by disparities in quality of education within this group who still predominantly attend former HOR schools. The coloured group is of particular interest, as this group, being predominantly Afrikaans first language speakers, offer a unique opportunity to study the impact of quality of education on performance in IQ tests such as the WISC-IV. As with the middle-class black group, some coloured children have accessed former Model C schooling which makes this a heterogeneous group in terms of quality of education.

For the purposes of the present research therefore, it was decided to provide preliminary normative indications on the WISC-IV to facilitate clinical practice in respect of Afrikaans speaking white and coloured children in South Africa, and at the same time to investigate whether quality of education, more so than first language or race, significantly impacts on IQ test performance. In order to make the new data comparable to the earlier Van Tonder data in respect of white English and black Xhosa speaking Grade 7 children, it was decided similarly to target Grade 7 children, and to analyse all the data from both data collections (van Tonder in addition to those of the present study) using Bonferroni's correction for the multiple subgroup comparisons.

CHAPTER 2. METHODOLOGY

The objective of the present study was to provide clinically useful preliminary cross-cultural normative indicators for performance on the WISC-IV (including the ten core subtests, the four index scores and the FSIQ score) for English, Xhosa and Afrikaans Grade 7 learners, stratified for advantaged versus disadvantaged quality of education. The methodology employed was as follows.

2.1. Participants

Participants were drawn from two cross-cultural data collections conducted at different times, including: 1) participants tested by Van Tonder in 2007 (Sample A), and 2) participants tested by this researcher in 2008 (Sample B). The final combined sample (N = 69) was made up of Grade 7 participants with an age range of 12 to 13 years, as summarised in Table 1.

Table 1: Total combined sample including new and pre-existing Grade 7 samples, stratified for ethnicity¹, language², quality of education³, and gender.

Ethnic Group	First Language	Education	Gender		Sample (N = 69)	
			M	F		
White	English	Private/Model C	n = 6	n = 6	n = 12	A
Black	Xhosa	Private/Model C	n = 6	n = 6	n = 12	
Black	Xhosa	DET Township	n = 6	n = 6	n = 12	
White	Afrikaans	Model C	n = 6	n = 6	n = 12	B
Coloured	Afrikaans	Model C	n = 6	n = 3	n = 9	
Coloured	Afrikaans	HOR Township	n = 6	n = 6	n = 12	

Note: 1) White, Black, Coloured; 2) English, Xhosa, Afrikaans; 3) Advantaged, Disadvantaged

Sample A (N = 36) included white English and black Xhosa Grade 7 learners from Grahamstown (Eastern Cape, South Africa). Participants were purposefully selected according to strict criteria which allowed for stratification of relevant variables within a non-clinical sample. Two main stratification dimensions were employed: 1) ethnicity/first language (white English and black Xhosa), and 2) quality of education (advantaged and disadvantaged schooling). The following groups were represented: 1) white English advantaged learners attending a private/former Model C school (n = 12); 2) black Xhosa advantaged learners attending a private/former Model C school (n = 12); and 3) black Xhosa disadvantaged learners attending a township (former DET) school (n = 12). White English and black Xhosa advantaged participants represented a balanced distribution for attendance at either a private

or former Model C school. T-test analyses were conducted to investigate differences between these advantaged school types and in each case the differences were not significant with $p > 0.05$ for all measures (Van Tonder, 2007). However there were consistent trends in the direction of the private school participants doing better than those attending former Model C schools with regard to performance on the WISC-IV.

Sample B (N = 33) consisted of white Afrikaans and coloured Afrikaans Grade 7 learners, targeted to extend the existing sample. All participants were purposefully selected using criteria applied to sample A for ease of comparison. Sample B was therefore also stratified according to two main dimensions of ethnicity/first language and quality of education as follows: 1) ethnicity/first language (white Afrikaans and coloured Afrikaans), and 2) quality of education (advantaged and disadvantaged schooling). Due to the fact that there are no private Afrikaans-medium schools in the Eastern Cape vicinity where this study was taking place (to the knowledge of this researcher), in contrast to the Van Tonder (2007) data collection, the advantaged participants were drawn exclusively from former Model C schools. Accordingly, the following groups were represented: 1) white Afrikaans advantaged learners attending a former Model C school (n = 12); 2) coloured Afrikaans advantaged learners attending a former Model C school (n = 9); and 3) coloured Afrikaans disadvantaged learners attending a township (former HOR) school (n = 12). The intention was to sample Grade 7 learners from Grahamstown (Eastern Cape, South Africa) only, in keeping with Van Tonder's sampling criteria. However due to the scarcity of white Afrikaans, and in particular coloured Afrikaans learners able to meet the criteria for advantaged education in Grahamstown, the comparative study criteria was extended. Grade 7 learners from Port Elizabeth (Eastern Cape, South Africa) and Cape Town (Western Cape, South Africa) who attended schools considered relatively equivalent in terms of socioeconomic status and quality of education to the targeted schools in Grahamstown, were therefore included.

Additionally, both samples were stratified according to dimensions of age, level of education, and gender.

Inclusion and exclusion criteria

Inclusion criteria. All participants were between 12 and 13 years of age; all participants were in Grade 7 at the time of the data collection; only children who had been in the designated school type for three or more years consecutively were allowed to participate in the study to ensure clear distinctions in terms of differential levels of quality of education.

Exclusion criteria. All participants who had repeated a grade or who were known to have a learning disability, a history of medical, psychiatric or neurological disorder were excluded

from this study, in keeping with previous protocols for cross-cultural norming to ensure that the sample was representative of a non-clinical population.

2.1.1. Age

Participants were all between the ages of 12.01 and 13.11 years ($X = 13.04$, $SD = 0.34$). Age differences between the comparative groups were not statistically significant ($p > 0.05$ in all instances). Participants with advantaged schooling ($X = 13.12$, $SD 0.33$) were on average 4 months older than participants with disadvantaged schooling ($X = 12.89$, $SD = 0.29$).

2.1.2. Level of education

To investigate the effects of quality of education, level of education was restricted to Grade 7 (the final year of Intermediate Phase education in South Africa). To ensure an equal performance distribution, the researchers consulted with the schools to verify learners' marks for Grade 6 and Grade 7. This was done as the objective was to test a cross-section of children across all performance levels so that the sample would be representative of normally performing children within a specific targeted school situation. Across comparative groups, care was taken not to create an uneven mark distribution within a group. This was not possible within the coloured Afrikaans advantaged schooling group however, as this group did not typically perform well academically. Therefore, learners which were representative of this group tended to be in the bottom performance range within their class.

2.1.3. Gender

The goal was to sample an equivalent number of males ($n = 6$) and females ($n = 6$) in each group in order to minimise possible gender differences. A target total of $n = 12$ participants was met for all groups with the exception of the coloured Afrikaans advantaged group due to the paucity of coloured children in former Model C Afrikaans-medium schools. In particular there were few female learners who met the selection criteria, which meant that the gender criteria for this group could not be met and therefore an unequal number of males ($n = 6$) and females ($n = 3$) were sampled.

2.1.4. Language

Three first language groups were compared in this study, namely English, Xhosa and Afrikaans. According to the 2001 census data cited by Statistics South Africa in their provincial profile reports for 2004, Zulu (23.8%) is the most widely spoken language in South Africa, followed by Xhosa (17.6%) and Afrikaans (13.3%), with English (8.2%) ranked fifth. For the purposes of this study, those language groups most prevalent in the Eastern Cape were selected – i.e. Xhosa (83.4%), Afrikaans (9.3%) and English (3.6%) (Stats SA, 2006).

2.1.5. Quality of education

It has been proposed that quality of education may be a greater determinant of intellectual functioning than level of education. The research conducted by Shuttleworth-Edwards, Kemp, et al. (2004) and Van Tonder (2007) which was previously reviewed, strongly supports this claim in that African first language individuals with disadvantaged education tend to have poorer performance on IQ tests, with a difference of approximately 20 points on average between individuals with advantaged versus disadvantaged schooling. It is widely recognised that due to the segregated development of education in South Africa, two school 'systems' (one historically advantaged and the other historically disadvantaged), continue to exist more than a decade after the first democratic elections in 1994 which confirmed the end of apartheid (Fleisch, 2007).

As the racialised legacy of apartheid continues in Education, it was considered appropriate to replicate this dimension of advantaged versus disadvantaged schooling in the present WISC-IV study. For the purposes of the study, advantaged schooling will be defined as that which is provided by private and former Model C schools while disadvantaged schooling will be defined as that which is provided by township (former DET or HOR) schools.

The combined sample used in this study was divided into six groups based on ethnicity, language and quality of education. No assumptions were made about exact equivalence of quality of education amongst schools in the advantaged (private/former Model C schools targeted in Sample A or former Model C schools targeted in Sample B) grouping or the disadvantaged (township: former DET schools targeted in Sample A or former HOR school targeted in Sample B) grouping even though it is possible that wide variations within groups may exist. However it is considered unlikely that any of the disadvantaged schools would be in a position to offer the quality of education offered in the advantaged schools.

2.2. Procedure

2.2.1. Data collection

Sample A data was collected by three intern clinical psychologists, and a Xhosa speaking intern clinical psychologist was used as translator for testing black Xhosa disadvantaged learners. Sample B data was collected by an intern counselling psychologist and two psychology honours students (who practiced the test with each other in English and then in Afrikaans to ensure familiarity with pronunciation and comparable test administration procedure between administrators). All test administrators were trained in the standardised

administration and scoring of the WISC-IV according to the manual (Wechsler, 2004), under the supervision of Prof. Ann Edwards, a registered clinical psychologist. Test administrators were randomly assigned participants from various schools, and care was taken to ensure that each administrator tested a cross section of learners during the respective data collection periods – i.e. each administrator tested participants from each of the comparative groups, with equal gender, level of education and quality of education distribution.

Only schools with learners who met the selection criteria were approached for participation. Participation in the research was entirely voluntary and necessary permission in the form of signed consent was obtained from the schools, the parents/guardians, as well as, from the children prior to the undertaking (see Appendix A through E, and Van Tonder, 2007). The headmaster and class teachers were asked to identify potential participants, according to the sampling criteria.

2.2.2. Test administration

Participants were screened using the Screening Questionnaire (see appendix F, and Van Tonder, 2007). Sample A received the full WISC- IV^{UK} battery (core and additional subtests) as well as Digit-Symbol Coding Incidental Immediate and Delayed recall tasks. Sample B received the WISC- IV^{UK} ten core subtests only, together with the aforementioned memory task. During both data collection periods, all tests were individually administered in the morning during school hours. A decision was taken to restrict the data collection to the core subtests only for the second phase of the research (Sample B) which became the focus of the extended study, due to more limited researcher capacity, and in the interests of putting the available resources into gaining an equivalent number of participants in the extended sample. The test battery was completed with each participant in a single sitting, and a break was generally taken half way through testing. Each test took between 80 to 150 minutes to administer depending on the learner's ability. Tests were administered in a testing room at the particular school and attempts were made to minimise noise and distraction.

2.2.3. Language of assessment

It is not currently the policy of the South African government to provide mother-tongue instruction for African first language speakers beyond the Foundation Phase (Grades 1 to 3), and English (or Afrikaans) becomes the primary language of instruction and testing at school when children enter the Intermediate Phase (Grades 4 to 7) (Broom, 2004; Fleisch, 2007). In a clinical setting it is often considered appropriate to conduct testing in a child's language of tuition. However, if a child is not considered sufficiently proficient in their language of tuition, in order to administer a test such as the WISC-IV that does not have a relevant translation, a

clinician would normally employ a translator to repeat instructions that are given in English in the child's first language, unless the clinician was sufficiently bilingual to translate. At present there is a shortage of Xhosa speaking practitioners, and therefore the use of an English speaking clinician with a Xhosa speaking translator is a frequently employed mode of test administration being used for testing Xhosa first language children attending disadvantaged schools. Such children would not be considered proficient in English to the extent that children in the historically advantaged English-medium schools would be, due to the common practice amongst teachers in disadvantaged schools to employ codeswitching (switching between the use of English and African first language) in the classroom, resulting in varying levels of English proficiency amongst learners (Broom, 2004; Fleisch, 2007). Similarly, English speaking clinicians may also choose to employ an Afrikaans translator when administering a test such as the WISC-IV that does not have a formal Afrikaans translation, in order to repeat the instructions given in English in Afrikaans. However, there are many Afrikaans or bilingual English/Afrikaans clinicians in practice who would use their own informal translation of the WISC-IV test and administer the test to the testee directly in Afrikaans, thereby removing the need for an initial instruction given to the testee in English.

The aim of the present study was to produce norms that could be utilised in such typical clinical situations (described above) as they currently apply in the South African context, and therefore test administration, and specifically the language of assessment with different groups, was tailored to match the current state of regularly applied clinical practice in South Africa. The research was done in the full knowledge that these practices deviate from the ideal of test administration with formally translated and standardized tests. However, in the absence of such a facility, it was considered that the provision of normative indications would substantially increase the ability to interpret test data derived on the basis of such commonly employed practices in relation to the use of the WISC-IV.

Specifically with respect to Sample A of the present study, participants all attended English-medium schools and clinical assessment conditions were replicated for this group as follows. The WISC-IV was administered in the standardised English version to those participants attending private/former Model C schools who would have received good quality English language tuition. It was thus assumed that both English and Xhosa first language speakers in advantaged schools were relatively proficient in English. Those participants attending a township (former DET) school would have received English language tuition only from Grade 4 upwards as African first language instruction (in Xhosa) is provided for Grade 1 to 3. In addition due to codeswitching being a regular practice in township schools, English language tuition is likely to be of a lower quality. Van Tonder (2007) used a Xhosa translator when

testing black Xhosa disadvantaged participants, as it was assumed that these Xhosa first language participants would have questionable English proficiency due to mixed-Xhosa/English language use in the classroom and general disadvantaged schooling. Instructions were therefore given in English by the test administrator and repeated in Xhosa by the translator.

Specifically with respect to Sample B, all participants attended Afrikaans-medium schools, and therefore the WISC-IV was administered in Afrikaans. This again replicated the kind of situation typically encountered in a clinical situation and is the testing practice recommended by Claassen, et al. (2001) who conducted the WAIS-III standardisation for South African use. This group of participants was not considered proficient in English due to the fact that their education would have been in Afrikaans. To facilitate test administration in Afrikaans, the test instructions were translated into Afrikaans and the translation verified by an Afrikaans first language speaking clinician – a process similar to that used by Van Tonder (2007) for translating the test for the Xhosa translator. Use of the translated test ensured consistency amongst administrators during testing, and a translator was not employed as the administrators were considered sufficiently bilingual to administer the test in Afrikaans.

It is recognised that such translations as used for data collection in the present study have limitations as they do not conform to strict standardisation criteria. However, it was noted that past cross-national studies of the WISC have never designed any subtests from scratch (Van de Vijver, 2003). Various countries differed with regard to the level of application (direct literal translation) or adaptation needed, but in the WISC-III cross-cultural studies, 90% of items were closely translated or copied and 10% were adapted. The greatest number of adaptations was required for the Vocabulary subtest, while generally performance subtests were used as is (Van de Vijver, Mylonas, et al., 2003). The researchers therefore acknowledge that translation may impact on verbal subtests in particular, but it would be unlikely that the performance subtests would be affected by translation. The method employed in the present study was therefore considered reasonable in keeping with the aims of the study, in that it allowed the researchers to obtain preliminary normative data for clinical utility (for the Xhosa disadvantaged and Afrikaans speaking participants) in the absence of formal standardised translations of the WISC-IV.

2.2.4. Scoring

The WISC-IV tests were scored as indicated in the standardised manual (Wechsler, 2004). Cross verification of scoring was done to ensure consistency, therefore increasing the reliability of scoring. In cases of scoring differences, the research teams conferred to reach

consensus. It should be noted that the WISC-IV^{UK} and related UK norms have been used in relation to the South African sample in this study to generate cross-cultural norms. The WISC-IV^{UK} standardised manual (Wechsler, 2004, p. 284) states that "close correspondence" was demonstrated between the UK and US normative data sets. However, some minor differences were observed on certain subtests. Therefore the means and standard deviations included in the WISC-IV^{UK} manual pertain to the UK scaling and norms.

2.3. Data analysis

Only the WISC-IV core subtest results pertain to the present comparative study, therefore additional subtest data from Sample A, as well as data pertaining to Digit-Symbol Coding recall tasks for both Sample A and B were disregarded. Relevant comparative data for Sample A were extracted, while WISC-IV raw scores for Sample B were calculated and converted to scaled scores using age-specific UK norms for each participant. The data for Sample A were combined with the new data set of Sample B, and submitted for analysis.

Descriptive statistics were generated to determine the mean scores and standard deviations for all WISC-IV core subtest scaled scores, index and IQ scores. Levene's statistics were generated to ensure normal distribution and homogeneity of variance. An ANOVA analysis was used to examine differences between comparative groups for quality of education, and post-hoc Scheffe's multiple comparisons were used to examine pair-wise differences between groups stratified for ethnicity/first language and advantaged versus disadvantaged quality of education.

For the post hoc pair-wise comparisons, the use of Scheffe's test ensures that the overall level of significance does not exceed a 5% level of significance. However, when multiple test measures are being investigated in respect of the same groups (as was the case for the present study) it is necessary to make an adjustment in the level of significance towards stringency in order to reduce the risk of a Type I error (i.e. the identification of any significant differences between groups where these do not exist). Such an adjustment (i.e. Bonferroni adjustment) serves to protect against Type I error, but does so at the cost of possibly minimizing significance, and therefore increases the likelihood of Type II error (i.e. failure to identify a real difference). Therefore, in order to protect against Type I error, a Bonferroni adjustment was made towards stringency by setting the level of significance at the 1% level (0.01). It was decided that any more stringent adjustment than this would inevitably increase the risk of Type II error, especially in light of the small sample numbers.

Sample size

It is acknowledged that a relatively small sample size, with the target total for each group set at $n = 12$ participants, was used. However, this was considered adequate for the purposes of the present study in light of the research previously done by Shuttleworth-Edwards, Kemp, et al. (2004) with respect to WAIS-III performance of an adult population, comprising similar small yet well-controlled and carefully stratified samples. It has been pointed out that well-stratified norming studies with small participant numbers are preferable to poorly stratified studies with large participant numbers (Strauss, et al., 2004). Despite the small sample numbers, the WAIS-III performance study delivered statistically significant differences between comparative groups and was particularly relevant in that it provided practitioner-orientated indications for cross-cultural assessment where a paucity of such literature exists. The importance of the Shuttleworth-Edwards, Kemp, et al. (2004) research is further evident in that it was cited in the leading neuropsychological text of Strauss, et al. (2006). As the present study had similar aims to that of Shuttleworth-Edwards, Kemp, et al. (2004) which effectively used a similar sample format in the past – the relatively small sample used for this comparative study was considered adequate to achieve the objective of providing practitioner-oriented cross-cultural normative indicators for use in clinical practice on well controlled and carefully stratified samples where no such resource previously existed. As discussed above, precautions were taken to ensure that differences between comparative groups were statistically significant.

2.4. Data presentation

The results will be set out in a single table covering the different comparative groups, including: means, standard deviations, ANOVA p -values and the direction of significant differences for the Scheffe's post hoc analyses, for all ten core subtest scaled scores, index and IQ scores.

CHAPTER 3. RESULTS

A comparative analysis of WISC-IV performance, including core subtests, indices and FSIQ, was conducted using an ANOVA and Scheffe's post hoc pairwise comparisons, in respect of English, Xhosa and Afrikaans first language, Grade 7 learners, stratified for advantaged versus disadvantaged quality of education (see summary of analyses, Table 2, at the end of the chapter, p. 39). The results of these analyses will firstly be discussed in terms of broad overall trends, following which, evidence for statistical significance according to Scheffe's post hoc analyses will be discussed.

3.1. Overall significance

The ANOVA revealed significant differences between the mean scores of the six comparative groups for quality of education, evident on all four factor indices (VCI, PRI and WMI at $p = 0.000$; PSI at $p = 0.001$); the FSIQ ($p = 0.000$); and all ten core subtest mean scores (p ranging from 0.000 to 0.001 for nine of the ten subtests, and for the Coding subtest at 0.050). All results were therefore highly significant at the 1% level ($p \leq 0.001$) with the exception of the Coding subtest which was just significant at $p \leq 0.05$.

Note: in respect of post hoc pair-wise comparisons a Bonferroni adjustment (as discussed in section 2.3, p. 29) was made towards stringency by setting the level of significance at the 1% level. Therefore, in this chapter when post hoc significance is reported, the level of significance is at most $p \leq 0.01$ in all instances, and in cases where the level of significance is reported as being at $p \leq 0.001$, this would be considered a highly significant difference.

3.2. WISC-IV performance trends

WISC-IV performance revealed a performance continuum where a downward trend for performance with lower quality of education was observed when Grade 7 ethnic/first language groups were stratified for advantaged versus disadvantaged quality of education. In other words, the overall trend revealed that groups with advantaged schooling performed better than those with disadvantaged schooling. The historically advantaged white English group obtained the highest mean scores across all four indices, as well as on the FSIQ. This group also obtained the highest mean scores on 8 out of 10 of the core subtests. When the advantaged groups were ranked according to their performance on the WISC-IV, the

following continuum emerged: 1) white English advantaged participants performed best, 2) followed by white Afrikaans advantaged and black Xhosa advantaged participants with lower mean scores compared to the white English advantaged group but with largely corresponding scores when compared to each other, 3) followed by coloured Afrikaans advantaged participants with the poorest performance in the advantaged grouping. A further downward trend was observed between advantaged and disadvantaged groups. Within the disadvantaged grouping, black Xhosa disadvantaged participants performed somewhat better than their coloured Afrikaans disadvantaged counterparts. The performance of the coloured Afrikaans disadvantaged group was poorest overall, and they obtained the weakest mean scores on all four indices and on the FSIQ, as well as the lowest mean scores on 9 out of 10 of the core subtests with the exception of the Coding subtest for which they were marginally better than the black Xhosa disadvantaged group and the same as the coloured Afrikaans advantaged group

Significant differences ($p \leq 0.01$) between comparative groups were mostly observed with regard to the VCI and verbal subtests of Similarities, Vocabulary and Comprehension – with statistically significant differences occurring both within advantaged, and between advantaged and disadvantaged, groupings. These differences were largely replicated on the FSIQ. Significant differences with regard to the PRI and WMI were only observed in comparisons between the advantaged and disadvantaged groupings. Although the ANOVA revealed a significant overall group effect for the PSI and the Coding subtest ($p = 0.001$ and $p = 0.050$, respectively) there were no significant differences revealed on the Scheffe's post hoc analyses for the subgroup comparisons in respect of these two measures.

3.2.1. Quality of education: advantaged schooling

White English Advantaged

Overall trends in respect of the white English advantaged group were as follows. Mean index scores tended to range between *average* (90 – 109) and *superior* (120 – 129) for the white English advantaged group. The mean VCI score was 120.92 (SD = 14.76) and in the *superior* range, the mean PRI score was 111.67 (SD = 18.10) and in the *high average* (110 – 119) range, while the mean WMI and PSI scores were 101.25 (SD = 13.37) and 96.17 (SD = 14.89) respectively, and within the *average* range. The mean FSIQ score of 112.83 (SD = 13.17) was in the *high average* range. This group obtained the highest mean scores on the verbal subtests of Similarities, Vocabulary and Comprehension ($X = 14.08, 13.75$ and 12.92 respectively), and on the performance subtests of Block Design, Picture Concepts and Matrix Reasoning ($X = 11.83, 11.67$ and 10.75 respectively). White English advantaged participants also obtained the highest mean scores on the Digit Span ($X = 11.42$) and Symbol Search (X

= 10.75) subtests. The only two subtests on which the white English advantaged group did not achieve the highest mean scores were Letter-Number Sequencing and Coding, where the white Afrikaans advantaged group achieved the highest mean scores. Therefore, overall white advantaged participants achieved the highest mean scores on WISC-IV core subtests compared to all other groups.

Post hoc analyses supported these trends and revealed that the white English advantaged group performed significantly better ($p \leq 0.01$) than most other groups with regard to the VCI and FSIQ. Significant differences were observed between the white English advantaged group and other advantaged groups, in the direction of better performance for the white English advantaged group compared with the following: 1) white Afrikaans advantaged and coloured Afrikaans advantaged groups on the VCI ($p = 0.000$, and therefore a highly significant difference in both instances) and on the verbal subtests of Similarities, Vocabulary, and Comprehension ($p \leq 0.01$ in all instances); 2) black Xhosa advantaged group on the verbal subtest of Vocabulary ($p = 0.001$); and 3) black Xhosa advantaged ($p = 0.008$) and coloured Afrikaans advantaged groups ($p = 0.000$) on the FSIQ. Furthermore, the white English advantaged group performed significantly better than both the disadvantaged (black Xhosa disadvantaged and coloured Afrikaans disadvantaged) groups on the VCI, PRI and FSIQ ($p = 0.000$, and therefore highly significant differences in all instances). Only with regard to the PSI were there no significant differences ($p \leq 0.01$) between the white English advantaged group and other groups, however a strong trend towards significant difference on the PSI in favour of the white English advantaged group ($p = 0.019$) was observed in respect of the coloured Afrikaans disadvantaged group.

White Afrikaans Advantaged

Overall trends in respect of the white Afrikaans advantaged group were as follows. All mean index scores for the white Afrikaans advantaged group were within the *average* range and were within 1 SD of the UK norms. The mean VCI score was 92.58 (SD = 12.40), the mean PRI score was 97.50 (SD = 16.83), the mean WMI score was 97.00 (SD = 12.13) and the mean PSI score was 96.17 (SD 15.09). The mean FSIQ score of 94.42 (SD = 13.25) was also in the *average* range and was within 1 SD of the UK norm. The white Afrikaans advantaged group obtained lower mean scores than the white English advantaged group on 8 out of 10 of the core subtests, with exception of the Letter-Number Sequencing ($X = 10.33$) and Coding ($X = 8.33$) subtests. Compared to the white English advantaged group, the white Afrikaans advantaged group showed less fluctuation between mean index scores and mean FSIQ score. White Afrikaans advantaged mean scores were generally lower than those of their white English advantaged counterparts.

Post hoc analyses revealed significant differences between the white English advantaged and white Afrikaans advantaged groups in the direction of lower scores for the white Afrikaans speaking group, with regard to the VCI ($p = 0.000$) and the three verbal subtest of Similarities ($p = 0.003$), Vocabulary ($p = 0.000$) and Comprehension ($p = 0.008$) (therefore, $p \leq 0.01$ in all instances, and a highly significant difference noted for the Vocabulary subtest).

Black Xhosa Advantaged

Overall trends in respect of the black Xhosa advantaged group were as follows. Mean index scores for the black Xhosa advantaged group were in the *average* range, with the exception of the mean PSI score which was in the *low average* (80 – 89) range. The mean VCI score was 101.30 (SD = 10.12), the mean PRI score was 92.75 (SD = 7.57), the mean WMI score was 100.08 (SD = 10.08), while the mean PSI score was 84.50 (SD = 12.30). The mean FSIQ score of 93.92 (SD = 5.85) was in the *average* range and was within 1 SD of the UK norm. Mean scores of the black Xhosa advantaged group were generally lower than those of the white English advantaged group, but were largely equivalent to those of the white Afrikaans advantaged group.

Post hoc analyses revealed that although there was an overall trend for the black Xhosa advantaged mean scores to be lower than those of the white English advantaged group, significant differences ($p \leq 0.01$) in the direction of poorer performance for the Xhosa speaking advantaged group were observed only with regard to the FSIQ ($p = 0.008$) and Vocabulary subtest ($p = 0.001$). No statistically significant differences were observed between mean scores of the white Afrikaans and black Xhosa advantaged group, thus supporting the trend of comparative equivalence.

Coloured Afrikaans Advantaged

Overall trends in respect of the coloured Afrikaans advantaged group were as follows. With the exception of the mean PRI score which was in the (lower) *average* range, mean index scores for the coloured Afrikaans advantaged group were in the *low average* range. The mean VCI score was 85.00 (SD = 6.08), the mean PRI score was 90.67 (SD = 10.09), the mean WMI score was 85.67 (SD = 12.45), and the mean PSI score was 84.33 (SD = 6.12). The mean FSIQ score of 82.67 (SD = 7.43) was in the *low average* range and was between 1 and 2 SD of the UK norm. Mean scores of the coloured Afrikaans advantaged group were generally lower than those of the other advantaged groups.

Post hoc analyses revealed that although there was an overall trend for the coloured Afrikaans advantaged mean scores to be lower than those of the other advantaged (white

English advantaged, white Afrikaans advantaged and black Xhosa advantaged) groups, significant differences ($p \leq 0.01$) in the direction of poorer performance for the coloured Afrikaans advantaged group were observed only when this group was compared to the white English advantaged group. These significant differences were found in respect of the FSIQ, VCI, and the verbal subtests of Similarities and Vocabulary ($p = 0.000$, and therefore highly significant in all instances) as well as on the verbal subtest of Comprehension ($p = 0.002$). No statistically significant differences ($p \leq 0.01$) were observed between the mean scores of white Afrikaans advantaged, black Xhosa advantaged and coloured Afrikaans advantaged groups. However, a strong trend towards significant differences between the black Xhosa advantaged and coloured Afrikaans advantaged groups in respect of the Similarities subtest ($p = 0.013$) was observed in favour of better performance of the black Xhosa advantaged group.

3.2.2. Quality of education: disadvantaged schooling

Black Xhosa Disadvantaged

Overall trends in respect of the black Xhosa disadvantaged group were as follows. The black Xhosa disadvantaged group mean index scores tended to range between *low average* and *borderline* (70 – 79). The mean VCI score was 80.42 (SD = 13.59), the mean PRI score was 80.83 (SD = 11.21), the mean WMI score was 86.50 (SD = 12.99) and were all within the *low average* range, while the mean PSI score was 79.83 (SD = 16.28) and within the *borderline* range. The mean FSIQ score of 77.08 (SD = 13.79) was in the *borderline* range and was between 1 and 2 SD of the UK norm. A clear downward trend in performance was observed in the direction of the black Xhosa disadvantaged group, with mean scores of this disadvantaged group generally lower than those of all the advantaged groups.

Post hoc analyses revealed that although there was an overall trend for the black Xhosa disadvantaged mean scores to be lower than those of the advantaged (white English advantaged, white Afrikaans advantaged, black Xhosa advantaged and coloured Afrikaans advantaged) groups, significant differences ($p \leq 0.01$) were observed only between the white English advantaged and black Xhosa disadvantaged groups in the direction of poorer performance for the disadvantaged group, with regard to the FSIQ, VCI, and the three verbal subtests of Similarities, Vocabulary and Comprehension ($p = 0.000$, and therefore highly significant in all cases), as well as between the PRI ($p = 0.000$) and two of the performance subtests namely Block Design ($p = 0.001$) and Matrix Reasoning ($p = 0.006$). Furthermore, there were significant differences ($p \leq 0.01$) between the black Xhosa advantaged and black Xhosa disadvantaged groups in the direction of poorer performance for the disadvantaged group, with regard to the VCI ($p = 0.005$) and one verbal subtest of Similarities ($p = 0.000$).

No statistically significant differences ($p \leq 0.01$) were observed between the black Xhosa disadvantaged group and the white Afrikaans advantaged and coloured Afrikaans advantaged groups, however differences between the white Afrikaans advantaged and black Xhosa disadvantaged groups approached significance on the FSIQ ($p = 0.020$) and on the Block Design subtest ($p = 0.046$) in favour of better performance of the white Afrikaans advantaged group.

Coloured Afrikaans Disadvantaged

Overall trends in respect of the coloured Afrikaans disadvantaged group were as follows. Mean index scores for the coloured Afrikaans disadvantaged group ranged between *borderline* and *extremely low* (below 70). The mean VCI score was 65.06 (SD = 11.25) and within the mild mental retardation range, while the mean PRI score was 73.83 (SD = 12.04), the mean WMI score was 71.00 (SD = 11.78), and the mean PSI score was 75.33 (SD = 11.24) and were all within the *borderline* range. The mean FSIQ score of 64.25 (SD = 9.73) was in the mild mental retardation range and was between 2 and 3 SD of the UK norm. The coloured Afrikaans disadvantaged group obtained the lowest mean scores on the verbal subtests of Similarities, Vocabulary and Comprehension ($X = 4.33, 3.17$ and 4.58 respectively), and on the performance subtests of Block Design, Picture Concepts and Matrix Reasoning ($X = 4.92, 6.92$ and 5.33 respectively). Coloured Afrikaans disadvantaged participants also obtained the lowest mean scores on the Digit Span ($X = 6.00$), Letter-Number Sequencing ($X = 4.00$) and Symbol Search ($X = 5.00$) subtests. Coding was the only subtest on which the coloured Afrikaans disadvantaged group did not achieve the lowest mean score, as the black Xhosa disadvantaged group achieved the lowest mean score ($X = 5.83$) for this subtest. Therefore, a further downward trend in performance for disadvantaged groups is observed in the direction of poorer performance for the coloured Afrikaans disadvantaged group, with mean scores of this group being consistently lower overall than those of other groups.

Post hoc analyses confirmed the trend with regard to the coloured Afrikaans disadvantaged group having the weakest WISC-IV performance overall, as significant differences ($p \leq 0.01$) in the direction of poorer performance for this group were revealed when the coloured Afrikaans disadvantaged group was compared to advantaged groups (white English advantaged, white Afrikaans advantaged and black Xhosa advantaged). In comparison to the white English advantaged group, the coloured Afrikaans disadvantaged group performance was significantly weaker on the FSIQ ($p = 0.000$), all indices ($p = 0.000$) and subtests (p ranging from 0.000 to 0.005 for nine of the ten subtests), with the exception of the PSI and Coding subtest where differences were non-significant, although differences in respect of the

PSI revealed a strong trend towards significant difference ($p = 0.019$) in the direction of poorer performance for the coloured Afrikaans disadvantaged group. Similar significant differences ($p \leq 0.01$) as found between the coloured Afrikaans disadvantaged and white English advantaged groups were observed when the coloured Afrikaans disadvantaged group performance was compared to the white Afrikaans advantaged group. The coloured Afrikaans disadvantaged group performance was significantly weaker on the FSIQ ($p = 0.000$) and indices (p ranging from 0.000 to 0.005), again with the exception of the PSI and Coding subtest when compared to the white Afrikaans advantaged group, although differences in respect of the PSI here too revealed a strong trend towards significant difference ($p = 0.019$) in the direction of poorer performance for the coloured Afrikaans disadvantaged group. Significant lowering in performance for the coloured Afrikaans disadvantaged group was also observed on the Vocabulary ($p = 0.000$), Comprehension ($p = 0.008$), Block Design ($p = 0.001$), Letter-Number Sequencing ($p = 0.000$) and Symbol Search ($p = 0.001$) subtests when compared to the white Afrikaans advantaged group. Furthermore there were significant differences ($p \leq 0.01$) in the direction of poorer performance for the coloured Afrikaans disadvantaged group when this group was compared to the black Xhosa advantaged group, observed on the FSIQ, VCI and WMI ($p = 0.000$ in all instances), as well as Similarities ($p = 0.000$), Vocabulary ($p = 0.000$), Comprehension ($p = 0.001$) and Letter-Number Sequencing subtests ($p = 0.000$) ($p \leq 0.001$, and therefore highly significant in all instances).

Despite the trend for the coloured Afrikaans disadvantaged group to be poorest of all six comparative groups (as per the results continuum described above), the post hoc analyses did not reveal any significant differences ($p \leq 0.01$) between this group and the coloured Afrikaans advantaged and black Xhosa disadvantaged groups. However, an overview of the post hoc results clearly reveals that the coloured Afrikaans disadvantaged group has by far the most frequent occurrence of significantly lowered scores compared with other groups, including 21 instances of significant lowering compared with only 10 instances of significant lowering for the next most poorly performing black Xhosa disadvantaged group. Furthermore, differences between the coloured Afrikaans advantaged and coloured Afrikaans disadvantaged groups approached significance on both the VCI ($p = 0.021$) and FSIQ ($p = 0.023$) in favour of better performance of the coloured Afrikaans advantaged group, while differences between the black Xhosa disadvantaged and coloured Afrikaans disadvantaged groups approached significance on the Vocabulary ($p = 0.013$) and Letter-Number Sequencing ($p = 0.029$) subtests in favour of better performance of the black Xhosa disadvantaged group.

3.3. Results summary

The initial ANOVA analysis revealed highly significant differences for quality of education between the six comparative groups, in respect of mean scores for all four indices, the FSIQ, and on nine out of ten of the core subtests ($p \leq 0.001$ in all instances), with the exception of the Coding subtest which was just significant at $p = 0.05$. Furthermore, a specific trend in respect of quality of education was noted in that groups with advantaged schooling were observed to perform better on the WISC-IV than those with disadvantaged schooling, when groups were stratified for advantaged versus disadvantaged quality of education. Post hoc pair-wise comparisons of groups provided supportive evidence in respect of this broad trend and suggested a "performance continuum" in respect of quality of education. In terms of a WISC-IV performance continuum, groups may be ranked in order of best to poorest performance in respect of mean scores obtained by Grade 7 ethnic/first language groups stratified for advantaged versus disadvantaged quality of education, as follows: 1) white English advantaged, 2) white Afrikaans advantaged and black Xhosa advantaged with largely comparable performance, 3) coloured Afrikaans advantaged, 4) black Xhosa disadvantaged, and 5) coloured Afrikaans disadvantaged. Additionally, in respect of specific performance trends, quality of education was observed to impact most significantly on verbal performance both within the advantaged, and between advantaged and disadvantaged, groupings, and this effect was replicated in respect of the FSIQ.

Table 2: ANOVA and Scheffe's post hoc comparative analyses of WISC-IV performance of English, Xhosa and Afrikaans Grade 7 learners aged 12-13 years, stratified for advantaged versus disadvantaged quality of education. (N=69)

Index or Subtest	ADVANTAGED				DISADVANTAGED		ANOVA p -value	Scheffe's post hoc ($p \leq 0.01$)
	Group 1 White English Adv. (n = 12)	Group 2 White Afrikaans Adv. (n = 12)	Group 3 Black Xhosa Adv. (n = 12)	Group 4 Coloured Afrikaans Adv. (n = 9)	Group 5 Black Xhosa Disad. (n = 12)	Group 6 Coloured Afrikaans Disad. (n = 12)		
VCI	X = 120.92 (SD = 14.76)	X = 92.58 (SD = 12.40)	X = 101.30 (SD = 10.12)	X = 85.00 (SD = 6.08)	X = 80.42 (SD = 13.59)	X = 65.08 (SD = 11.25)	0.000**	1 > 2, 4 1 > 5, 6 ; 2 > 6 ; 3 > 5, 6
Similarities	X = 14.08 (SD = 2.35)	X = 8.92 (SD = 3.03)	X = 12.33 (SD = 2.35)	X = 7.44 (SD = 1.59)	X = 6.42 (SD = 3.50)	X = 4.33 (SD = 3.20)	0.000**	1 > 2, 4 1 > 5, 6 ; 3 > 5, 6
Vocabulary	X = 13.75 (SD = 2.49)	X = 8.42 (SD = 2.39)	X = 9.08 (SD = 2.07)	X = 6.78 (SD = 1.92)	X = 7.08 (SD = 3.61)	X = 3.17 (SD = 1.19)	0.000**	1 > 2, 3, 4 1 > 5, 6 ; 2, 3 > 6
Comprehension	X = 12.92 (SD = 3.26)	X = 8.75 (SD = 2.26)	X = 9.58 (SD = 2.43)	X = 7.89 (SD = 1.27)	X = 6.50 (SD = 2.68)	X = 4.58 (SD = 2.07)	0.000**	1 > 2, 4 1 > 5, 6 ; 2, 3 > 6
PRI	X = 111.67 (SD = 18.10)	X = 97.50 (SD = 16.83)	X = 92.75 (SD = 7.57)	X = 90.67 (SD = 10.09)	X = 80.83 (SD = 11.21)	X = 73.83 (SD = 12.04)	0.000**	1 > 5, 6 ; 2 > 6
Block Design	X = 11.83 (SD = 2.66)	X = 10.17 (SD = 4.28)	X = 8.33 (SD = 1.92)	X = 7.11 (SD = 2.09)	X = 6.42 (SD = 1.93)	X = 4.92 (SD = 2.02)	0.000**	1 > 5, 6 ; 2 > 6
Picture Concepts	X = 11.67 (SD = 2.43)	X = 9.67 (SD = 2.84)	X = 10.00 (SD = 2.34)	X = 10.00 (SD = 3.00)	X = 7.67 (SD = 2.64)	X = 6.92 (SD = 2.84)	0.001**	1 > 6
Matrix Reasoning	X = 10.75 (SD = 3.28)	X = 8.92 (SD = 2.54)	X = 8.08 (SD = 2.02)	X = 8.33 (SD = 1.73)	X = 6.58 (SD = 1.93)	X = 5.33 (SD = 2.35)	0.000**	1 > 5, 6
WMI	X = 101.25 (SD = 13.37)	X = 97.00 (SD = 12.13)	X = 100.08 (SD = 10.08)	X = 85.67 (SD = 12.45)	X = 86.50 (SD = 12.99)	X = 71.00 (SD = 11.78)	0.000**	1, 2, 3 > 6
Digit Span	X = 11.42 (SD = 3.61)	X = 8.83 (SD = 2.95)	X = 10.42 (SD = 2.23)	X = 6.78 (SD = 2.28)	X = 7.25 (SD = 2.42)	X = 6.00 (SD = 2.17)	0.000**	1 > 6
Letter-Number Sequencing	X = 9.25 (SD = 2.90)	X = 10.33 (SD = 2.02)	X = 9.83 (SD = 2.17)	X = 8.33 (SD = 3.20)	X = 8.17 (SD = 3.27)	X = 4.00 (SD = 3.02)	0.000**	1, 2, 3 > 6
PSI	X = 96.17 (SD = 14.89)	X = 96.17 (SD = 15.09)	X = 84.50 (SD = 12.30)	X = 84.33 (SD = 6.12)	X = 79.83 (SD = 16.28)	X = 75.33 (SD = 11.24)	0.001**	—
Coding	X = 8.00 (SD = 2.66)	X = 8.33 (SD = 2.77)	X = 7.08 (SD = 2.64)	X = 6.00 (SD = 1.23)	X = 5.83 (SD = 2.73)	X = 6.00 (SD = 1.95)	0.050*	—
Symbol Search	X = 10.75 (SD = 2.56)	X = 10.25 (SD = 2.77)	X = 7.33 (SD = 2.61)	X = 8.56 (SD = 1.59)	X = 6.92 (SD = 3.48)	X = 5.00 (SD = 2.63)	0.000**	1, 2 > 6
FSIQ	X = 112.83 (SD = 13.17)	X = 94.42 (SD = 13.25)	X = 93.92 (SD = 5.85)	X = 82.67 (SD = 7.43)	X = 77.08 (SD = 13.79)	X = 64.25 (SD = 9.73)	0.000**	1 > 3, 4 1 > 5, 6 ; 2, 3 > 6

Note: 1) * $p \leq 0.05$; ** $p \leq 0.01$

2) Verbal Comprehension Index (VCI); Perceptual Reasoning Index (PRI); Working Memory Index (WMI); Processing Speed Index (PSI); Full Scale IQ (FSIQ)

CHAPTER 4. DISCUSSION

The objective of the present study was to provide clinically useful cross-cultural normative indicators for use on the WISC-IV in respect of South African children. These norms relate specifically to Grade 7 children (in their final year of Intermediate Phase education), aged 12 to 13 years, and with groups stratified for ethnicity/first language as well as quality of education. Past research has demonstrated the importance of stratifying a sample for quality of education by illustrating that this variable affects performance on cognitive tests (Manly, et al., 2004; Shuttleworth-Edwards, Kemp et al., 2004).

The literature review chapter highlighted the legacy of apartheid in South Africa in respect of past segregated education and the subsequent development of two schooling systems. These schooling systems persist more than a decade after South Africa's first demographic elections and can be operationalised as advantaged schooling (delivered by private and former Model C schools) versus more disadvantaged schooling (delivered by the vast majority of township schools, and particularly former DET and HOR schools for black and coloured children, respectively) (Fleisch, 2007). After South African schools were desegregated in 1991, children were free to attend any school of their choice. Therefore, in recent years, it has been possible to investigate the effects of quality of education within different ethnic/first language population groups as some black and coloured individuals (formerly only allowed to attend DET or HOR schools, respectively) have accessed better quality of education (in private or former Model C schools). Specific ethnic/first language groups in South Africa should therefore no longer be considered homogenous. The present study compared the performance of South African children across differing quality of education. Specifically those black and coloured children who attend advantaged schools were compared with children of the same groups who remain in the relatively underprivileged schools which are characterised by poorer quality of education. Accordingly, six comparative groups were targeted for investigation. The advantaged schooling groups included white English advantaged, white Afrikaans advantaged, black Xhosa advantaged, and coloured Afrikaans advantaged learners. Disadvantaged schooling groups included black Xhosa disadvantaged and coloured Afrikaans disadvantaged learners.

An ANOVA analysis revealed highly significant differences for quality of education between the six comparative groups in respect of all four index scores, FSIQ, and all but one of the core subtests – Coding being the exception. Furthermore, pair-wise post hoc comparative analyses for the present study revealed a clear trend in respect of quality of education where groups with advantaged schooling outperformed those with disadvantaged schooling on the

WISC-IV. This trend replicates the findings of the Shuttleworth-Edwards, Kemp, et al. (2004) study in respect of adults tested on the WAIS-III, as well as findings of the Van Tonder (2007) study in respect of children tested on the WISC-IV, reinforcing the conclusion from these prior studies that quality of education is one of the most significant variables impacting on IQ test performance in South Africa.

For discussion purposes, a comparative table of cross-cultural normative data has been compiled (that will also have clinical utility) using the composite mean index and FSIQ scores of Shuttleworth-Edwards, Kemp, et al. (2004), Van Tonder (2007) and the present study (see Table 3, at the end of the chapter, p. 53). The Wechsler Intelligence Scales provide two types of age-corrected standard scores, namely: 1) scaled scores derived from the total raw score of each of the subtests which are scaled to metric with a mean of 10 and a SD of 3; and 2) composite scores for indices and FSIQ based on the sums of subtest scaled scores which are scaled to a metric with a mean of 100 and a SD of 15 (Wechsler, 2004). Scores on the WISC-IV are therefore comparable with those of the WAIS-III as both instruments use age-corrected standard scores, scaled to metric.

In the discussion to follow, results of the present study as summarised in Table 2 (p. 39) in respect of the WISC-IV will be considered, along with an overview of comparative data between the WISC-IV and WAIS-III studies as summarized in the comparative template contained in Table 3 (p. 53).

4.1. WISC-IV performance continuum effect

The results of the present study revealed a trend for performance on the WISC-IV where comparative groups may be ranked along a continuum in order of best to poorest performance as follows: 1) white English advantaged, 2) white Afrikaans advantaged and black Xhosa advantaged with largely comparable performance, 3) coloured Afrikaans advantaged, 4) black Xhosa disadvantaged, and 5) coloured Afrikaans disadvantaged. This continuum reflects differences in respect of quality of education, where groups that attended advantaged schools with better quality of education, outranked those with disadvantaged schooling. Additionally, differences in respect of ethnicity/first language were revealed, where the groups with English as a first language outranked those with another first language. This trend replicated the finding of previous studies as in the Shuttleworth-Edwards, Kemp, et al. (2004) WAIS-III study, as well as the Van Tonder (2007) WISC-IV study, where a performance trend was noted in which, for the most part, white English advantaged groups

achieved higher mean scores across indices and in all cases achieved higher mean scores on the FSIQ than black African/Xhosa first language advantaged groups, and both advantaged schooling groups achieved consistently higher mean scores across indices and FSIQ than their disadvantaged schooling counterparts. More detailed discussion will follow in the order of highest to lowest performing groups in respect of this continuum.

4.1.1. Advantaged group comparisons

It was noted that white English first language participants performed best overall and were ranked at the top of the WISC-IV performance continuum in the present study (see Table 2, p. 39). This was also a consistent finding across all three comparative studies (see Table 3, p. 53), and was not unexpected as this group most closely resembled the standardisation samples of the WISC-IV and WIAS-III which consists of mostly white English speaking individuals. The white English first language participants received the test in its standardised English-version, which was their first language. Therefore issues of bilingualism and/or test translation were not expected to impact on the performance of these participants. Across all indices and in respect of the FSIQ, mean scores of the South African Grade 7, Grade 12 and graduate white English advantaged groups were equivalent to, or somewhat higher than, mean scores of the US/UK standardisation samples. The graduate white English advantaged mean FSIQ score was in the superior range ($X = 123.00$), while the mean FSIQ score of the Grade 12 white English advantaged group was in the higher average range ($X = 106.57$), and the Grade 7 white English advantaged mean FSIQ score was in the high average range ($X = 112.83$).

The generally higher mean scores for these white English advantaged groups can be accounted for in that the South African sample was specifically stratified for ethnicity/first language, level of education and quality of education, which is not the general practice when tests are standardised. In terms of the graduate WAIS-III white English advantaged group in particular, it would be expected that this group would achieve higher mean scores than that of the US standardisation sample as this upper level of education is not representative of the general population. In addition, higher mean scores for the Grade 12 and Grade 7 white English advantaged samples compared with the white Afrikaans advantaged sample may be accounted for by the fact that a proportion of the white English advantaged participants received private schooling whereas the Afrikaans sample was purely made up of non-private, Model C learners. Ardila, et al. (2005) reported that children who attended private schools generally had parents with a higher level of education and performed better on tests of executive function than children who attended public schools. Parents with higher levels of education are more likely to have the financial means to provide for their children, and

generally provide more stimulating environments, as well as fostering a culture of learning in their families. Children with parents that have a higher level of education are also more likely to develop better verbal skills, and the converse is true in that children from poorer communities are more likely to have lower verbal skills. The mean VCI score of the white English advantaged Grade 7 learners in the Van Tonder (2007) study was particularly high ($X = 120.92$) falling in the superior range. As previously mentioned, Van Tonder (2007) did not find significant differences between the private and former Model C school groups, although there was a strong trend in the direction of the private school learners performing better than their former Model C school counterparts that may have reached significance with higher sample numbers. This private versus former Model C school dynamic, therefore, is a likely contributing factor in the higher mean scores for the white English advantaged groups.

When the top ranking white English advantaged group was compared to the white Afrikaans advantaged group which was ranked second in terms of WISC-IV performance (see Table 2, Group 1 and 2, p. 39), a lowering of more than 1 SD (18.41 points) in respect of the mean FSIQ score in the direction of the white Afrikaans advantaged group was noted. This finding is not altogether unexpected given past research that has documented a lowering of scores for Afrikaans speakers in comparison to English speakers on cognitive tests (Claassen, et al., 2001; Verster & Prinsloo, 1988). Verster and Prinsloo (1988) however documented a diminishing gap between the scores of these two groups, with a difference of approximately only 5 points by the 1980s. This trend of a diminishing gap between the two groups was not evident in the present study. Possible explanations for this are three fold.

Firstly, as indicated above, the white Afrikaans speaking sample was drawn from former Model C schools only, while the white English speaking sample was drawn from both private and former Model C schools. Sampling differences may have introduced a higher quality of education for the English speaking group, as private schools are known to offer more challenging curricula and are better resourced than government funded schools. Secondly, Broom (2004) has commented on the phenomenon that most South Africans prefer that their children should be educated in English – a trend also observed amongst many Afrikaans first language speakers who have placed their children in English-medium schools. Therefore, a possible explanation for the phenomenon of a large gap in performance between the white English and white Afrikaans speaking groups in the present study may be that as these learners have remained in Afrikaans-medium schools, they would not have been involved in a process of acculturation to the same degree as learners who are now attending English-medium schools. Such learners may also not have the financial means to access private schooling and may be socio-economically less advantaged than their white English

counterparts. Therefore, the group of white Afrikaans first language participants sampled in the present study may represent a subculture of white Afrikaans first language speakers in South Africa who are still influenced more by Afrikaans cultural practices than English values.

Finally (thirdly), the explanation for this white English versus white Afrikaans discrepancy may relate to test administration rather than culture-specific differences, in that in the present study, the WISC-IV was administered in Afrikaans to white Afrikaans speaking learners. According to Claassen, et al. (2001) it is preferable that individuals who speak Afrikaans as a first language and who are educated in this language are tested in Afrikaans, however to date there are no formal standardised translations of the WISC-IV or WAIS-III in Afrikaans. It is well known that translation of tests may impact on verbal subtests in particular (Van de Vijver, Mylonas, et al., 2003), and in the present study performance of the white Afrikaans speaking group was significantly lower on the VCI (by 28.34 points, almost 2 SD) and verbal subtest (by 4 or 5 points, approximately 1.5 SD) than that of their English speaking counterparts. Therefore taken together, the issues of a somewhat lesser degree of advantaged schooling (former Model C only), remaining in a more traditional Afrikaans setting where the effects of acculturation would be less pronounced (Afrikaans-medium schooling), as well as test translation effects, may account for the relatively poorer performance of white Afrikaans speaking learners as compared to their white English speaking counterparts in the present study.

When the top ranking white English advantaged group was compared to the black Xhosa advantaged group which was also ranked second in terms of WISC-IV performance (see Table 2, Group 1 and 3, p. 39), a lowering of more than 1 SD (18.91 points) in respect of the mean FSIQ score in the direction of the black Xhosa advantaged group was noted. This lowering was statistically significant in the present study. Comparisons of black African advantaged and white English advantaged adult samples also revealed a lowering in mean FSIQ score (as mentioned previously) but this lowering was less significant than for the Grade 7 WISC-IV sample. On the WAIS-III, the difference between the Grade 12 white English advantaged and black African advantaged groups mean FSIQ scores were less than 1 SD (6.67 points) in the direction of poorer performance for the African language speakers. A difference of less than 1 SD (9.60 points) was also noted for the graduate white English advantaged and black African advantaged groups, in the direction of poorer performance for the African language speakers. Therefore, even when groups are equivalent in terms of quality of education, a lowering for the black African groups relative to the white English groups is less than for the black African groups with disadvantaged education, but is still in evidence (see Table 3, p. 53). Therefore, besides quality of education, it is proposed that

once again, language-specific issues may be at play. For example, research by Broom (2004) illustrated that performance of English first language learners is consistently higher than that of second language learners even when they have been educated in the same school. Furthermore, while the performance of second language learners attending advantaged schools is much better than that of their disadvantaged schooling counterparts, they still score below first language English speakers by virtue of the fact that they are learning in a second (or even third) language. This explanation is supported by the fact that as learners progress higher in the school system their learning in a second language is likely to become more efficient and less of a hindrance, and hence the differences between the groups is much less for the young adult groups of the Shuttleworth-Edwards, Kemp et al. (2004) study than the Grade 7 groups of the present analysis.

The coloured Afrikaans advantaged group was ranked third along the WISC-IV performance continuum, and obtained the lowest scores in the advantaged schooling subset (see Table 2, Group 4, p. 39). When compared to the top ranking white English advantaged group, the coloured Afrikaans advantaged group mean FSIQ score was lower by 2 SD (30.16 points) and the difference between mean FSIQ scores of these groups was statistically significant. The coloured Afrikaans advantaged group mean FSIQ scores differed from the second ranked white Afrikaans and black Xhosa advantaged groups by less than 1 SD (11 points) and these differences were not statistically significant. The same three fold explanation applied to the white Afrikaans advantaged group in comparison to white English advantaged learners (discussed above) would also be relevant to the coloured Afrikaans advantaged group, in that this group was sampled only from former Model C schools and learners have remained in an Afrikaans-medium school, furthermore the WISC-IV translation issues would apply to this group as they also received the test in Afrikaans. In addition, the following sampling considerations may account for overall lowering of scores for this coloured Afrikaans group within the advantaged subset.

First, the coloured Afrikaans advantaged population elicited in the present study tended to be amongst the lower achievers in the bottom half of the class, although this was considered representative of the average coloured Afrikaans speaking individual attending former Model C schools. Secondly, the coloured Afrikaans advantaged group was also smaller than other comparative groups ($n = 9$, compared to $n = 12$), with only three females sampled while six male participants were sampled. This was due to the paucity of coloured learners in former Model C schools who met the selection criteria of having attended the designated school for at least three years prior to participation in the research. Therefore it was noted that coloured Afrikaans speakers had not accessed advantaged schooling to the same extent as black

Xhosa speakers, which made this quality of education comparison less effective with regard to the coloured Afrikaans speaking group in the present study. A reason for this may be that the coloured population of South Africa remains relatively socio-economically disadvantaged. However, the general trend of better performance for individuals who have accessed advantaged schooling over those who have remained within relatively disadvantaged schools was still illustrated convincingly with respect to the coloured Afrikaans speaking group regardless of sampling difficulties.

4.1.2. Disadvantaged group comparisons

In terms of a broad overview of the WISC-IV performance continuum, as indicated above, a general downward trend in performance was noted between advantaged and disadvantaged schooling groups. While the performance of the advantaged groups in respect of the FSIQ ranged from high to low average along the continuum, the performance of the disadvantaged groups were in the borderline and extremely low (mild mental retardation) ranges for the black Xhosa disadvantaged and coloured Afrikaans disadvantaged groups respectively (see Table 2, Group 5 and 6, p. 39). The same trend was noted in respect of the Grade 12 disadvantaged black African language group in the Shuttleworth-Edwards, Kemp, et al. (2004) study, in that this group also had a mean FSIQ score in the borderline range of performance (see Table 3, p. 53). As all participants in these studies were representative of a non-clinical population, were judged to be of average academic standard and had never failed a grade before, the findings of these studies are cause for concern. Practitioners applying the US or UK norms to individuals who are currently attending underprivileged schools, or who had received this poorer quality of education in the past, need to exercise caution to avoid potential misdiagnosis. Children may be mistakenly classified as mentally handicapped or intellectually compromised with implications for placement in special schools. With regard to both adults and children, treatment or compensation may be inappropriately advised in the particular case if quality of education is not accounted for.

More specifically, within the disadvantaged subset, the black Xhosa group performed better on the WISC-IV than their coloured Afrikaans counterparts, and although there were no statistically significant differences between these two groups, the results on the Vocabulary and Letter-Number Sequencing subtests approached significance in the direction of better performance for the black Xhosa group, and may well have reached significance with a larger sample size. The overall poorer performance of the disadvantaged groups in comparison to advantaged groups was not unexpected in light of the differences in quality of education received. Fleisch (2007) comments that children who attend township schools tend to underachieve academically as they acquire only limited knowledge and skills during their

first seven years of schooling. Such children tend to use inappropriate concrete techniques and have learning that remains context-bound and non-generalisable. This has implications for performance on cognitive tests as formal schooling develops test-wiseness in that children become familiar with test procedures and materials, learning what is required of them and learning how to manage examination situations. But, children in disadvantaged schools do not seem to develop these skills to the same extent as their advantaged schooling counterparts (Ardila, 1996; Kendall, et al, 1988). Furthermore, it has implications for test performance as cognitive tests tap curriculum content, and scores of intelligence tests have been shown to correlate positively with performance on reading comprehension and mathematical knowledge (Brody, 1997; Byrd, et al. 2005) – two areas where Fleisch (2007) has demonstrated that children with disadvantaged schooling lack competence.

Specifically with regard to black children, Fleisch (2007) goes on to comment that while there is a difference in performance between children in the advantaged schooling subset, in that children educated in a second language or additional language do not perform as well as English speaking counterparts in the same schools, this difference is more pronounced for children in disadvantaged schools. A number of reasons may account for this performance gap. Firstly, most teachers in disadvantaged schools are not English first language speakers and often make use of codeswitching, language mixing or translation, whereas children in advantaged schools have the advantage of 'immersion' in an English language environment, are taught by teachers proficient in English, and are in classrooms with more adequate resources. Proficiency in the language of learning becomes more important as children progress in school as they need to use their language to learn rather than learning to use their language (Broom, 2004; Fleisch, 2007). Fleisch (2007) also suggests that the difference in performance between black African language speakers and white English speakers attending advantaged schools is not as significant as the difference in performance observed for black African language speakers attending disadvantaged schools because for urban township children who are not as immersed in English at home and in their community as the children of the new black middle-class, language may be a far greater barrier. Furthermore, this language barrier may become more pronounced for children living in rural areas as English is more likely to seem like a foreign language. Quality of education and language issues therefore interact to impact on test performance of children in disadvantaged schools as questionable English language proficiency has a marked impact on test performance.

Within the disadvantaged subset, a further lowering in scores was noted in respect of the coloured Afrikaans disadvantaged group who achieved the lowest performance on the WISC-IV overall. This difference between the two disadvantaged groups may be explicable

in terms of methodological differences. Van Tonder's (2007) method allowed for presenting test instructions in English, then repeating them in Xhosa for those participants from township schools who were deemed to possess questionable English proficiency, as previously noted. This procedure has limitations in terms of strict standardisation criteria as there would be repetition of instructions. This researcher considered that, in Van Tonder's study, the Xhosa first language children attending township schools were given a distinct advantage over other groups as they received the test in their language of tuition (English), with repetition of instructions in their first language (Xhosa). The present study attempted to minimise confounding effects, especially repetition, by providing instructions in only one language. This was preferred as some participants may have had differential exposure to English and so it was necessary to ensure that no participants enjoyed an unfair advantage. The coloured Afrikaans disadvantaged group therefore received instructions only once in Afrikaans. Furthermore, the coloured Afrikaans disadvantaged learners who received the test in Afrikaans may also have been subject to test translation effects (as discussed above with regard to other Afrikaans speaking groups). A last consideration which may explain why the coloured Afrikaans disadvantaged group did not perform as well as their black Xhosa disadvantaged counterparts could relate to the fact that the disadvantaged coloured Afrikaans group were all sampled from a single former HOR township school while the disadvantaged black Xhosa group were sampled from two different former DET township schools. Van Tonder (2007) noted that there was a strong within group difference between the two DET township schools in respect of WISC-IV performance. Therefore it was considered that within the disadvantaged schooling subgroups differences in quality of education may exist which may have impacted on the performance of the disadvantaged groups. As only one school was sampled in respect of the coloured Afrikaans disadvantaged group, it may be that this school was of a lower educational standard overall.

4.2. WISC-IV specific Index scores and subtest findings

A further observation pertaining to the present study that warrants mentioning is that significant differences between comparative groups were largely observed in respect of verbal performance (as measured by the verbal subtests of Similarities, Vocabulary and Comprehension, and represented by the composite VCI score), with these differences replicated on the FSIQ. Significant differences between comparative groups in respect of the VCI and FSIQ were observed both within the advantaged groupings, as well as between the advantaged and disadvantaged groupings (see Table 2, p. 39). The correlation between schooling and performance on intelligence test has been discussed previously. Ardila (1999)

specifically comments on the bidirectional relationship between schooling and IQ and suggests that IQ scores are a measure of school learning, as much as being predictive of school performance. Moreover, Ardila (1999) remarks that the largest correlations between IQ and school performance are found with regard to verbal intelligence subtests (and particularly the Vocabulary subtest) and not with FSIQ, a finding which is attributed to the fact that many educational systems are biased in favour of verbal ability. As intelligence tests were initially designed to predict school performance this is not surprising. The finding of the present study is therefore consistent with previous research in that the greatest differences in IQ performance was noted with respect to verbal functioning which suggests that verbal performance measures are particularly sensitive to cultural differences.

While verbal tasks reveal themselves as sensitive to variables such as quality of education as well as ethnicity/first language, it was noted that there were significant differences in respect of the PRI observed only for the comparisons of advantaged versus disadvantaged groups, where advantaged groups performed significantly better on both the Block Design and Matric Reasoning subtests. Non-verbal performance measures therefore seem to be more sensitive to quality of education effects rather than cultural effects. Furthermore, differences related to quality of education were also noted in respect of the WMI (and more specifically for the Letter-Number Sequencing subtest). There were no significant differences on the PSI (and on the Coding subtest in particular) which would suggest that this index is relatively unaffected by any cultural differences including quality of education. However, it is of note that differences between the white (English and Afrikaans) advantaged groups and coloured Afrikaans disadvantaged group, were strongly *approaching* significance for the PSI ($p = 0.019$). This raises questions with regard to overly strict adjustments towards stringency as, had a Bonferroni adjustment not been setting the level of significance at 1%, a significant difference at the 5% level (0.05) would have been recorded for this index. Given the small sample size, caution is therefore advised with regard to overly stringent statistical adjustments that could lead to missing clinically significant results, therefore increasing the possibility of a Type II error. More specifically, the PSI comprises two subtests, namely Coding and Symbol Search. Significant differences were observed on the Symbol Search subtest between the white (English and Afrikaans) advantaged groups and the coloured Afrikaans advantaged group in favour of the white advantaged learners, and while no significant differences were found in respect of the Coding subtest, the trend was consistently in the direction of favouring advantaged schooling groups.

Of particular note in respect of the Coding subtest, is that for five out of the six comparative groups, the exception being the coloured Afrikaans disadvantaged group, this mean score

was the lowest score obtained across all subtests (with mean scores ranging from $X = 8.33$ to $X = 5.83$ across groups). A possible explanation for this Coding subtest phenomenon could be that South African learners at the end of the Intermediate Phase of schooling may not be as speed orientated as their UK and US counterparts. This may be due to the fact that South Africa has adopted an Outcomes Based Education (OBE) curriculum, which places less emphasis on speeded tasks. This phenomenon of lowered performance on the Coding subtest was not evident in the research of Shuttleworth-Edwards, Kemp, et al. (2004) in respect of adult participants tested on the WAIS-III, and with the exception of black African language disadvantaged participants in Grade 12, all other groups obtained mean scores for the Coding subtest which were equivalent or higher than the US standardisation sample mean scores. A reason for this effect may be that the relatively new OBE curriculum was only fully introduced at Senior Phase level more recently (by end 2005), and the Grade 12 class of 2008 was the first to write exams in terms of this new curriculum. It is postulated that as the research of Shuttleworth-Edwards, Kemp, et al. (2004) was conducted prior to the introduction of the OBE curriculum, effects on speeded tasks would not be evident in adult populations at that time, and may only become evident with future cohorts. An alternative or additional explanation in respect of the Coding subtest phenomenon may involve learner motivation, as proposed by Cocodia, et al. (2003) who suggested that learners require more entertainment now than previously to remain stimulated and engaged, and that learners are prone to exhibiting shorter attention spans. Therefore it is suggested that their performance would be weaker on tasks that are mundane and less likely to hold their attention, such as the Coding subtest which requires rote copying.

The preceding discussion has considered the results of the present study in respect of the WISC-IV (see Table 2, p. 39), with specific comparisons to the WAIS-III adult study as deemed appropriate. What follows is a broader overview of comparative data between the WISC-IV and WAIS-III studies pertaining specifically to Table 3 (p. 53).

4.3. WISC-IV versus WAIS-III outcomes

Comparisons between advantaged and disadvantaged groups where ethnicity/language and level of education were constant, as in comparisons between the Grade 7 black Xhosa advantaged and disadvantaged groups and the Grade 7 coloured Afrikaans advantaged and disadvantaged groups, revealed that learners with advantaged schooling performed more than 1 SD better on the WISC-IV than their disadvantaged schooling counterparts in respect of the FSIQ. The mean FSIQ score of black Xhosa speaking learners differed by 16.84

points, while that of coloured Afrikaans speaking learners differed by 18.42 points, in favour of advantaged over disadvantaged schooling groups. Similar differences were noted for the adult WAIS-III sample, where at the Grade 12 and graduate levels of education the black African language advantaged schooling groups mean FSIQ scores were again more than 1 SD better than those of the disadvantaged schooling groups. The mean FSIQ score of Grade 12 black African language speakers differed by 25.5 points, while that of graduate black African language speakers differed by 18.5 points, in favour of the advantaged over disadvantaged schooling groups. Overall therefore, this research lends credence to the fact that quality of education impacts considerably on IQ scores fairly consistently at both the young adolescent and young adult levels, with differences of more than 1 SD observed between advantaged and disadvantaged schooling groups. This factor should therefore be accounted for when testing different ethnic groups in South Africa from at least the intermediary Grade 7 level through to the graduate level.

When disadvantaged schooling groups were compared to white English advantaged schooling counterparts, differences on the FSIQ became more pronounced. The performance of the white English advantaged schooling groups was more than 2 SD better than that of their disadvantaged schooling counterparts, in all cases except for the graduate level of education where the difference was approaching 2 SD (1.87) in favour of the white English advantaged schooling group. The mean FSIQ score of the Grade 7 black Xhosa speaking disadvantaged learners differed by a massive 35.75 points, while that of coloured Afrikaans speaking disadvantaged learners differed by an even greater margin of 48.58 points, in favour of the white English advantaged schooling groups. Similar differences were noted for the adult WAIS-III sample, where the mean FSIQ score of the Grade 12 black African language speaking disadvantaged group differed by 32.17 points, while that of the graduate black African language speaking disadvantaged group differed by 28.1 points, in favour of the white English advantaged schooling groups. These wide discrepancies between the South African language/ethnic groups again highlights the need for careful stratification to control for confounding variables that impact on interpretation of test scores and highlights that norms developed for white English speaking samples are not appropriate for use with other ethnic/first language groups, especially where there is relatively disadvantaged quality of education.

In conclusion, findings of the present study largely replicated the results of previous South African studies that have investigated the influence of quality of education on IQ test performance. Quality of education has been shown to impact significantly on both WIAS-III

and WISC-IV performance and should therefore be accounted for in test interpretation with multicultural and multilingual populations. However, the present study has also shown that while quality of education is an important moderating factor in performance on intelligence tests, subtle effects of culture may still influence performance and should be taken into account when interpreting test results. It is therefore essential that appropriate cross-cultural norms are used in clinical practice to ensure that misdiagnosis is avoided. In particular, considerable care should be exercised in interpreting test results of individuals from disadvantaged schooling backgrounds, as preliminary normative indicators would suggest that these individuals achieve scores which are more than 2 SD lower than the UK standardisation sample.

Table 3: Comparative table of WAIS-III and WISC-IV Index and IQ scores for South African participants stratified for ethnic group, language, level and quality of education.

		ADVANTAGED		DISADVANTAGED	
Shuttleworth-Edwards, Kemp, Rust, Muirhead, Hartman & Radloff (2004)	Index	White English Adv. (n = 14)	Black African Adv. (n = 10)	Black African Disad. (n = 10)	
GRADUATES Age 19 – 30 years, with a mean of 16.50 years of education	VCI	X = 124.29 (SD = 8.41)	X = 116.00 (SD = 8.78)	X = 99.00 (SD = 12.30)	
	POI	X = 116.29 (SD = 10.60)	X = 105.90 (SD = 10.87)	X = 94.10 (SD = 15.92)	
	WMI	X = 119.79 (SD = 11.23)	X = 109.70 (SD = 11.46)	X = 99.50 (SD = 6.59)	
	PSI	X = 111.64 (SD = 11.07)	X = 103.30 (SD = 11.07)	X = 91.20 (SD = 9.32)	
	VIQ	X = 124.93 (SD = 8.20)	X = 116.10 (SD = 7.50)	X = 98.80 (SD = 9.43)	
	PIQ	X = 116.14 (SD = 9.78)	X = 107.80 (SD = 11.82)	X = 90.40 (SD = 12.63)	
	FSIQ	X = 123.00 (SD = 8.44)	X = 113.40 (SD = 9.03)	X = 94.90 (SD = 11.67)	
Shuttleworth-Edwards, Kemp, Rust, Muirhead, Hartman & Radloff (2004)	Index	White English Adv. (n = 14)	Black African Adv. (n = 10)	Black African Disad. (n = 10)	
GRADE 12 Age 19 – 30 years, with a mean of 12.45 years of education	VCI	X = 103.14 (SD = 11.36)	X = 94.50 (SD = 13.66)	X = 75.20 (SD = 8.24)	
	POI	X = 111.86 (SD = 15.36)	X = 100.90 (SD = 14.64)	X = 80.10 (SD = 9.76)	
	WMI	X = 103.86 (SD = 16.17)	X = 104.50 (SD = 16.11)	X = 83.60 (SD = 14.61)	
	PSI	X = 104.29 (SD = 11.97)	X = 99.20 (SD = 12.54)	X = 77.60 (SD = 9.22)	
	VIQ	X = 102.71 (SD = 10.96)	X = 98.90 (SD = 14.98)	X = 77.20 (SD = 6.70)	
	PIQ	X = 110.50 (SD = 13.46)	X = 100.80 (SD = 14.28)	X = 74.90 (SD = 7.89)	
	FSIQ	X = 106.57 (SD = 12.15)	X = 99.90 (SD = 14.28)	X = 74.40 (SD = 7.00)	
Van Tonder (2007)	Index	White English Adv. (n = 12)	Black Xhosa Adv. (n = 12)	Black Xhosa Disad. (n = 12)	
GRADE 7 Age 12 – 13 years, with 7 years of education	VCI	X = 120.92 (SD = 14.76)	X = 101.33 (SD = 10.12)	X = 80.42 (SD = 13.59)	
	PRI	X = 111.67 (SD = 18.10)	X = 92.75 (SD = 7.57)	X = 80.83 (SD = 11.21)	
	WMI	X = 101.25 (SD = 13.37)	X = 100.08 (SD = 10.08)	X = 86.50 (SD = 12.99)	
	PSI	X = 96.17 (SD = 14.89)	X = 84.50 (SD = 12.30)	X = 79.83 (SD = 16.28)	
	FSIQ	X = 112.83 (SD = 13.17)	X = 93.92 (SD = 5.85)	X = 77.08 (SD = 13.79)	
Present Study	Index	White Afrikaans Adv. (n = 12)	Coloured Afrikaans Adv. (n = 9)	Coloured Afrikaans Disad. (n = 12)	
GRADE 7 Age 12 – 13 years, with 7 years of education	VCI	X = 92.58 (SD = 12.40)	X = 85.00 (SD = 6.08)	X = 65.08 (SD = 11.25)	
	PRI	X = 97.50 (SD = 16.83)	X = 90.67 (SD = 10.09)	X = 73.83 (SD = 12.04)	
	WMI	X = 97.00 (SD = 12.13)	X = 85.67 (SD = 12.45)	X = 71.00 (SD = 11.78)	
	PSI	X = 96.17 (SD = 15.09)	X = 84.33 (SD = 6.12)	X = 75.33 (SD = 11.24)	
	FSIQ	X = 94.42 (SD = 13.25)	X = 82.67 (SD = 7.43)	X = 64.25 (SD = 9.73)	

Notes: 1) "Advantaged education" for the Shuttleworth-Edwards, Kemp, et al. (2004) and Van Tonder (2007) studies included participants from former Model C *and* private schools, whereas the Afrikaans speaking participants in the present study were derived from former Model C schools only.
2) "Black African" groups in the Shuttleworth-Edwards, Kemp, et al. (2004) study included mixed African first language participants, although the majority were Xhosa speaking.

CHAPTER 5. EVALUATION AND RECOMMENDATIONS

5.1. Evaluation of the present study

There is a great need for culturally relevant normative data for clinical use in South Africa, and in addition, norms for use with South African children have been particularly lacking (Nell, 1994; Sattler, 1992; Strauss, et al., 2006). In the absence of relevant norms, misdiagnosis can occur with serious implications for individuals, including unnecessary treatment or even treatment failure. An example would be when inappropriate norms are applied in the diagnosis and treatment of individuals suffering the effects of road traffic accidents, assaults and specific learning disabilities, all of which are at a high incidence in South Africa (Skuy, et al., 2001). Here may be implications for financial compensation, and in medico-legal assessments, the clinician has the burden of offering proof (based on relevant normative data) to substantiate a diagnosis and to draw conclusions regarding future prognosis. Accordingly, the chief value of this study is in the provision of South African cross-cultural normative indications for the WISC-IV where no such data were previously available for use in clinical and medico-legal settings. The results of the present study added to a growing body of evidence that quality of education impacts on intellectual functioning, and on IQ test performance in particular, at both the adult and child levels. It serves to highlight the importance of stratifying for quality of education when developing norms for cognitive tests, particularly in a multicultural and multilingual context such as South Africa, where there is a legacy of educational segregation.

5.1.1. *Strengths*

A relative strength of the study is that it is based on established research design and it extends and refines existing data. It also makes use of strict criteria to stratify target groups across a number of demographic variables which have proven valuable in the past for delivering the existing cross-cultural normative databases for use with the Wechsler Intelligence Scales in South Africa. By building on the data of Shuttleworth-Edwards, Kemp, et al. (2004) who provided norms for use with adults on the WAIS-III and Van Tonder (2007) who provided preliminary norms for use with children on the WISC-IV, this research has ensured that there are now norms available not only for use with adults, but also more far-reaching norms for use with children. Norms for children now cover white English and white Afrikaans, as well as black Xhosa and coloured Afrikaans groups for educational level Grade 7, within the age range of 12 to 13 years. Data pertaining to these white English and Afrikaans, black Xhosa and coloured Afrikaans groups are particularly pertinent to the Eastern Cape where Xhosa is the first language of the majority of the population, followed by

Afrikaans and English. Individuals representing these cultural/language groups are thus very likely to be encountered in clinical practice in this region.

Despite the considerable strengths of the study, a number of limitations and cautionary comments apply.

5.1.2. Limitations

Sample size

Whilst there does not seem to be agreement on what constitutes adequate sample size, as previously mentioned, leading neuropsychological texts offer estimates ranging from 50 to 200 subjects to ensure reliability and representivity of norms. It is also known that when larger studies are stratified for specific demographic characteristics, small subgroup sizes generally result (Mitrushina, et al., 2005; Sattler, 1992; Strauss, et al., 2006). The present study sampled 69 subjects, with target subgroups consisting of 12 subjects. Therefore the sample may be considered relatively small. As argued in the literature review however, preference should be given to well-stratified norming studies with smaller participant numbers over poorly stratified studies with large participant numbers which may not offer appropriate norms for a specific group being assessed (Strauss, et al., 2006). This sampling strategy was effectively employed by Shuttleworth-Edwards, Kemp, et al. (2004) and Van Tonder (2007) on whose research the present study was modelled. It is of relevance that the work of Shuttleworth-Edwards, Kemp, et al. (2004) using subgroups of only 10 to 14 participants has been favourably reviewed and cited in a seminal neuropsychological text (Strauss, et al., 2006). Findings of the aforementioned studies have been consistently replicated, and are regarded as having adequate statistical significance. In particular, significant differences between groups in the present study were for the most part highly significant ($p \geq 0.001$) rather than merely significant at the 1% level ($p \geq 0.01$). Therefore, despite relatively small sample sizes, results were considered statistically powerful.

Bonferroni adjustment

Conventionally, statistical significance is set at the 5% level (0.05) meaning that there is a 1:20 probability that differences between groups will occur as a result of chance. This is also known as the Type I error (α). When multiple comparisons are made, the study-wide error rate increases and α is no longer 0.05, therefore an adjustment in the level of significance towards stringency should be made in order to reduce the risk of a Type I error and to ensure that α remains at 0.05 (Brandt, 2007; Perneger, 1998). In the present study, a Bonferroni adjustment was made towards stringency by setting the level of significance at the 1% level (0.01). As discussed in the methodology section, such a Bonferroni adjustment however,

increases the risk of Type II error. A number of between-group differences in respect of this study were described as approaching significance as they were significant at $p \geq 0.05$. This is a possible limitation of the present study where lack of significant differences (as seen between the coloured Afrikaans advantaged, black Xhosa disadvantaged and coloured Afrikaans disadvantaged groups, which were at the bottom of the performance continuum) may be an artefact of an overly stringent adjustment as differences between these groups appear to be descriptively large and therefore clinically meaningful. For example, a difference of 18.42 and 19.92 points between the coloured Afrikaans advantaged and coloured Afrikaans disadvantaged groups in respect of the FSIQ and VCI, respectively and a difference of 12.83 and 15.38 points between the black Xhosa disadvantaged and coloured Afrikaans disadvantaged groups in respect of the FSIQ and VCI, respectively. Less stringent adjustment may therefore be warranted in a study such as this, where the analysis is already at risk of Type II error due to small sample numbers. Both Brandt (2007) and Perneger (1998) advocate that it would be more prudent to simply describe what has been done, explain the rationale behind this decision, and then discuss the implications of each result so that the reader can come to practical conclusions without the help of Bonferroni adjustments.

Generalisability

In the present study, groups were very carefully stratified for age, gender, ethnicity/language, level, and quality of education. Sampling was done in the Eastern Cape, and in addition the Afrikaans advantaged group sampling was also done in the Western Cape. The resultant norms are thus very specific for the groups investigated, as well as being regionally specific. Therefore, caution should be exercised when applying the norms to individuals from other regions of South Africa or to individuals from other ethnic/language groups such as other black African language groups. These results provide only a broad interpretative guide except when applied to the specific Grade 7 population and in the age range of 12 to 13 years for which they are well suited. Norms could however be applied to give some preliminary indications with regard to other groups' expected performance on the WISC-IV, in the absence of norms for that specific group. In such cases where the demographic variables differ from those of the standardisation sample, interpretations would need to be made with great caution.

In addition, the WISC-IV^{UK} and related UK norms were used in the present study to generate cross-cultural norms in relation to the South African sample. It was noted that the WISC-IV^{UK} normative data differs somewhat from that of the US standardisation (Wechsler, 2004), and that the means and standard deviations included in the WISC-IV^{UK} manual therefore pertain to the UK scaling and norms. Consequently, it was considered by this researcher, that some

minor discrepancies between scores could occur when applying the US versus UK norms, and therefore caution would need to be exercised by clinicians who employ the cross-cultural norms of the present study in conjunction with the US standardisation of the WISC-IV.

Sampling

A further limitation of this research is that the white Afrikaans advantaged and coloured Afrikaans advantaged groups were sampled only from former Model C schools, whereas the white English advantaged and black Xhosa advantaged groups were sampled from both private and former Model C schools. This represents a deviation from the method employed by Van Tonder (2007) and impacts on the degree of certainty with which direct comparisons between Sample A (existing white English and black Xhosa sample) and Sample B (new white Afrikaans and coloured Afrikaans sample) can be made. It is commonly known that private schools in South Africa are most well-resourced, have lower teacher-pupil ratios, and offer what is considered a more challenging curriculum. However, in the absence of private Afrikaans-medium schools within the Eastern Cape, sampling of Afrikaans speaking participants in the present study was by necessity more limited. As indicated in the discussion chapter, Van Tonder (2007) does not report significant differences between the private and former Model C groups, although it is considered that with larger sample numbers a strong trend that favoured the performance for private school over Model C learners in that study, may have reached significance. It was therefore considered that the scores of the white Afrikaans and coloured Afrikaans advantaged groups who were sampled from former Model C schools only, may be somewhat lowered in comparison to those of the white English and black Xhosa advantaged groups who were sampled from both private *and* former Model C schools.

Van Tonder (2007) also limited data collection to a specific region, i.e. Grahamstown (Eastern Cape, South Africa). However, due to the unavailability of Afrikaans first language learners able to meet the selection criteria for advantaged education in Grahamstown, as previously discussed, the regional criteria for the present study was extended to include Grade 7 learners from Port Elizabeth (Eastern Cape, South Africa) for white Afrikaans advantaged, and Cape Town (Western Cape, South Africa) for both white and coloured Afrikaans advantaged, groups. Wider sampling therefore represents a further methodological deviation from that employed by Van Tonder (2007). The schools were however chosen on the basis of being relatively equivalent to the targeted schools in Grahamstown with regard to socio-economic status of the learners and quality of education provided. Hence, the Eastern Cape and Western Cape samples were considered comparable for the purposes of this study.

Language

Another deviation from the method employed by Van Tonder (2007) concerns the language in which testing was conducted in the present study. For instance, this issue needs to be considered as a limitation when making direct comparisons between Sample A (existing white English and black Xhosa sample) and Sample B (new white Afrikaans and coloured Afrikaans sample). The aim of this study was to produce norms that could be utilised in typical clinical settings (as described in section 2.2.3, p. 26) as they currently apply in the South African context, and therefore it was considered appropriate to conduct testing in the child's language of tuition. Participants from Sample A were tested in English (in the case of the white English and black Xhosa advantaged groups) or English with Xhosa translation (in the case of the black Xhosa disadvantaged group), while participants from Sample B were all tested in Afrikaans by English/Afrikaans bilingual test administrators using a consistent (but not standardised) translation of the test. In the absence of a formally translated version of the WISC-IV standardised for use in South Africa, these test administration practices were deemed adequate (despite the fact that they represent a deviation from the ideal of a formal translation), in order to obtain much needed normative indicators to enhance the ability to interpret WISC-IV test data in the South African setting. Nevertheless it is important to be cautious about making absolute comparisons between the subgroups in this study due to these sampling variations in respect of translation issues.

Another potential limitation of the present study in terms of making direct comparisons between subgroup IQ test performances, is that the weaker scores for the coloured Afrikaans disadvantaged group compared to the black Xhosa disadvantaged group may be partially accounted for by the fact that the Xhosa disadvantaged group had the benefit of receiving the test instructions twice (in English and then in Xhosa via a translator), while the Afrikaans disadvantaged group only received instructions once (in Afrikaans). It was also recognised that such translations, as used for data collection in the present study, have limitations as they do not conform to strict standardisation criteria. The researchers moreover acknowledge that translation may impact on verbal subtests in particular. Again, however, this method was in keeping with the aims of the study, in that it allowed the researchers to obtain preliminary normative data specifically for tests as typically applied in clinical settings in this country (for the Xhosa disadvantaged and Afrikaans speaking participants) in the absence of formal standardised translations of the WISC-IV. In other words, the objective of the study was not to make direct comparisons of IQ test performance with strictly comparable administration procedures, and it is important that caution is applied when using the present data to make such comparisons.

5.2. Recommendations for future study

While it would be very useful to replicate the aforementioned WAIS-III and WISC-IV studies with larger sample sizes in order to increase the statistical power of the normative data which is available, this is likely to prove an arduous and expensive exercise. In light of the urgent need for cross-cultural normative data for use in the South African clinical setting, and given the scarcity of resources to dedicate to such a task, it would be prudent in the first instance to focus on refining and extending the current preliminary normative data set using similarly small, but well stratified samples. The following more specific research suggestions could be implemented towards the objective of refining and extending available norms.

5.2.1. Official languages

In South Africa, 11 official languages are recognised. It would thus be useful to extend the present normative data set to include other ethnic/first language groups. Besides English, Xhosa and Afrikaans groups, which were the focus of the present study, it would be useful to produce black Zulu speaking population norms as this constitutes the most represented ethnic/language group in South Africa with 23.8% of South Africans claiming Zulu as their first language. Other black African language groups to consider for inclusion are: Ndebele, Pedi, Sotho, SeSwati, Tsonga, Tswana and Venda.

5.2.2. Regions

South Africa is also divided into nine provinces. The present research has focused largely on the Eastern Cape, and included some Afrikaans speaking advantaged learners from the Western Cape. It is therefore also recommended that, as the current sample is limited in its geographical scope, it would be useful to sample groups across the other provinces in South Africa (i.e. Northern Cape, Free State, KwaZulu-Natal, North West, Gauteng, Mpumalanga and Limpopo).

5.2.3. Level of education

In order to provide a wider coverage across the spectrum of cognitive testing in South Africa, existing normative data can be extended upwards, with respect to white Afrikaans and coloured Afrikaans groups, to complete the currently available set of data for WAIS-III derived on white English and black African first language participants. The existing normative data set can also be extended downwards to Grade 3 level (which is the final year of Foundation Phase education in South Africa), for all groups previously studied for the WISC-IV. See table on future research options (Table 4, p. 61) for suggested sampling strategy.

5.2.4. Quality of education

The present normative data could be extended in order to comment more exactly on the variable of quality of education without the confounding variable of translation issues. Specifically the influence of private versus former Model C advantaged schooling could be addressed within the advantaged subset by stratifying for private versus former Model C schooling and eliciting the sample from English-medium schools. See table on future research options (Table 5, p. 61) for suggested sampling strategy. For the purposes of such research, in order to minimise the effects of test translation, only the standardised English-version of the test should be administered to all groups. Due to the fact that many South Africans view English as the language with the most status, as well as the language of political and economic empowerment, many parents are preferentially sending their children to English-medium schools. It should therefore be possible to select white Afrikaans advantaged, coloured Afrikaans advantaged and coloured Afrikaans disadvantaged children who are attending English-medium schools.

5.3. Final summary

This study has provided clinically useful South African cross-cultural norms on the WISC-IV for use with white and coloured Afrikaans, white English and black Xhosa speaking Grade 7 children, aged 12 to 13 years, stratified for advantaged versus disadvantaged quality of education. The present study has also demonstrated that while language and ethnic variables reveal subtle effects on IQ test performance, quality of education has the most significant effect, and a descending IQ test performance continuum has been revealed as follows: 1) white English advantaged (high average), 2) white Afrikaans advantaged and black Xhosa advantaged (average), 3) coloured Afrikaans advantaged (below average), 4) black Xhosa disadvantaged (borderline), and 5) coloured Afrikaans disadvantaged (extremely low). In light of the findings of this study, it is recommended that considerable care is exercised in interpreting test results of individuals from different language/ethnic groups, and in particular those with disadvantaged schooling, as preliminary data suggest that these individuals may achieve scores which are 20 – 35 points lower than the UK standardisation. Further research is however needed to refine these data and to address the limitations and cautionary comments that apply to this study as these norms are of a preliminary nature and apply to a specific subset of the South African population only.

Table 4: Future research options: Identification of gaps in available cross-cultural WAIS-III and WISC-IV data in need of further research, for white English, white Afrikaans, black Xhosa and coloured Afrikaans participants with advantaged and disadvantaged education.

Age	ADVANTAGED					DISADVANTAGED		
	White English Adv.	White Afrikaans Adv.	Black African Adv.	Black Xhosa Adv.	Coloured Afrikaans Adv.	Black African Disad.	Black Xhosa Disad.	Coloured Afrikaans Disad.
WAIS-III (Adult) age 19-30 years	Graduate ¹	Graduate	Graduate ¹	Graduate ²	Graduate	Graduate ¹	Graduate ²	Graduate
WAIS-III (Adult) age 19-30 years	Grade 12 ¹	Grade 12	Grade 12 ¹	Grade 12 ²	Grade 12	Grade 12 ¹	Grade 12 ²	Grade 12
WISC-IV (Child) age 12-13 years	Grade 7 ³	Grade 7 ⁴		Grade 7 ³	Grade 7 ⁴		Grade 7 ³	Grade 7 ⁴
WISC-IV (Child) age 8-9 years	Grade 3	Grade 3		Grade 3	Grade 3		Grade 3	Grade 3

Note: 1) Shuttleworth-Edwards, Kemp, Rust, Muirhead, Hartman & Radloff (2004); 2) Gaylard (2005); 3) Van Tonder (2007); 4) Present study; and Grey shaded areas represent identified gaps for upward and downward extension of the sample for future study.

Table 5: Future research options: Proposal for WAIS-III and WISC-IV research *within* the advantaged group, with refined stratification for quality of education that differentiates between private and former Model C schools in the Eastern Cape, South Africa.

Age	ADVANTAGED (English-Medium Schools only)							
	White English Private	White English Model C	White Afrikaans Private	White Afrikaans Model C	Black Xhosa Private	Black Xhosa Model C	Coloured Afrikaans Private	Coloured Afrikaans Model C
WAIS-III (Adult) age 19-30 years	Graduate Grade 12	Graduate Grade 12	Graduate Grade 12	Graduate Grade 12	Graduate Grade 12	Graduate Grade 12	Graduate Grade 12	Graduate Grade 12
WISC-IV (Child) age 12-13	Grade 7	Grade 7	Grade 7	Grade 7	Grade 7	Grade 7	Grade 7	Grade 7
WISC-IV (Child) Age 8-9	Grade 3	Grade 3	Grade 3	Grade 3	Grade 3	Grade 3	Grade 3	Grade 3

CHAPTER 6. REFERENCES

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APPENDICES

Note: Documents used were adapted from those used by Van Tonder (2007) to ensure consistency in the research process. As additional data collection for the research was conducted in Afrikaans-medium schools, all documentation was made available in both English and Afrikaans.

Appendix A: Letter sent to schools

To the Headmaster and School Governing Body: (*School Name*)

RE: Permission to administer the Wechsler Intelligence Scale for Children-Fourth Edition (WISC-IV)

Under the auspices of the Psychology Department at Rhodes University, an Intern Counselling Psychologist and two Honours-level Researches, working under the supervision of Prof Ann Edwards, would like to request your permission to test (*x number*) selected Grade 7 children from your school.

The purpose of the research is to provide preliminary normative data on the WISC-IV for Afrikaans first language children. This will be an extension of normative data collected in 2007 for Xhosa and English first language children. These data are important for use in professional settings in the South African context because this frequently used IQ test is currently only standardised for use on American children whose first language is English. In order to make appropriate diagnostic and placement decisions, it is important to have norms relevant to South African children.

We kindly request your assistance in the selection of participants. We therefore ask that your teachers help to select possible participants who meet the following criteria: they must have attended the school since Grade 1, should never have failed a grade, and must have no background of any learning disability, psychiatric or neurological disorders. For research purposes we would also request access to their results in Grade 6 and results to date for Grade 7, in order to ensure that we test a cross section of children across all performance levels.

The researchers will assess the participants using the WISC-IV test, and have been trained in the administration and scoring of this test by the project supervisor, Prof Ann Edwards, who is a registered Clinical Psychologist. These tests are regularly used by psychologists for placement and professional purposes, and their administration for research purposes is not considered to be invasive or harmful. Confidentiality is assured and no personal information will be disclosed. Only members of the research team will have access to the data, which will be stored in a confidential filing system by the supervisor at the Rhodes Psychology Clinic. The data may be used anonymously for research and publication purposes under the auspices of the Rhodes University Psychology Department.

No individual test results will be offered to the school, child or parent/guardian. However, should any of the individual data be required for professional purposes, it can be made available on request following consent from the child's parent or guardian. Such an event might occur, for example, if scholastic difficulties become apparent, or were a child to sustain a head injury at a later date, in which case information on the child's earlier cognitive ability would be useful. This is a potential benefit that would be available for those that participate in the research.

Participation will require signed consent from the headmaster of the school involved, as well as from the parent or guardian in the case of each child. It is understood that participation in this research project is voluntary and a child can withdraw at any stage in the process even though they have consented to be part of the study.

If you have any questions regarding this research, please do not hesitate to contact Adele van der Merwe on email a.vandermerwe@ru.ac.za or telephone number 046 803 7070 or cell number 072 762 4429.

Yours sincerely

Prof Ann Edwards
Clinical Psychologist (Project Supervisor)

Adele van der Merwe
Intern Counselling Psychologist

English Version

Aan die Skoolhoof en Skool- Beheerliggaam: (*School Name*)

Insake: Toestemming vir administrasie van die "Wechsler Intelligence Scale for Children-Fourth Edition (WISC-IV)".

Onder beskerming van die Departement van Sielkunde by Rhodes Universiteit, vra 'n Intern Beradings-Sielkundige en twee Honeurs-vlak Navorsers, in samewerking met Prof Ann Edwards wie verantwoordelik is vir die toetsing van die studente, vir u toestemming om (*x number*) uitgesoekte graad 7 leerlinge van u skool te toets.

Die doel van die navorsing is om voorlopige normatiewe data te bekom ten opsigte van die "WISC-IV" toets vir Afrikaans eerstetaal-sprekende kinders. Dit sal 'n uitbreiding wees van navorsing wat in 2007 gedoen is met Xhosa en Engels eerstetaal-sprekende kinders. Hierdie data is belangrik vir gebruik in professionele stellings in die Suid Afrikaanse konteks omdat hierdie IK toets wat gereeld gebruik word, tans slegs gestandaardiseer is ten opsigte van Engels eerstetaal-sprekende Amerikaanse kinders. Dit is belangrik om relevante norms vir Suid Afrikaanse kinders te hê, om te verseker dat korrekte diagnose gemaak word en ook om regte besluite te neem ten opsigte van die plasing van kinders met akademiese probleme.

Ons vra vir u samewerking met die uitsoek van die deelnemers. Dit sal waardeer word indien u onderwysers moontlike deelnemers kan identifiseer, wat aan die volgende vereistes voldoen: hulle moet vanaf Graad 1 by die skool wees, moes nog nooit 'n graad gedruip het nie, en moet geen agtergrond hê van enige leerprobleme, psigiatriese of neurologiese steurings nie. Vir navorsingsdoeleindes, vra ons ook vir toegang tot hierdie leerlinge se rapport vir Graad 6 en enige punte wat voorlopig vir Graad 7 beskikbaar is. Dit sal ons in staat stel om kinders te toets wat elke prestasie vlak verteenwoordig.

Die navorsers sal die leerlinge toets deur gebruik te maak van die "WISC-IV" toets. Hulle is ten volle opgelei om hierdie toets te administreer en te merk, en is deur die projek toesighouer Prof Ann Edwards, 'n geregistreerde Kliniese Sielkundige, opgelei. Hierdie toets word gereeld deur sielkundiges gebruik vir professionele doeleindes en die plasing van kinders, en die administrasie daarvan vir navorsing doeleindes word nie as indringend of skadelik beskou nie. Vertroulikheid word verseker en geen persoonlike inligting sal bekend gemaak word nie. Slegs lede van die navorsingspan sal toegang hê tot hierdie data, en dit sal in 'n vertroulike liassingstelsel gestoor word deur die projek toesighouer, in die Rhodes Sielkunde Kliniek. Die data mag anomieem gebruik word vir navorsing en publikasie doeleindes onder die beskerming van die Rhodes Universiteit Sielkunde Departement.

Geen individuele toetsuitslae sal aan die skool, kind of ouer/voog verstrek word nie. Maar, indien enige individuele data vir professionele doeleindes benodig word, kan dit op aanvraag beskikbaar gestel word indien die kind se ouer/voog toestemming daartoe verleen. So 'n geleentheid mag byvoorbeeld voorkom indien die kind akademiese probleme ontwikkel, of indien die kind op 'n latere stadium 'n hoofbesering opdoen. In so 'n geval sal vroeër inligting van die kind se kognitiewe vermoë wel belangrik wees. Dit is 'n potensiële voordeel vir enige deelnemer aan hierdie navorsing.

Deelname sal skriftelike toestemming vereis van die Skoolhoof van die betrokke skool, asook die skriftelike toestemming van die ouer of voog van elke leerling wat deelneem. Deelname aan hierdie navorsingsprojek is geheel en al vrywillig en 'n leerling kan ter enige tyd van die navorsing onttrek al het hy of sy ingestem om deel te wees van die projek.

Indien u enige vrae het met betrekking tot hierdie navorsing, kan u met vrymoedigheid kontak maak met Adele van der Merwe by epos.a.vandermerwe@ru.ac.za of telefonies by 046 603 7070 of selfoonnommer 072 762 4429.

Appendix B: Letter sent to parents

To the Parent/Guardian

RE: Permission to administer the Wechsler Intelligence Scale for Children-Fourth Edition (WISC-IV)

Under the auspices of the Psychology Department at Rhodes University, an Intern Counselling Psychologist and two Honours-level Researches, working under the supervision of Prof Ann Edwards, would like to request your permission to test your child.

The purpose of the research is to provide preliminary normative data on the WISC-IV for Afrikaans first language children. This will be an extension of normative data collected in 2007 for Xhosa and English first language children. These data are important for use in professional settings in the South African context because this frequently used IQ test is currently only standardised for use on American children whose first language is English. In order to make appropriate diagnostic and placement decisions, it is important to have norms relevant to South African children.

The researchers will assess your child using the WISC-IV test, and have been trained in the administration and scoring of this test by the project supervisor, Prof Ann Edwards, who is a registered Clinical Psychologist. These tests are regularly used by psychologists for placement and professional purposes, and their administration for research purposes is not considered to be invasive or harmful. Confidentiality is assured and no personal information will be disclosed. Only members of the research team will have access to the data, which will be stored in a confidential filing system by the supervisor at the Rhodes Psychology Clinic. The data may be used anonymously for research and publication purposes under the auspices of the Rhodes University Psychology Department.

No individual test results will be offered to the school, child or parent/guardian. However, should any of the individual data be required for professional purposes, it can be made available on request following consent from the child's parent or guardian. Such an event might occur, for example, if scholastic difficulties become apparent, or were a child to sustain a head injury at a later date, in which case information on the child's earlier cognitive ability would be useful. This is a potential benefit that would be available for those that participate in the research.

Participation will require signed consent from the headmaster of the school involved, as well as from the parent or guardian in the case of each child. It is understood that participation in this research project is voluntary and a child can withdraw at any stage in the process even though they have consented to be part of the study.

If you have any questions regarding this research, please do not hesitate to contact Adele van der Merwe on email a.vandermerwe@ru.ac.za or telephone number 046 803 7070 or cell number 072 762 4429.

Yours sincerely

Prof Ann Edwards
Clinical Psychologist (Project Supervisor)

Adele van der Merwe
Intern Counselling Psychologist

English Version

Aan die Ouer/Voog

Insake: Toestemming vir administrasie van die "Wechsler Intelligence Scale for Children-Fourth Edition (WISC-IV)".

Onder beskerming van die Departement van Sielkunde by Rhodes Universiteit, vra 'n Intern Beradings-Sielkundige en twee Honeurs-vlak Navorsers, in samewerking met Prof Ann Edwards wie verantwoordelik is vir die toesig van die studente, vir u toestemming om u kind te toets.

Die doel van die navorsing is om voorlopige normatiewe data te bekom ten opsigte van die "WISC-IV" toets vir Afrikaans eerstetaal-sprekende kinders. Dit sal 'n uitbreiding wees van navorsing wat in 2007 gedoen is met Xhosa en Engels eerstetaal-sprekende kinders. Hierdie data is belangrik vir gebruik in professionele stellings in die Suid Afrikaanse konteks omdat hierdie IK toets wat gereeld gebruik word, tans slegs gestandaardiseer is ten opsigte van Engels eerstetaal-sprekende Amerikaanse kinders. Dit is belangrik om relevante norms vir Suid Afrikaanse kinders te hê, om te verseker dat korrekte diagnose gemaak word en ook om regte besluite te neem ten opsigte van die plasing van kinders met akademiese probleme.

Die navorsers sal u kind toets deur gebruik te maak van die "WISC-IV" toets. Hulle is ten volle opgelei om hierdie toets te administreer en te merk en is deur die projek toesighouer, Prof Ann Edwards, 'n geregistreerde Kliniese Sielkundige, opgelei. Hierdie toets word gereeld deur sielkundiges gebruik vir professionele doeleindes en die plasing van kinders, en die administrasie van die toets vir navorsings-doeleindes word nie as indringend of skadelik beskou nie. Vertroulikheid word verseker en geen persoonlike inligting sal bekend gemaak word nie. Slegs lede van die navorsingspan sal toegang hê tot hierdie data, en dit sal in 'n vertroulike liasseringstelsel gestoor word deur die projek toesighouer, in die Rhodes Sielkunde Kliniek. Die data mag anoniem gebruik word vir navorsings en publikasie doeleindes onder die beskerming van die Rhodes Universiteit Sielkunde Department.

Geen individuele toetsuitslae sal aan die skool, kind of ouer/voog verstrek word nie. Maar, indien enige individuele data vir professionele doeleindes benodig word, kan dit op aanvraag beskikbaar gestel word indien die kind se ouer/voog toestemming daartoe verleen. So 'n geleentheid mag byvoorbeeld voorkom indien die kind akademiese probleme ontwikkel, of indien die kind op 'n later stadium 'n hoofbesering opdoen. In so 'n geval sal vroeër inligting van die kind se kognitiewe vermoë wel belangrik wees. Dit is 'n potensieël voordeel vir enige deelnemer aan hierdie navorsing.

Deelname sal skriftelike toestemming vereis van die Skoolhoof van die betrokke skool, asook die skriftelike toestemming van die ouer of voog van elke kind wat deelneem. Deelname aan hierdie navorsingsprojek is geheel en al vrywillig en 'n kind kan enige tyd van die navorsing onttrek al het hy of sy ingestem om deel te wees van die projek.

Indien u enige vrae het met betrekking tot hierdie navorsing, kan u met vrymoedigheid kontak maak met Adele van der Merwe by epos.a.vandermerwe@ru.ac.za of telefonies by 046 603 7070 of selfoonnommer 072 762 4429.

Appendix C: Informed consent – Headmaster

**RHODES UNIVERSITY
DEPARTMENT OF PSYCHOLOGY
CONSENT FORM: HEADMASTER**

I _____ have been informed of the nature of the research which will be conducted on Afrikaans speaking children in my school, by an Intern Counselling Psychologist (Adele van der Merwe) and two Honours-level Researchers (Teri Richter and Dean Prigge) from Rhodes University, and hereby consent to the participation of my Grade 7 learners in this project.

I understand that:

1. The above-mentioned Intern Counselling Psychologist and Honours-level Researchers are conducting research to provide preliminary normative data on the Wechsler Intelligence Scale for Children-Fourth Edition (WISC-IV) for Afrikaans first language children, as a requirement for a Master Degree in Counselling Psychology and Honours Degrees in Psychology at Rhodes University.
2. The research will involve willing Afrikaans first language Grade 7 children as participants from your school. Participants will be assessed using the Wechsler Intelligence Scale for Children-Fourth Edition (WISC-IV).
3. Participation in the research is strictly voluntary. Individuals have the right to withdraw from the study at any stage.
4. The information collected on participants will be strictly confidential, with no personal information being disclosed. Access to this data will be restricted to members of the research team. On request, it may be accessed for professional purposes with parental/guardian consent.
5. Data arising out of this project may be used anonymously for thesis and publication purposes.

Signed: _____ Date: _____

Name: _____ School: _____

Address: _____

Contact Telephone Numbers: _____

Email: _____

English Version

RHODES UNIVERSITEIT
SIELKUNDE DEPARTEMENT
TOESTEMMINGSVORM: SKOOLHOOF

Ek _____ is deeglik ingelig ten opsigte van die navorsing wat met Afrikaanssprekende kinders in my skool gedoen sal word, deur 'n Intern Beradings Sielkundige (Adele van der Merwe) en twee Honeurs-vlak Navorsers, (Teri Richter and Dean Prigge) vanaf Rhodes Universiteit, en verleen hiermee toestemming tot die deelname van my Graad 7 leerlinge in hierdie projek.

Ek verstaan dat:

1. Die bogenoemde Intern Beradings Sielkundige en Honeurs-vlak Navorsers besig is om navorsing te doen om voorlopige normatiewe data te bekom vir die "Wechsler Intelligence Scale for Children-Fourth Edition (WISC-IV)" toets vir Afrikaans eerstetaal-sprekende kinders, as deel van die vereistes van 'n Meestersgraad in Beradings Sielkunde en Honeursgrade in Sielkunde by Rhodes Universiteit.
2. Die navorsing sal vrywillige Afrikaans eerstetaal Graad 7 kinders van my skool as deelnemers betrek. Deelnemers sal met die "Wechsler Intelligence Scale for Children-Fourth Edition (WISC-IV)" toets getoets word.
3. Deelname in die navorsing is geheel en al vrywillig. Enige deelnemer het die reg om ter enige tyd van die navorsing te onttrek.
4. Die inligting wat ten opsigte van individuele deelnemers versamel word, sal geheel en al vertroulik wees, en geen persoonlike inligting sal verklaar word nie. Toegang tot hierdie inligting sal beperk word tot die lede van die navorsingspan. Indien navraag gedoen word, mag die inligting vir professionele doeleindes bekom word, maar dan slegs met die toestemming van die ouer/voog.
5. Data bekom as gevolg van die projek mag anoniem gebruik word vir proefskrif en publikasie doeleindes.

Geteken: _____ Datum: _____

Naam: _____

Adres: _____

Kontak Telefoon Nommers: _____

E-pos: _____

Appendix D: Informed consent – Parent/Guardian

**RHODES UNIVERSITY
DEPARTMENT OF PSYCHOLOGY
CONSENT FORM: PARENT/GUARDIAN**

I _____ have been informed of the nature of the research which will be conducted on my child, by an Intern Counselling Psychologist (Adele van der Merwe) and two Honours-level Researchers, (Teri Richter and Dean Prigge) from Rhodes University, and I hereby agree to the participation of my child _____ in this project.

I understand that:

1. The above-mentioned Intern Counselling Psychologist and Honours-level Researchers are conducting research to provide preliminary normative data on the Wechsler Intelligence Scale for Children-Fourth Edition (WISC-IV) for Afrikaans first language children, as a requirement for a Master Degree in Counselling Psychology and Honours Degrees in Psychology at Rhodes University.
2. The research will involve willing Afrikaans first language Grade 7 children as participants from a number of Grahamstown schools. Participants will be assessed using the Wechsler Intelligence Scale for Children-Fourth Edition (WISC-IV).
3. Participation in the research is strictly voluntary. Individuals have the right to withdraw from the study at any stage.
4. The information collected on individual participants will be strictly confidential, with no personal information being disclosed. Access to this data will be restricted to members of the research team. On request, it may be accessed for professional purposes with parental/guardian consent.
5. Data arising out of this project may be used anonymously for thesis and publication purposes.

Signed: _____ **Date:** _____

Name: _____

Address: _____

Contact Telephone Numbers: _____

Email: _____

English Version

RHODES UNIVERSITEIT
SIELKUNDE DEPARTEMENT
TOESTEMMINGSVORM: OUER/VOOG

Ek _____ is deeglik ingelig ten opsigte van die navorsing wat met my kind gedoen sal word, deur 'n Intern Beradings Sielkundige (Adele van der Merwe) en twee Honeurs-vlak Navorsers, (Teri Richter and Dean Prigge) vanaf Rhodes Universiteit, en verleen hiermee toestemming tot my kind _____ se deelname in hierdie projek.

Ek verstaan dat:

1. Die bogenoemde Intern Beradings Sielkundige en Honeurs-vlak Navorsers besig is om navorsing te doen om voorlopige normatiewe data te bekom vir die "Wechsler Intelligence Scale for Children-Fourth Edition (WISC-IV)" toets vir Afrikaans eerstetaal-sprekende kinders, as deel van die vereistes van 'n Meestersgraad in Beradings Sielkunde en Honeursgrade in Sielkunde by Rhodes Universiteit.
2. Die navorsing sal vrywillige Afrikaans eerstetaal Graad 7 kinders as deelnemers betrek en die deelnemers sal van verskillende skole in die Grahamstad omgewing afkomstig wees. Deelnemers sal met die "Wechsler Intelligence Scale for Children-Fourth Edition (WISC-IV)" toets getoets word.
3. Deelname in die navorsing is geheel en al vrywillig. Enige deelnemer het die reg om ter enige tyd van die navorsing te onttrek.
4. Die inligting wat ten opsigte van individuele deelnemers versamel word, sal geheel en al vertroulik wees, en geen persoonlike inligting sal bekend gemaak word nie. Toegang tot hierdie inligting sal beperk word tot die lede van die navorsingspan. Indien navraag gedoen word, mag die inligting vir professionele doeleindes bekom word, maar dan slegs met die toestemming van die ouer/voog.
5. Data bekom as gevolg van die projek mag anoniem gebruik word vir proefskrif en publikasie doeleindes.

Geteken: _____ Datum: _____

Naam: _____

Adres: _____

Kontak Telefoon Nommers: _____

E-pos: _____

Appendix E: Informed consent – Child participant

**RHODES UNIVERSITY
DEPARTMENT OF PSYCHOLOGY
CONSENT FORM: CHILD PARTICIPANT**

I _____ have been informed of the nature of the research which will be conducted on me, by an Intern Counselling Psychologist (Adele van der Merwe) and two Honours-level Researchers, (Teri Richter and Dean Prigge) from Rhodes University, and I hereby agree to participate in this project.

I understand that:

1. The above-mentioned Intern Counselling Psychologist and Honours-level Researchers are conducting research to provide preliminary normative data on the Wechsler Intelligence Scale for Children-Fourth Edition (WISC-IV) for Afrikaans first language children, as a requirement for a Master Degree in Counselling Psychology and Honours Degrees in Psychology at Rhodes University.
2. The research will involve willing Afrikaans first language Grade 7 children as participants from a number of Grahamstown schools. Participants will be assessed using the Wechsler Intelligence Scale for Children-Fourth Edition (WISC-IV).
3. Participation in the research is strictly voluntary. Individuals have the right to withdraw from the study at any stage.
4. The information collected on individual participants will be strictly confidential, with no personal information being disclosed. Access to this data will be restricted to members of the research team. On request, it may be accessed for professional purposes with parental/guardian consent.
5. Data arising out of this project may be used anonymously for thesis and publication purposes.

Signed: _____ **Date:** _____

Name: _____

Address: _____

Contact Telephone Numbers: _____

Email: _____

English Version

RHODES UNIVERSITEIT
SELKUNDE DEPARTEMENT
TOESTEMMINGSVORM: DEELNEMENDE KIND

Ek _____ is deeglik ingelig ten opsigte van die navorsing wat met my gedoen sal word, deur 'n Intern Beradings Sielkundige (Adele van der Merwe) en twee Honeurs-vlak Navorsers, (Teri Richter and Dean Prigge) vanaf Rhodes Universiteit, en verleen hiermee toestemming tot my deelname in hierdie projek.

Ek verstaan dat:

1. Die bogenoemde Intern Beradings Sielkundige en Honeurs-vlak Navorsers besig is om navorsing te doen om voorlopige normatiewe data te bekom vir die "Wechsler Intelligence Scale for Children-Fourth Edition (WISC-IV)" toets vir Afrikaans eerstetaal-sprekende kinders, as deel van die vereistes van 'n Meestersgraad in Beradings Sielkunde en Honeursgrade in Sielkunde by Rhodes Universiteit.
2. Die navorsing sal vrywillige Afrikaans eerstetaal Graad 7 kinders as deelnemers betrek en die deelnemers sal van verskillende skole in die Grahamstad omgewing afkomstig wees. Deelnemers sal met die "Wechsler Intelligence Scale for Children-Fourth Edition (WISC-IV)" toets getoets word.
3. Deelname in die navorsing is geheel en al vrywillig. Enige deelnemer het die reg om ter enige tyd van die navorsing te onttrek.
4. Die inligting wat ten opsigte van individuele deelnemers versamel word, sal geheel en al vertroulik wees, en geen persoonlike inligting sal bekend gemaak word nie. Toegang tot hierdie inligting sal beperk word tot die lede van die navorsingspan. Indien navraag gedoen word, mag die inligting vir professionele doeleindes bekom word, maar dan slegs met die toestemming van die ouer/voog.
5. Data bekom as gevolg van die projek mag anoniem gebruik word vir proefskrif en publikasie doeleindes.

Geteken: _____ Datum: _____

Naam: _____

Adres: _____

Kontak Telefoon Nommers: _____

E-pos: _____

Afrikaans Version

Appendix F: Screening questionnaire for potential participants

RHODES UNIVERSITY
DEPARTMENT OF PSYCHOLOGY
SCREENING QUESTIONNAIRE FOR POTENTIAL PARTICIPANTS

Date: _____

Name of Participant: _____

Name of Test Administrator: _____

Mark with an X that which is applicable to participant.

Academic History

- Has failed a grade at school
- Is undergoing remedial teaching
- Has a learning disability

Medical History

- Is on any medication for an reason

Please specify type of medication and reason for medication:

- Has any other neurological disorder

Please specify:

- Has epilepsy
- Has previously sustained a head injury involving loss of consciousness and/or hospitalisation
- Has any problem involving eyesight
- Has any problem involving hearing

Emotional Well-being

- Has depressive/irritable mood much of the time
- Is presently seeing a psychologist / psychiatrist

English Version

RHODES UNIVERSITEIT
SIELKUNDE DEPARTEMENT
KEURING VRAE VIR POTENSIELE DEELNEMERS

Datum: _____

Naam van Deelnemer: _____

Naam van Toets Administrator: _____

Merk met 'n X dit wat van toepassing is op die deelnemer.

Akademiese Geskiedenis

- Het 'n graad gedop op skool
- Ondergaan remediese onderrig
- Het 'n leergebrek

Medical History

- Is op enige medikasie vir enige rede

Spesifiseer asseblief tipe medikasie en rede vir die medikasie:

- Het enige neurologiese toestand

Spesifiseer asseblief:

- Het epilepsy
- Het van tevore 'n hoofbesering opgedoen en gevolglik bewusein verloor en/of was in die hospitaal
- Het enige probleem te make met sig
- Het enige problem te make met gehoor

Emotional Well-being

- Het depressiewe/geirriteerde buie vir die meeste van die tyd
- Sien op die oomblik 'n sielkundige / psigiator