The Wechsler Intelligence Scales have led the way in assessment of intelligence for almost seven decades, since the release of the original Wechsler-Bellevue Intelligence Scale in 1939 (Saklofske, Weiss, Beal & Coalson, 2003). Despite exemplary characteristics of other new and revised versions of intelligence tests, the Wechsler tests remain, and in the foreseeable future are likely to remain, the most widely used standardised measures for individual testing of children and adults worldwide, covering the age range from 2.5 to 89 years (Flanagan & Kaufman, 2009). The intermediate age ranges are catered for by the Wechsler Intelligence Scale for Children (WISC) which, when first released in 1949, marked the division of the Wechsler Intelligence Scales into separate tests for children and adults (Saklofske et al., 2003).

The WISC has gone through two previous revisions (WISC-R, 1974; WISC-III, 1991) prior to the most recently released version of the WISC-IV (Wechsler, 2003; 2004) that is intended for use with children aged 6 years to 16 years 11 months. 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, Weiss, Saklofske & Rolfhus, 2005). It also encompasses a fundamental theoretical shift, as it was designed with current trends in factor analysis theories in mind and thereby is considered to have introduced stronger psychometric properties (Baron, 2005). 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 results of the US standardisation confirmed that the WISC-IV achieved high levels of reliability, with test-retest reliability being at least .76, but mostly in the .80s, and with subtest scores being less stable compared to Index scores and the Full Scale Intelligence Quotient (FSIQ); convergent validity with preceding editions of the Wechsler tests, including the WISC-III, yielded correlations from at least .73, but mostly in the high .70s and high .80s (Wechsler, 2003).

Based on new neurological models of cognitive function, the WISC-IV’s main departure from the traditional Wechsler model is that it improves on the test’s ability to evaluate perceptual reasoning, working memory and processing speed (Wechsler, 2003). This has been achieved by making changes to some
subtests and/or incorporating new subtests, and by the creation of four domain Index scores including the Verbal Comprehension Index (VCI), the Perceptual Reasoning Index (PRI), the Working Memory Index (WMI) and the Processing Speed Index (PSI). The VCI was designed to replace the Verbal IQ (VIQ) and measures verbal knowledge, reasoning and conceptualisation, and the PRI was designed to replace the Performance IQ (PIQ) and measures interpretation, reasoning and organisation of visually presented nonverbal information; the WMI measures attention, concentration and working memory for verbal material, and the PSI measures speed of mental and graphomotor processing (Strauss, Sherman & Spreen, 2006). The test still allows for the calculation of a FSIQ derived from the four domain Index scores, thus representing a general composite score for the entire scale.

Specifically, in order to calculate the four composite Index scores and forming the basis of the FSIQ, the WISC-IV consists of a core battery of ten subtests, including Vocabulary, Similarities and Comprehension, which contribute to the VCI score; Block Design, Picture Concepts and Matrix Reasoning, which contribute to the PRI score; Digit Span and Letter-Number Sequencing, which contribute to the WMI score; and Coding and Symbol Search, which contribute to the PSI score. In addition there are five supplementary subtests, including Picture Completion, Cancellation, Information, Arithmetic and Word Reasoning. It is possible to replace one or more of the subtests from the core battery with one of the supplementary subtests within the same functional modality, thereby enhancing the test’s flexibility.

WISC-IV standardisation and demographic indications

The WISC-IV has been standardised on a USA population of 2,200 children equally distributed for males and females, and an ethnic stratification that matches the 2000 USA census data closely (that is, white majority and other-than-white minority). In addition the test has been adapted and standardised for use in Canada, the UK, 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). For the UK standardisation (used for the purposes of the present research), minor changes to content items were carried out in order to make the test more culture-specific, rather than a comprehensive rewriting of the test being undertaken (Wechsler, 2004). Comparisons between the US WISC-IV subtest raw scores and those derived from the WISC-IV (UK) version across each age group demonstrated close correspondence between the two sets of data. In the case of the UK standardisation, stratification for race/ethnic group was based on the UK 2001 census data, resulting in a sample that was made up of a majority of white individuals, including 87.6 per cent white and 12.4 per cent relatively evenly distributed black, Asian and other (Chinese and mixed) individuals (Wechsler, 2004).
Various demographic influences have been investigated in respect of the US standardisation sample of the WISC-IV, including the effects of sex and race. No differences were found for sex, with the exception of a small superior performance for boys over girls on the PSI of approximately five points (as reviewed in Strauss et al., 2006), thereby obviating the need for sex-specific normative data. However, substantial differences were found to be present for race. Specifically, persistent group differences between African-Americans, Hispanics and whites in the WISC-IV standardisation sample have been demonstrated, with white children achieving higher IQ scores than their African-American and Hispanic peers of 11.5 and 10 points, respectively (Prifitera et al., 2005; Sattler & Dumont cited in Strauss et al., 2006). The differences observed between these groups on individual Index scores varied, but PSI and WMI scores showed the least variation between groups. 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.

Additional cross-cultural research in respect of any of the WISC tests is sparse, and only two studies were identified in respect of black African-American individuals. Kusch, Watkins, Ward, Ward, Canivez & Worrell (2001) demonstrate that factor loadings revealed anomalies for a referred black sample, and Brown (1998) reports that African-American children in her study performed 20 points below the mean of 100 for the WISC-III composite scores. Specifically with reference to the African continent, the only published cross-cultural research to date on the WISC in any of its forms appears to be that by Zindi (1994), who demonstrated a 25 point IQ differential on the WISC-R between black Zimbabwean children and white British children matched for social class, and he showed almost the same magnitude of difference on the Raven’s. Evidence for test differences such as this between ethnic groups raises concerns about the use of the WISC-IV in the multicultural South African situation. While there has been an attempt to standardise the Wechsler Adult Intelligence Scale – Third Edition (WAIS-III) for a South African population (Claassen, Krynauw, Paterson & Mathe, 2001), to date there has been no attempt at South African standardisation of any of the Wechsler intelligence tests for children, including the WISC-IV.

The intricacies that are involved in cross-cultural test influences generally, in addition to those that pertain specifically to the South African context, warrant further elaboration.

Cross-cultural test issues

Two sets of issues relating to cross-cultural test influences are discussed here: issues pertaining to race and culture, and those involving education.

Race and culture

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 (Lezak, Howieson & Loring, 2004; Mitrushina, Boone, Razani & D'Elia, 2005). It is now commonly accepted in the cross-cultural literature that focusing 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, including literacy levels and English fluency, quality of education and socio-economic status, may better serve as an explanation for variance in test scores (Ardila, 1996; Harris & Llorente, 2005; Manly, Byrd, Touradj & Stern, 2004; Manly, Jacobs, Touradj, Small & Stern, 2002; Shuttleworth-Edwards, Kemp, Rust, Muirhead, Hartman & Radloff, 2004). In the South African context, due to the legacy of apartheid, test users need to acknowledge that race is a particularly potent mediator of the quality of education, economic opportunities, urbanisation and socio-economic status of many South Africans, and as such cultural issues are likely to impact on test performance (Nell, 1999). Stead (2002), like other researchers (for example, Van de Vijver & Rothmann, 2004), has highlighted two possible approaches that can be followed to address this problem.

Firstly, Stead cites researchers such as Sehlapelo and Terre Blanche who argue that non-indigenous (for example, US and European) tests should not be used in South Africa because of the questionable validity of test scores among black South Africans. This line of argument calls for the development of tests specific to the South African context, in that tests that have been developed elsewhere are inherently problematic for use in this country. Secondly, Stead draws attention to the contrasting argument of researcher Shuttleworth-Jordan (1996), who proposes that rather than ‘reinventing the wheel’, minor content modification and standardisation of existing tests is sufficient to allow for their use with a substantial proportion of previously disadvantaged black South Africans. This argument is based on the fact that many black South Africans have experienced an acculturation process, including moving from rural to urbanised conditions, and in the process have had the opportunity to access Westernised education and develop literacy in English. Accordingly, Shuttleworth-Jordan (1996) strongly advocates norming of commonly employed, internationally based cognitive tests for use in the South African context, rather than producing newly devised tests without the benefit of a long history of test refinement through clinical and research practices.

Commensurate with the latter position, it was decided by the Human Sciences Research Council (HSRC) to norm the most recent Wechsler test in current international use at that time, that is the WAIS-III, in its English administration, rather than devising a new South African-specific IQ test for use in the newly democratised South Africa (Claassen et al., 2001). The standardisation was achieved in respect of a young adult population only (age range 19–30). Notably, the Claassen et al. HSRC standardisation of the WAIS-III has been heavily criticised as being flawed due to the lack of control for quality of education within the other-than-white populations in the norm sample (Nell, 1999; Shuttleworth-Edwards et al., 2004). This is a factor that is of particular pertinence for cross-cultural researchers in both the adult and child populations, and demands further exploration.
**Education, including quality of education**

As is commonly documented, level of education is a highly significant variable of neuropsychological test performance, and specifically educational attainment correlates significantly with scores on intelligence tests (Ardila, 1996). However, researchers have shown 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, that is, with subjects closely linked to curriculum content (Brody, 1997; Byrd, Jacobs, Hilton, Stern & Manly, 2005). Byrd et al. (2005) conclude that while educational level has been documented to be a strong predictor of performance on intelligence tests, reading level and literacy are more accurate reflections of academic achievement than years of education. Further research reveals lowered cognitive test performance amongst elderly African-Americans from the south and north of the USA that is attributed to the factor of quality of education, in that some individuals were more likely to have had lower quality of education because of segregated schooling (Manly et al., 2004). In a key article included in a special edition of *The Clinical Neuropsychologist* on African-American normative data, Manly cautions that separation of test battery norms purely in terms of ethnicity is not scientifically meaningful due to the ‘tremendous [within-group] heterogeneity in cultural, educational, linguistic and environmental exposure’ (Manly, 2005, p.274). Manly’s observation has particular relevance in light of disparate educational opportunities historically within South Africa, and current developments in association with 20 years of democratisation.

It is clearly apparent that 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 learners from other race groups who had the financial means, attended privately funded independent schools (hereafter termed private schools) or government-funded Model C schools run by various provincial departments of education. These children enjoyed access to more than 75 per cent 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 underqualified teachers, and currently the vast majority of black and coloured South African children (those from working-class and poor families) are still attending former DET or HOR schools (hereafter termed township schools), making up approximately 80 per cent of all learners in South Africa (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 have resources that
may be underutilised (Matomela, 2008a; 2008b). These schools often lack basic supplies, books or even desks. They also receive only basic government funding; there is absenteeism from the classroom (of teachers and learners); ineffective teaching methods are used; there are higher teacher–learner ratios in township schools; and teachers are often underqualified, have weak subject knowledge and do not cope with changing demands of the curriculum. Moreover, the township teachers are often not fully proficient in the English language, although tuition is normally expected to occur in English in these schools from Grade 3 (Fleisch, 2007). All these factors, therefore, contribute to a poorer quality of education in township schools (Cooper, 2004; Fleisch, 2007; Nell, 1999). In short, the inequality in the South African education system continues, especially in the relatively poor Eastern Cape Province (Cull, 2001; Matomela, 2008a; 2008b).

In the apartheid era, the educational divide between private and Model C schooling and township schooling was almost exclusively manifested along racial lines. Since democratisation, however, this is no longer the case, in that increasing numbers of black and coloured children attend the traditionally white English-medium private and former Model C schools, thereby being exposed to relatively better-resourced and advantaged educational settings. This, in turn, is likely to impact on IQ test performance differentially within these ethnic groups. Therefore, as indicated above, failure to take the within-groups variable of quality of education into account has resulted in heavy criticism being levelled at the Claassen et al. (2001) WAIS-III standardisation attempt. Specifically in order to redress the shortfall in this regard, Shuttleworth-Edwards et al. (2004) set about generating preliminary normative indications for the WAIS-III (English administration), in respect of a predominantly South African sample that was stratified for white English first-language and black African first-language individuals who were either working or studying in the medium of English, and that in turn was stratified for both level (Grade 12 and graduate) and quality of education (advantaged private/former Model C schooling versus disadvantaged township schooling).

The results of this study revealed significant effects for both level and quality of education in the direction of poorer performance for Grade 12s versus Graduate groups across both black African and white English first-language groups, and for disadvantaged schooling in relation to advantaged schooling within the black African first-language group of around 25 IQ points. It was deemed imperative, therefore, given the absence of any further available cross-cultural research on the WISC series of tests, to extend the Shuttleworth-Edwards et al. (2004) WAIS–III investigation downwards with a cross-cultural investigation into WISC-IV test performance in respect of a South African child population that was similarly stratified for both race and quality of education.

The WISC-IV norming study

An investigation into WISC-IV performance was conducted by the present researchers, using the WISC-IV (UK) version of the test (Wechsler, 2004) that is virtually identical to the WISC-IV (US) version of the test (Wechsler, 2003),
with the objective of producing comparative normative indications for the ten core subtest scores, four Index scores and the FSIQ score that could be utilised in typical clinical situations as they currently apply in the South African context. Importantly, this type of within-group normative study, which is finely stratified for demographic characteristics such as race and language, needs to be differentiated from a test standardisation that pertains more broadly to the general population (Strauss et al., 2006). Typically, the within-group normative study is in respect of relatively small subgroup samples when compared with the typically large standardisation sample, and subgroup normative data are frequently presented in the descriptive form of means and standard deviations (Mitrushina et al., 2005; Strauss et al., 2006).

**Procedure and sample distribution**

Building on the research of Shuttleworth-Edwards et al. (2004), preliminary normative data were collected for a Grade 7 South African child sample stratified for race and language (white English, black Xhosa, white Afrikaans, coloured Afrikaans) and quality of education (advantaged private/former Model C schooling versus disadvantaged township schooling). In order to ensure a nonclinical sample, the following exclusion criteria applied: repeated grade at any stage; presence of a learning disability; history of medical, psychiatric or neurological disorder. 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 3.1.

**Table 3.1 Grade 7 samples, stratified for ethnicity, language, quality of education and sex**

<table>
<thead>
<tr>
<th>Ethnic group</th>
<th>First language</th>
<th>Education</th>
<th>Sex</th>
<th>Sample (N = 69)</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>English</td>
<td>Private/Model C</td>
<td>M</td>
<td>n = 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>F</td>
<td>n = 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>n = 12</td>
</tr>
<tr>
<td>Black</td>
<td>Xhosa</td>
<td>Private/Model C</td>
<td>M</td>
<td>n = 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>F</td>
<td>n = 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>n = 12</td>
</tr>
<tr>
<td>Black</td>
<td>Xhosa</td>
<td>DET Township</td>
<td>M</td>
<td>n = 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>F</td>
<td>n = 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>n = 12</td>
</tr>
<tr>
<td>White</td>
<td>Afrikaans</td>
<td>Model C</td>
<td>M</td>
<td>n = 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>F</td>
<td>n = 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>n = 12</td>
</tr>
<tr>
<td>Coloured</td>
<td>Afrikaans</td>
<td>Model C</td>
<td>M</td>
<td>n = 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>F</td>
<td>n = 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>n = 9</td>
</tr>
<tr>
<td>Coloured</td>
<td>Afrikaans</td>
<td>HOR Township</td>
<td>M</td>
<td>n = 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>F</td>
<td>n = 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>n = 12</td>
</tr>
</tbody>
</table>

Notes: ‘White, black, coloured; “English, Xhosa, Afrikaans; ’” Advantaged, disadvantaged.

**Level of education**

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. This was not possible within the coloured Afrikaans advantaged schooling group, however, as this group did not typically perform well academically, and learners in this group tended to be in the bottom performance range within their class.
School sampling
The white English and black Xhosa Grade 7 learners were sampled from schools in Grahamstown (Eastern Cape, South Africa), with a balanced distribution for attendance at either a private or former Model C school. The white Afrikaans and coloured Afrikaans Grade 7 learners included white Afrikaans and coloured advantaged learners attending former Model C schools only, due to the lack of availability of private Afrikaans-medium schools in the area where the study was taking place. To complete the sample, Afrikaans learners with advantaged education were drawn from Port Elizabeth and Cape Town, as well as from Grahamstown.

Age and sex
Participants were all between the ages of 12.01 and 13.11 years (mean = 13.04, SD = 0.34). Age differences between the comparative groups were not statistically significant (p > 0.05 in all instances). A target total of n = 12 participants with equal sex distribution was met for all groups, with the exception of the coloured Afrikaans advantaged group that yielded a total of n = 9 participants, with an unequal sex distribution of males (n = 6) and females (n = 3).

Data collection
The data were collected by intern clinical/counselling psychologists assisted by psychology honours students trained in the administration of the test. Whereas the WAIS-III norming initiatives in South Africa of Claassen et al. (2001) and Shuttleworth-Edwards et al. (2004) employed an English-only administration of the test, this route was not deemed appropriate for children at Grade 7 level, as in a clinical setting it is considered appropriate to conduct testing in a child’s language of tuition. Accordingly, white English and black Xhosa advantaged learners who were from English-medium schools were given the standardised English administration, as it was assumed that they had received good-quality English language tuition. A Xhosa-speaking intern clinical psychologist was used as a translator for testing black Xhosa disadvantaged learners, who were given test instructions in English followed by a spontaneous Xhosa translation of the instruction, as this practice mirrored mixed Xhosa/English language use in these classrooms. Afrikaans participants who were from Afrikaans-medium schools were tested in Afrikaans by testers proficient in spoken Afrikaans, on the basis of an Afrikaans translation of the test devised by a bilingual postgraduate student specifically for the purposes of the research. It was acknowledged that this approach deviated from the ideal of using formally translated and standardised tests. However, the modus operandi was typical of the current mode of test application in clinical settings (given the absence of standardised translations), and the research aim was to provide preliminary normative indications to facilitate clinical practice, rather than a large-scale standardisation of the test.

Results and discussion
From the normative table (Table 3.2) it is clear that WISC-IV performance revealed a clear continuum of a downward trend in association with lower quality of education. In other words, the overall trend was that groups with advantaged
Table 3.2 WISC-IV performance of English, Xhosa and Afrikaans Grade 7 learners, stratified for advantaged versus disadvantaged education (N = 69)

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

Notes: VCI = Verbal Comprehension Index; PRI = Perceptual Reasoning Index; WMI = Working Memory Index; PSI = Processing Speed Index; FSIQ = Full Scale IQ; M = mean; SD = standard deviation.
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 white English advantaged participants performed best. Next best were 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. The coloured Afrikaans advantaged participants achieved 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, who 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.

Importantly, the downward trend of IQ test performance in association with quality of education was true for all Index scores in both the verbal and non-verbal modalities. However, the overall lowering for disadvantaged education was much higher for the VCI (a massive 55 points overall), and somewhat less for the other three Index scores in descending order of PRI (40 points), WMI (30 points) and PSI (20 points). Lowering in nonverbal areas is consistent with the observation of cross-cultural researchers such as Nell (1999), who emphasise the effect of differential test-taking attitudes and test-wiseness on all cognitive test performance, not just on acquired verbal function. The relative preservation of the WMI and PSI demonstrated on the present research (compared with the VCI and PRI) is consistent with indications on the WISC-IV cross-cultural research of Sattler & Dumont (cited in Strauss et al., 2006), and Prifitera et al. (2005) referred to earlier, in respect of Hispanic and African-American children.

Across all indices and the FSIQ, mean scores of the South African Grade 7 white English advantaged group were equivalent to, or somewhat higher than, mean scores of the US/UK standardisation samples. The generally higher mean scores for the white English advantaged group 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. Further, the higher mean scores for the Grade 7 white English advantaged sample compared with the white Afrikaans advantaged sample may be accounted for by the facts that (i) 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; and (ii) the WISC-IV was administered in Afrikaans to white Afrikaans-speaking learners, and it is possible that the translation of the test may have impacted negatively on the outcome for this group on verbal items in particular.
Similar sampling and administrative explanations may apply to the finding of lower scores for the coloured advantaged group compared with the black advantaged group, in that (i) the black group was drawn from both private and Model C schooling (whereas the Afrikaans sample was purely made up of non-private Model C learners); and (ii) the black group would have had the advantage of receiving test instructions in English in the standardised form (in contrast to getting the test instructions in the Afrikaans form, as per the administration mode that was applied with the Afrikaans learners). Additional sampling effects that may have contributed generally to the relatively depressed performance for the Afrikaans advantaged group are that the coloured Afrikaans advantaged population tended to be amongst the lower achievers in the bottom half of the class, and furthermore this was the only unbalanced group in respect of sex (three female compared with six male participants).

It is of particular note that, while the performances of the advantaged groups in respect of the FSIQ ranged from high to low average along the continuum, the performances 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 3.2, Groups 5 and 6). As all participants in the study were representative of a nonclinical population, and were judged to be of average academic standard and had never failed a grade before, the findings are cause for concern. The important implication arising from these norms is that when practitioners apply the WISC-IV US or UK norms to individuals who are currently attending relatively disadvantaged schools, or who have a substantive background of exposure to such poorer quality of education, they need to exercise caution to avoid potential misdiagnosis.

For instance, children with disadvantaged educational exposure may be mistakenly classified as mentally handicapped or intellectually compromised, with the implication of the need for placement in special educational streams or special needs schools, when this is not actually applicable. Such erroneous placement would in turn cause further disadvantage in terms of educational exposure, by virtue of the child having been removed from the challenge of mainstream education, and would in addition be harmful to self-esteem as a consequence of the child’s perception of him- or herself as being intellectually subnormal. In addition, treatment or compensation for the presence and extent of damage following brain trauma will be extremely difficult to evaluate with any accuracy if the specific effect of disadvantaged education is unknown. Lowered scores may result in an overestimate of the extent of damage, and thereby contribute to a falsely applied sick image, or unwarranted financial compensation. Conversely, for those with relatively advantaged education, if interpretations of test data are applied with the expectation of significantly lowered scores on the basis of race alone when this is not applicable, the presence of clinically significant lowering due to brain dysfunction may be overlooked. Such misdiagnosis could preclude a child from receiving appropriate medical interventions which might even be life-saving, or could preclude the child from special educational support when it is indicated, and/or could deprive the child of deserved financial compensation.
Conclusion

The WISC-IV is the most recent advance in the Wechsler series of intelligence scales for children covering the age range 6 years to 16 years 11 months (Wechsler, 2003), with stronger psychometric properties than earlier versions of the test (Baron, 2005; Prifitera et al., 2005). However, it has never been standardised for a South African population, nor have any South African standardisations been undertaken for preceding versions of the test.

This chapter has presented the results of preliminary norms established for a Grade 7, largely Eastern Cape population in the age range 12 to 13 years across participants stratified for race, language, and disadvantaged versus advantaged education. The resultant norms are thus very specific to the demographic features of 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 than Xhosa-speaking black African language groups. Nevertheless, the outcome reveals substantive lowering in association with disadvantaged education across all race groups of as much as 20 to 30 IQ points, replicating the earlier South African WAIS-III study of Shuttleworth-Edwards et al. (2004), and earlier research in relation to the WISC-R and WISC-III of Zindi (1994) and Brown (1998), respectively. In accordance with the observations of Nell (1999) and Manly (2005) noted above, the research confirms in robust fashion that ethnicity in itself is not a meaningful norming category. Significant heterogeneity within ethnic groups, particularly in terms of quality of education, should therefore be accounted for in test interpretation with multicultural and multilingual populations. It is essential that appropriate cross-cultural norms such as those explicates here are used in clinical practice to ensure that misdiagnosis is avoided.

Although sample numbers were relatively small within the Shuttleworth-Edwards et al. (2004) study (n = 10 to 12 participants per subgroup), data that are well stratified for the pertinent variables of age, level of education, ethnicity and/or quality of education are considered to have more validity than poorly stratified data on large sample numbers (Lezak et al., 2004; Mitrushina et al., 2005; Strauss et al., 2006). Accordingly, the research is published in a leading international journal of clinical neuropsychology, and cited in a number of seminal neuropsychology assessment texts (for example, Grant & Adams, 2009; Strauss et al., 2006). A current literature search failed to reveal any further cross-cultural reports since the Shuttleworth-Edwards et al. (2004) study in respect of any of the adult and child Wechsler Intelligence Scales, including the WAIS-R, WAIS-III, WAIS-IV, WISC-R and WISC-IV, such that the indications from this 2004 South African study on the WAIS-III have remained the most pertinent to date, with a glaring gap in cross-cultural information in respect of the child versions of this series of intelligence scales.

The data in this chapter in respect of the WISC-IV, while also in respect of small sample numbers, similarly gain validity in that the sample is well stratified for the relevant socio-cultural variables. Further, clear replication of the adult findings in this child-oriented research, of a downward continuum of IQ
test performance in association with poorer quality of education rather than ethnicity per se, provides cross-validation for both the adult and child research probes. Thus, the cross-cultural data presented in this chapter go a significant way towards filling the South African cross-cultural research gap in respect of the Wechsler intelligence scales.¹

Note
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standardisation sample and for black students referred for psychological evaluation. 
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