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Cross-cultural Effects on IQ Test Performance: A Review and Preliminary Normative Indications on WAIS-III Test Performance

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ABSTRACT

This article presents a review of cross-cultural influences on Wechsler IQ tests, together with a preliminary investigation into WAIS-III test performance *(English administration)* for a southern African sample (age range 19–30) stratified for white English first language and black African first language, level *and* quality of education. ('African language' is the term used to denote the indigenous languages of black populations in southern Africa). A two-way ANOVA revealed highly significant effects for both level and quality of education within the black African first language group. Scores for the white English *and* black African first language groups with advantaged education were comparable with the US standardization, whereas scores for black African first language participants with disadvantaged education were significantly lower than this. Thus indications from this research are that normative studies should take account of the influential variable of quality of education, in addition to level of education. Alternatively faulty conclusions may be drawn about the effects of ethnicity, with the potential for neuropsychological misdiagnosis.

INTRODUCTION

It is well-recognized that the application of tests of cognitive ability from one ethnic group to another without appropriate standardization is highly problematic for both diagnostic and placement purposes (Ardila, 1995; Ardila and Moreno, 2001; Fletcher, Todd, & Satz, 1975; Hanna, House & Salisbury, 1968; Loewenstein, Arguelles, Arguelles & Linn-Fuentes, 1994; Manly, Jacobs et al., 1998; Manly, Miller et al. 1998; Ogden & McFarlane-Nathan, 1997; Okazaki & Sue, 2000; Stricks, Pittman, Jacobs, Sano & Stern, 1998; Tang, Lau, & Chang, 1996; Viljoen, Levett, Tredoux & Anderson, 1994). Many of the differences found on comparisons by these researchers have been attributed to a homogenous set of socio-cultural factors that happen to characterize a particular ethnic group, rather than ethnic attributes per se. Complicating the issue, however, is that an ethnic group may, but equally may not be homogenous in terms of socio-cultural characteristics (Gasquoine, 2001; Manly et al., 2000; Shuttleworth-Jordan, 1996). In the current milieu of globalization, and

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rapid movement of previously disadvantaged individuals to urbanized western conditions, there may be marked variations in socio-cultural features within ethnic groups. This in turn will be accompanied by variable effects on cognitive test performance.

Socio-cultural influences encompass a number of closely inter-related variables that are difficult to separate, including language usage and reading ability, level and quality of educational attainment, socio-economic status, home and schooling socialization experiences (Ardila, 1995; Gonzales & Roll, 1985; Helms, 1992; Manly, Jacobs et al., 1998; Manly, Miller et al., 1998; Manly et al., 2000; Nell, 1999; Olazaran, Jacobs & Stern, 1996; Shuttleworth-Jordan, 1996). Ardila notes that culture dictates what is, and what is not relevant, and provides models for ways of thinking, acting and feeling, with resultant variations in cognitive test results. Such influences contribute to the acquisition of *crystallized* functions of language ability and factual knowledge, as well as *procedural* functions incorporated under the term `test-wiseness' such as pencil use, familiarity with copying tasks, better attitudes, self-confidence and concentration in test-taking situations (Anastasi, 1982; Nell, 1999). These entrenched classroom-type skills are described by Nell (1999) as "the most powerful moderator of test performance" (p. 133), and hence there is the potential for substantial socio-cultural effects on cognitive test measures in both the verbal and non-verbal areas. Accordingly, Rosselli and Ardila (2003) challenge the frequently upheld view that visuospatial and non-verbal tests are culturally and educationally fairer than verbal tests, citing a number of studies that demonstrate a strong association between educational level and performance on common non-verbal neuropsychological tests. Further insight into socio-cultural influences in both the verbal and non-verbal test areas can be gleaned from a review of cross-cultural studies on the various Wechsler IQ tests.

Applying Wechsler Intelligence Tests to Different Cultures

A universalist conception of intelligence would argue that the measurement of intelligence can be achieved with the same instruments in different cultures. In support of this notion is the common finding of cross-cultural congruence with respect to the factor structure of the Wechsler IQ scales. This has been demonstrated for American blacks versus whites (Faulstich, McAnulty, Carey & Gresham, 1987; Kaufman, McLean & Reynolds, 1991); for a Spanish speaking versus English speaking US sample (Demsky, Gass & Golden, 1998); for Argentinians versus the US sample (Insua, 1983), for Italians versus the US sample (Orsini & Laicardi, 2000), and for Chinese versus the US sample (Lynn & Dai, 1993). Further, in a study of substance abusers by Ryan, Arb & Kreiner (2000), reliability of the WAIS-III was good for both African Americans and Caucasians.

However, the universalist notion is problematic in light of the need for significant item adjustment, and differences in subtest data that are reported across a broad spectrum of studies on the cross-cultural application of Wechsler intelligence tests. For example, modifications to the American standardizations of the WAIS and the WAIS-R were necessary when applying these tests in Argentina (Insua, 1983), including extensive modifications to the subtests Vocabulary, Information, and Comprehension, and moderate alteration to the Arithmetic subtest. Despite these alterations when Argentine and American individuals were compared, the American group significantly outperformed the Argentine group on Digit Symbol, Vocabulary, Arithmetic and Similarities. The educational level of the Argentine group was lower than the American group, and in addition probably of a poorer quality, and Insua hypothesizes this as the explanation for the differences, except for Digit Symbol which may be a result of "unknown cultural and personality factors" (Insua, 1983, p.436).

In three different studies of blacks versus whites, the whites significantly outperformed the blacks on WAIS-R Vocabulary and Block Design (Kaufman, McLean & Reynolds, 1988; Marcopulos, McLain & Giuliano, 1997; Paolo, Ryan, Ward & Hilmer, 1996). Similarly, in a study on Indians versus whites (Ardila & Moreno, 2001) whites outperformed the Indians on WISC-R Block Design, and in a study comparing whites with African Americans a measure of acculturation accounted for poor scores on WAIS-R Block

Design for the African Americans (Manly, Miller, et al., 1998)[1]. A poor Vocabulary score can easily be understood in terms of educational differences. However, it is of note from these studies that the non-content oriented Block Design subtest has also consistently emerged as culturally sensitive in a negative direction. In a New Zealand study (Ogden & McFarlane-Nathan, 1997), Vocabulary scores for Maori men were lower than indications from the American standardization, whereas, surprisingly, in view of the Maori's more impoverished educational background, Block Design scaled scores were higher. The authors speculate that Maoris may have a particular aptitude for visuospatial perception, in association with a culture that is rich in designs not unlike the Block Design patterns. Overall it is of note that both Vocabulary and Block Design are particularly sensitive to cultural diversity usually in a negative direction in association with a relatively deprived educational background. Importantly, although Block Design is a performance rather than verbal task, on the basis of these studies it does not stand up as a culture fair test. In keeping with this is the outcome of a comparison of WAIS IQ scores between blacks, Mexican Americans and whites (Overall & Levin, 1978). In this study Performance IQ (PIQ) was lowered for blacks and Mexican Americans by almost as much as the lowering apparent for Verbal IQ (VIQ).

Even in English-speaking populations modifications to the original American-based Wechsler tests have been necessary. In Ireland James and Dalton (1993) produced alternate questions for the WAIS-R Information subtest. A similar item-exchange exercise was carried out in New Zealand (Petrie, Dibble, Long-Taylor & Ruth, 1986). Crawford, Gray & Allan (1995) demonstrated differences in favor of UK participants versus the US standardization for Arithmetic and Digit Span. These authors point to literature on modem theories of working memory which demonstrate that speed of articulation is related to memory span for sequences of pronounceable items, as well as mental arithmetic performance. Hence it is suggested that the characteristic American drawl (which reduces articulation rate) might explain the higher Digit Span and Arithmetic subtest scores for the UK group. Importantly, Digit Span is another test (as with Block Design, see argument above), which might plausibly be thought of as a culture fair test due to apparently low culturally acquired content. However, as pointed out by Crawford et al. (1995) on the basis of their research, such an assumption for Digit Span may be false.

The application of western IQ tests to very different cultures, such as African-based cultures, is considered especially problematic (Kendall, Verster & Von Mollendorf, 1988). Zindi (1994) compared the results of black working-class Zimbabwean children with those of white London children on the Wechsler Intelligence Scale for Children - Revised (WISC-R). Overall the English group had a mean Full Scale IQ of 94.7 while the Zimbabwean group had a mean IQ score of 67.09. The Zimbabwean group fell consistently below the English group by approximately 2.56 scaled points on each subtest. Zindi (1994) also used the Raven's Progressive Matrices (typically viewed as a relatively culture-fair test) for comparative purposes. Again the English group outperformed the Zimbabwean sample with mean IQ's being 96.71 and 72.36 respectively. Since language is not necessary for the administration of the Raven's Progressive Matrices, Zindi suggests that the lack of westernized test sophistication is likely to be a contributory factor for this lowered performance. Dugbartey et al. (1999) demonstrate a strong verbal component in the WAIS-III Matrix Reasoning test (a test which is highly comparable to the Raven's Progressive Matrices). Thus these authors caution that WAIS-III Matrix Reasoning may not be a culture fair task, an argument that is consistent with the depressed scores on the Raven's Progressive Matrices in Zindi's research.

In South Africa, Skuy, Schutte, Fridjhon and O'Carroll (2001) converted the WISC-R performance of black students in the historically

[1]A measure of 'acculturation' as defined by such researchers is the extent to which an ethnic group adopts the behaviours, language and values of the dominant culture. It incorporates a number of closely inter-related variables including, language usage, reading ability, level and quality of educational attainment, socio-economic status, home and schooling socialization experiences, all of which in turn are companied by variable effects on cognitive test performance.

black Soweto schools according to the American standardization data, obtaining scaled scores ranging from as low as 2.85 for Vocabulary, and 7.06 and 7.60 for Picture Completion and Mazes, respectively. Avenant (1988) applied the WAIS-R to a sample of black South Africans, aged over 18, with education at least to the Standard 7 level. The sample comprised prison warders and students from historically black universities. The university undergraduates scored better than the prison warders, but fell significantly below the American standardization sample, with a mean Full Scale IQ of 77 (recalculated in Nell, 1999, p. 132). The prison warder's mean Full Scale IQ was 73. In contrast Shuttleworth-Jordan (1996) conducted a study drawing on African first language students studying in the medium of English at a traditionally white university. In this study there was consistent, yet only marginal lowering of scores for black African first language versus white English first language students on a variety of neuropsychological measures, including the South African Wechsler Adult Intelligence Scale (SAWAIS) Digit Span and Digit Symbol subtests. Further it was found that the black African first language scores were equivalent to those of comparable American standardization data.

When comparing the indications from the Avenant and Shuttleworth- Jordan studies, which were both on black University students, it appears that quality of education must be called upon in order to explain the highly discrepant findings. Albeit ostensibly equivalent for educational level, in Avenant's study students from the historically disadvantaged black universities demonstrate an IQ level in the borderline range. In contrast, in Shuttleworth-Jordan's study, students from a historically advantaged white university achieve scores that were commensurate with the American standardization data, and that were not substantially different from their white English-speaking university counterparts.

Importantly, Shuttleworth-Jordan (1996) notes that whilst most of the cognitive test differences between the advantaged black African first language and white English first language groups in her study were broadly equivalent there was still marginal lowering for black students relative to whites. This is explained in terms of subtle differences in quality of education within the black sample, in that whilst currently enjoying advantaged quality of education at a traditionally white university, some of the black students are likely to have had a history of disadvantaged schooling. Similarly, Manly, Jacobs, et al. (1998) found that when the education of the participants was controlled many of the depressed performances noted for elderly African-Americans in relation to white individuals became non-significant. However, these authors point out that there is likely to be variability in the characteristics of school experience of the two ethnic groups that is probably not adequately measured by the variable of years of education. Accordingly, in a subsequent study on African American and white elders (Manly et al., 2000) demonstrated that adjustments for reading scores greatly reduced cognitive test differences between the race groups, albeit the comparative groups were matched for years of education. (In this study reading scores were used as estimate of quality of education). Thus, as in the Shuttleworth-Jordan research, the indication from Manly et al. (Manly, Jacobs et al. 1998; Manly et al., 2000) is that education measured in terms of *level* of attainment makes a large contribution to cognitive test performance, but does not entirely explain the different performances, which may be better explained when *quality* of education is added.

In addition to Shuttleworth-Jordan (1996) and Manly et al. (2000), a gathering number of other cross-cultural researchers in recent years have alluded to the importance of quality of education as a possible moderating variable in psychometric test performance (Claassen, et al., 2001; Fillenbaum, Heyman, Huber, Ganguli, & Unverzagt, 2001; Grieve & Viljoen, 2000; Insua, 1983; Nell, 1999; Okazaki & Sue, 2000; Stricks et al., 1998). Quality of education is called upon to explain lowering for particular groups in spite of matching for educational level. It is also posed as an explanation for the lowering on so-called culture-fair *performance* tasks, such as occurs regularly for non-westernized groups (see earlier review), and which is not so easily attributable to differences in level of educational attainment.

The proposed influence of quality of education has implications for the standardization of the

WAIS-III (administered in English) that has recently been completed for South African use by the South African Human Science Research Council (HSRC)(Claassen et al., 2001). In South Africa, due to the apartheid regime there have been vastly discrepant educational facilities for white versus black individuals; and since the dismantling of Apartheid, there have been widely differing schooling opportunities for more socially advantaged black individuals versus those that are less advantaged. Thus the quality of education attained for South African individuals may differ substantially both across and within ethnic groups, and this will have implications for psychometric test performance.

However, it has not been normal practice to control for quality of education in standardization procedures for IQ tests (Wechsler, 1981; 1997), and commensurate with this, the HSRC did not devise empirical controls for this variable in the South African standardization. This omission has been heavily criticized by Nell (1999), who proposes that the representativeness of the HSRC standardization data will be flawed due to vastly different types of educational exposure amongst black people in South Africa as a legacy of the Apartheid structure. Accordingly, in order to test this proposition, it was decided to conduct an initial probe into WAIS-III test performance (English administration), on a South African sample of white English first language and black African first language participants, which was further stratified with respect to both level and quality of education.

METHOD

Participants

The mode of participant selection was modelled on that employed for the South African WAIS-III standardization (Claassen et al., 2001), for which a pre-planned sampling matrix was devised in order to stratify for relevant variables. In the present study, testers who were based in the Eastern Cape, South Africa, identified as many local participants as possible on a voluntary basis who complied with the sampling plan. Stratification was based on two ethnic/language groups (white English first language and black African first language), two factors of level of education (Grade 12 and Graduate) and two factors of quality of education (advantaged and disadvantaged). For each of these categories, subjects in the age range 19–30 were recruited. Equal numbers of males and females were drawn into the subgroups, and there was an attempt to maintain balanced numbers between comparative groups. Commensurate with the Claassen et al. (2001) sampling, all participants had to confirm on the basis of an interview that they were either studying or working in the medium of English, or speaking English most of the time at home. *Exclusion Criteria* comprised a past history of any head injury, learning difficulty, neurological or psychiatric disorder. The final sample consisted of 68 volunteer participants (mean age 24.06 years) of which there were 40 black African first language speakers (equally divided between advantaged and disadvantaged education) and 28 white English first language speakers (all advantaged education). The terms ‘black’ and ‘white’ are qualified by ‘African first language’ and ‘English first language’ to reflect the exclusion of any persons in the black group whose first language was other than an indigenous southern African language, and the exclusion of any persons in the white group whose first language was other than English.

Level of Education

As with the HSRC standardization (Claassen et al., 2001), sample-realization was most difficult in the low education bracket for relatively advantaged blacks that are proficient in English. These individuals usually have the motivation and means to progress to at least Grade 12 and beyond. Hence, in the present study blacks in the category of advantaged education without tertiary education were very difficult to find, and those without Grade 12 education were almost impossible to find. Thus, in order to investigate high versus low quality of education in relation to high versus low levels of education (which was the target of this investigation), it was necessary to restrict the comparative levels of educational attainment to Grade 12 versus Graduate, since participants were not available for lower levels of education in each cell of the sampling grid. Also, difficulties with sample realization among the advantaged blacks without graduate education served to curtail overall sample numbers (in the interest of achieving balanced numbers between groups).

Years of education were calculated according to the number of years it usually takes to achieve the education (i.e. not the actual number of years taken to arrive at that level). Thus the attainment of Grade 12, which is the school leaving and University entrance level, was recorded as 12 years; a 3-year bachelors degree or diploma as 15 years, an honors degree as 16 years and a masters degree as 18 years. Individuals with a 1 or 2 year diploma in addition to Grade 12, were attributed the extra 1 or 2 years of education, but were included

in the Grade 12 category on the basis that they were not university graduates. The mean number of years of education attained for comparative groups stratified for language of origin and quality of education was well controlled, ranging for Grade 12s between 12.20 and 12.60 years (mean = 12.45 years), and for Graduates between16.30 and 16.70 years (mean = 16.50 years).

Quality of Education

In the South African Apartheid regime schooling for blacks was organized separately from that for whites under a body entitled the Department of Education and Training (DET schooling). DET schooling had its own syllabi and examination systems, and minimal resources comprising only 5% to 25% of that expended on schooling for English and Afrikaans speaking whites (Claassen et al., 2001; Kallaway, 1984). Under the Apartheid system socially advantaged white South Africans were catered for by elite private schools modelled on the British public schools, as well as superior level government schools designated as Model C schools. Similarly in Zimbabwe, South Africa's closest neighbor on its northern boundary, the private schools were modelled on the British public schools, with education of an equivalent high standard.

Compared with such private/ Model C schooling, the under-resourced South African DET system typically resulted in high pupil-to-staff ratios because of insufficient schools, poor salaries with staff shortages such that teachers might be employed without appropriate qualifications, minimal extra-mural activities, and limited facilities in the form of classroom space, desks, and reading and writing materials. In the last decade, since the dismantling of Apartheid, blacks have been increasingly integrated into the previously white private and Model C schools. However, a large proportion of blacks in the country still attend the prior DET schools, and these are likely to remain relatively impoverished for many decades to come despite revised educational policy that demands a more equitable allocation of resources. The disparity in educational conditions implies that those with DET schooling would be less likely to have benefited to the same extent as those with white private/Model C schooling in respect of acquired knowledge (including English proficiency and reading ability) and test taking abilities. This is reflected annually in wide discrepancies in Grade 12 pass rates between these two educational sectors (Cull, 2001).

Thus, for the purposes of the present study, it was considered that private schooling in South Africa and Zimbabwe, and Model C schooling in South Africa, would represent a superior education, and South African DET schooling would represent a lower quality of education. Furthermore, such representation was ensured via sampling of participants largely in the Eastern Cape where the historically black (DET) schools are exceptionally under-resourced, in contrast to traditionally white schools in the same province that are of a particularly high caliber (Cull, 2001). The sample comprised three groups stratified for quality of education: (i) black African first language individuals with good quality Private/Model C schooling (n = 20; 14 Private and 6 Model C); (ii) black African first language individuals with poor quality DET schooling (n = 20), and (iii) white English first language individuals with good quality Private/Model C schooling (n = 28; 18 Private and 10 Model C). All (100%) of white Grade 12s and Graduates had Private/Model C education at both junior and senior school levels. All DET Grade 12s and Graduates with the required four years of senior school DET education, also had DET junior school education. Most (80%) of the black Private/Model C Grade 12s with the required four years of senior school Private/Model C education, had DET junior school education. Most (80%) of the black Private/Model C Graduates also had Private/Model C junior school education, making this an especially educationally advantaged black group with a measure of equivalence to the white Private/ Model C graduates, all of whom had Private/Model C schooling at both the junior and senior levels.

In respect of quality of education, it is logical to assume that there is a substantial measure of pre-selection in the comparative groups. In other words, many of those blacks acquiring advantaged education rather than disadvantaged education in the southern African context are likely to have come from more advantaged backgrounds in the first instance in terms of inherent ability, parental educational and occupational levels, and material opportunities. Furthermore, enhanced proficiency in English, including reading ability, is likely to be associated with better quality of education. Accordingly, Manly, Jacobs, Touradji, Small, and Stern (2002) use a measure of reading achievement as an estimate of quality of education, citing literature which reports positive correlations on measures of reading achievement with direct measures of quality of education including pupil expenditures, teacher/student ratios, and teacher education. However, whilst such variables are likely to be highly inter-related, they are unlikely to be entirely overlapping in their effects. Thus it would appear preferable to target the variable of quality of education directly (rather than via an estimate) as was made possible in the present study due the legacy of the former South African Apartheid system. Since selection in terms of good versus poor quality of education will provide an automatic grouping in respect of the above-mentioned influential variables of language and reading ability, material advantage, parental education, and so on, it is considered a crucial category for

use in clinical settings. Whilst of academic interest, it was not the purpose of the present practitioner-oriented research to examine the contribution of these various inter-related variables to the primary variable of 'quality of education' as delineated for this study.

Age Distribution

Participants were required to have completed Grade 12, including at least four consecutive years of education from one of these designated school categories. The mean age across comparative groups for quality of education varied for Grade 12s from 23.64 to 25.60 years, and for Graduates from 22.93 to 27.40 years. The mean age for DET groups fell at the top of the range for both Grade 12s and Graduates (25.60 and 27.40 years, respectively) indicating that individuals with DET education tended to be slightly older than those with Private/Model C education. It was considered that this age difference would not contribute to any significant effect on cognitive testing, being well within the decade bracket typically used for stratification purposes in norming studies (Lezak, 1995; Mitrushina, Boone D'Elia, 1999). Commensurate with this, perusal of the WAIS-III standardization (1997) in respect of all the subtests, indicates a high degree of overlap between the 18–19, 20–24, 25–29 and even the 30–34 year old age categories. In other words, conversion of the same raw score for any particular subtest across these four age stages, yields very little (if any) difference in scaled scores. Any attempt to control statistically for the effect of age in this sample is problematic, in that those participants with older age are also those with poor quality of education, the effects of which are likely to dominate the statistical outcome.

Accordingly, for the present study, correlations for all subtests between age and the raw scores were found to be *negative* and although weak, significant at the 0.01 level in five instances ($-0.369<r<-0.137$; $p>0.01$ for 9 correlations, and $0.002<p<0.009$ for 5 correlations). The negative direction of all the correlations indicates that older age is consistently associated with poorer scores. The pervasive negative correlation is not consistent with the well-documented pattern of normal aging effects (as reflected in the WAIS-III standardization manual, 1997), which typically comprises higher verbal and lower performance scores in association with advancing age from the young to middle adult years. The significant negative correlations, therefore, appear to be an artefact of the poorer scores that are expected in association with disadvantaged DET education, rather than a significant age effect per se. It is not expected that fundamental aging patterns with an accepted neurocognitive basis would alter dramatically cross-culturally. Furthermore, as indicated above, age effects for scaled scores on the WAIS-III in the age category 19–31 are virtually non-existent, which supports the argument that poor quality DET education rather than significant age effects is the more likely explanation for these results.

Thus it was decided that the use of the age-adjusted conversion of raw scores to scaled scores would be the most appropriate control (in addition to the restricted age stratification of the sample) for any subtle age effects in this study, albeit the adjustments are in respect of the US standardization sample. Furthermore, reference to scaled scores (rather than raw scores), and especially the ability to make comparisons with the U.S. scaled scores, was the objective of this practitioner-oriented study. This enables a clinician to take a patient's scaled score calculated according to the U.S. standardization, and compare it with the mean scaled score for a sample of equivalent black persons with DET Grade 12 education, also derived according to the U.S. standardization. In the clinical situation, the utilization of raw scores in isolation would have limited diagnostic value.

Linguistic Distribution

In southern Africa, in association with various geographical locations, there are numerous indigenous black African languages that are related albeit not identical. These can be considered broadly comparable linguistically in contrast to a language such as English that is of European rather than African derivation, thus justifying a composite group of participants with an indigenous African first language. Cultural differences may exist between linguistic groupings *within* the black African population, and given time and adequate resources might warrant separate analysis to examine fine subcultural differences. However, for the purposes of this preliminary study a black African group of mixed indigenous languages was investigated in order to fill the sampling grid in respect of the set variables of age and education. This is in keeping with the South African standardization of the WAIS-III (Claassen et al., 2001), in which the 'black' grouping was constituted via a pooling of participants based on the geographical distribution in the country, rather than on equal representation of geographical and/or linguistic groupings for separate comparative analysis. Consequently, in the Claassen et al. 'black' sample as in the present sample, there was an imbalance of regional representation (and by implication linguistic representation), comprising three times the number of blacks from the north-eastern provinces of the country, compared with those in other regions. (The linguistic distribution of the black sample was not specified in the standardization manual provided for clinical application in the country). Similarly, for the present research it was considered that differential outcome for separate

linguistic categories *within* the black African first language groups was likely to be subtle, and unlikely to obscure the more dominant effects on WAIS-III test performance for black versus white race in interaction with level and quality of education.

At the time of data collection for the current study (1999), advantaged education for black individuals in South Africa had been available for a short time only (since 1991). Consequently, there was a paucity of black graduates of Eastern Cape origin who had experienced at least four years of advantaged schooling prior to several years of tertiary education, causing the sampling net to be spread wider. Thus, the black sample largely comprised participants with an indigenous African first language of Eastern Cape origin (n = 29), but included a proportion of participants with an indigenous African first language who were living or studying in the Eastern Cape, but who originated from north-eastern provinces of South Africa (n = 6) and Zimbabwe (n = *5).* This yielded the following linguistic distribution: Xhosa (n = 29), Northern Sotho (n = 1), Tswana (n = 3), Zulu (n = 1), and Shona (n = 6). In relation to quality of education, the final linguistic break-down for the black African first-language sample was as follows: DET Grade 12s (9 Xhosa, 1 Northern Sotho); Private/Model C Grade 12s (9 Xhosa, 1 Shona); DET Graduates (9 Xhosa, 1 Tswana); Private/Model C Graduates (2 Xhosa, 1 Zulu, 2 Tswana, 5 Shona). It is considered that this sampling procedure produced the relevant stratification for advantaged versus disadvantaged quality of education, and complied with the broad linguistic criteria for the study, of blacks with an indigenous African first language versus whites with English as first language.

Procedure

The data were collected by four intern clinical psychologists, trained in the administration of the WAIS-III. The standard WAIS-III in English was administered to all participants, with only minor alterations in respect of obvious culture bias as designated by the HSRC for its standardization purposes (for example, rands in place of dollars in the Arithmetic subtest). The protocols were scored according to the WAIS-III manual scoring criteria. Consensus amongst the research team was achieved in cases of scoring uncertainty. Raw scores were converted to Scaled Scores, and Full Scale IQ, Verbal IQ, Performance IQ and the Factor Indexes were calculated using the American standardization (Wechsler, 1997).

Statistical Analyses

A two-way analysis of variance determined the overall effects of level and quality of education within the black African first language group. Multivariate analysis with more fine stratification than this was not feasible due to resultant overly small cell numbers. However, the results of the ANOVA for both level and quality of education within the black African first language group were for the most part highly significant in the expected direction. Hence, for further preliminary indications it was decided to conduct subgroup comparisons via t-test analyses as follows: (i) DET versus Graduate education within the white English first language group; (ii) Graduate DET versus Graduate Private/Model C subgroups within the black African first language group; (iii) Grade 12 DET versus Grade 12 Private/Model C subgroups within the black African first language group. Bonferroni's adjustment to the level of significance was applied to subgroup multiple comparison tests within the black African first language group. It was considered that the conversion to scaled scores would provide a measure of control for typical aging trends given the predominance of older participants in the DET subgroups. The use of age as a covariate in the ANOVA was therefore not indicated, and might in any case serve to confound the results due to the covariation between DET education and older age which described the sample.

RESULTS

Statistical Analysis

The results of the statistical analyses reveal a highly significant effect for both level and quality of education consistently in the direction of poorer performance for Grade 12s versus Graduates across both black African and white English first language groups (Table 1 and Table 2), and for DET education in relation to Private/Model C education in the black African first language group (Table 1). It is of note that for the black African first language sample (Table 1), the main effect for quality of education is even more pervasive than for level of education. For *quality* of education there is a significant lowering for poor quality DET education relative to good quality Private/Model C education across *all* subtests, Factor Indexes and IQ scores. For *level* of education the drop in performance for Grade 12 education fails to reach significance for Digit Symbol, Arithmetic, Matrix Reasoning, Letter-Number Sequencing and Object Assembly. Moreover (Table 1), the interaction effect for Digit Symbol denotes a substantial fall-off for Digit Symbol due to quality of education which is not as marked for level of education.

Table 1. Two Way Analysis of Variance (ANOVA) of Performance for Black African First Language Participants On WAIS-III Subtest Scaled Scores, Factor Indexes and IQ Scores, for Level and Quality of Education.

	Level					Quality					Inter-action
	Graduate *n* = 20		Grade 12 *n* = 20			Private/Model C *n* = 20		DET N = 20			
	Mean	(*SD*)	Mean	(*SD*)	F-Value	Mean	(*SD*)	Mean	(*SD*)	F-Value	F-Value
Picture Completion	10.05	(3.02)	8.30	(2.96)	4.45*	10.65	(2.45)	7.70	(2.97)	12.64**	0.61
Vocabulary	11.20	(2.89)	6.45	(3.19)	41.86**	10.80	(3.47)	6.85	(3.18)	28.67**	0.04
Digit Symbol	10.00	(2.60)	8.70	(3.57)	2.78	11.10	(2.75)	7.60	(2.52)	20.16**	4.76*
Similarities	11.45	(2.78)	8.15	(3.18)	17.12**	11.40	(2.92)	8.20	(3.11)	16.10**	1.27
Block Design	9.15	(2.50)	7.25	(2.67)	5.81*	9.00	(2.32)	7.40	(2.92)	4.12*	0.79
Arithmetic	10.55	(2.87)	8.90	(3.08)	3.69	11.05	(3.30)	8.40	(2.14)	9.53**	0.17
Matrix Reasoning	11.00	(3.39)	9.75	(3.97)	1.53	12.25	(3.29)	8.50	(3.14)	13.75**	0.88
Digit Span	10.60	(2.48)	8.65	(3.48)	5.30*	11.00	(3.06)	8.25	(2.63)	10.53**	1.84
Information	11.50	(2.54)	7.25	(2.53)	38.91**	10.75	(3.13)	8.00	(2.94)	16.29**	0.44
Picture Arrangement	9.30	(3.95)	6.55	(2.98)	13.03**	10.45	(3.24)	5.40	(2.14)	43.95**	0.21
Comprehension	12.30	(2.68)	8.75	(3.63)	19.43**	12.45	(3.12)	8.60	(3.07)	22.85**	0.65
Symbol Search	9.10	(2.43)	7.00	(2.77)	8.87**	9.45	(2.31)	6.65	(2.54)	15.77**	0.08
Letter- Number Sequencing	11.45	(2.33)	9.70	(3.56)	3.98	11.75	(2.47)	9.40	(3.27)	7.18*	1.43
Object Assembly	7.30	(2.15)	6.00	(2.97)	2.87	7.70	(2.82)	5.60	(2.04)	7.49**	0.02
Verbal-Comp Index	107.45	(12.15)	88.05	(15.86)	42.48**	105.25	(15.70)	87.10	(15.90)	27.27**	0.11
Perceptual-Org Index	99.10	(14.88)	87.85	(17.40)	5.30**	103.40	(12.81)	87.10	(14.72)	15.60**	1.19
Working-Mem Index	104.15	(13.90)	87.15	(17.05)	6.87**	107.10	(13.87)	91.55	(13.72)	14.93**	1.77
Processing Speed Index	107.50	(13.57)	84.85	(14.79)	6.94*	101.25	(11.70)	84.40	(11.40)	25.15**	2.00
Verbal IQ	100.00	(14.58)	90.50	(16.14)	36.31**	107.50	(14.52)	88.00	(13.64)	36.69**	0.47
Performance IQ	104.60	(10.79)	94.05	(18.41)	8.95**	104.30	(13.26)	82.65	(12.97)	33.15**	1.28
Full-Scale IQ	97.25	(11.73)	88.40	(15.41)	24.57**	106.65	(13.53)	84.65	(14.07)	41.15**	1.04

Significance (*p < 0.05; **p < 0.01)

Table 1 reveals that for the black African first language group, Performance IQ is as vulnerable as Verbal IQ to the effects of low level and poor quality of education, with highly significant lowering in both the Performance and Verbal IQ modalities for Grade 12s versus Graduates, and DET versus Private/Model C education. For these comparisons, the factor indexes also reflect this spread of lowered scores across both performance and verbal modalities. In contrast Table 2 reveals that for the white English first language group the effects of low level Grade 12 education relative to high level Graduate education is associated with poorer performance exclusively on the Verbal IQ scale, and exclusively on the Verbal Comprehension Index. It is also evident when perusing the results on Tables 3 and 4 (the investigation of quality of education in black African first language Graduates and Grade 12s, respectively) that when a lower level of education (Grade 12) aggregates

Table 2. A t-test Comparison of WAIS-III Subtest Scaled Scores, Factor Indexes and IQ Scores for White English First Language Participants with Private/Model C Education, Grade 12 versus Graduate.

	English First Lang. Private/Model C Graduate n = 14		English First Lang. Private/Model C Grade 12 n = 14		t - Value
	Mean	(*SD*)	Mean	(*SD*)	
Picture Completion	13.00	(2.72)	12.21	(3.26)	0.69
Vocabulary	15.43	(2.14)	10.57	(2.68)	5.30**
Digit Symbol	12.43	(1.91)	11.50	(1.87)	1.30
Similarities	13.57	(2.31)	11.00	(2.88)	2.60*
Block Design	11.64	(2.50)	11.14	(2.91)	0.49
Arithmetic	13.50	(1.91)	10.00	(2.91)	3.76**
Matrix Reasoning	13.36	(3.03)	12.43	(2.79)	0.84
Digit Span	12.86	(2.74)	10.86	(3.63)	1.64
Information	13.86	(1.51)	10.29	(2.27)	4.90**
Picture Arrangement	11.43	(2.53)	10.57	(2.28)	0.94
Comprehension	13.93	(1.82)	10.50	(2.18)	4.53**
Symbol Search	11.78	(2.33)	10.07	(2.70)	1.80
Let-Numb. Sequencing	13.57	(2.24)	11.14	(2.93)	2.46*
Object Assembly	9.86	(2.69)	9.79	(3.02)	0.07
Verbal Comprehension Index	124.29	(8.41)	103.14	(11.36)	5.60**
Perceptual Organisation Index	116.29	(10.60)	111.86	(15.36)	0.89
Working Memory Index	119.79	(11.23)	103.86	(16.17)	3.03**
Processing Speed Index	111.64	(11.07)	104.29	(11.97)	1.69
Verbal IQ	124.93	(8.20)	102.71	(10.96)	6.07**
Performance IQ	116.14	(9.78)	110.50	(13.46)	1.27
Full Scale IQ	123.00	(8.44)	106.57	(12.15)	4.16**

Significant Difference (*p < 0.05; **p < 0.01)

with a poor quality of education (DET), the drop in WAIS-III performance is more pervasive especially for performance tasks. Thus, for black African first language Graduates (Table 3) there are no significant differences for the Perceptual Organization and Working Memory Indexes, whereas for black African first language Grade 12s (Table 4) all factor indexes and IQ scores show significant differences. Black African first language private/Model C Grade 12s (Table 4) achieve IQ scores in the Average range (a Verbal IQ of 98.90 and Performance IQ of 100.80), whereas the black African first language DET Grade 12s reveal performances in the borderline range (a Verbal IQ of 77.2 and Performance IQ of 74.90).

Descriptive Analysis of Specific Subtests

Of note with respect to specific subtests is that the Vocabulary subtest reveals the most striking fall-off when a low educational level and poor quality of education occur simultaneously. Thus, the black African first language DET Grade 12s score a vastly discrepant 4.40 for Vocabulary compared with 15.3 for white English first language Private/Model C Graduates (Table 4 and Table 2, respectively). Block Design consistently ranks amongst the lowest scoring subtest within the black African first language groups across all levels and quality of education (Table 1). Further, the significant interaction effect for level and quality of education in relation to the Digit Symbol task indicates that this test was particularly affected by poor quality of education in the absence of a marked effect for poor level of education (Table 1). Matrix Reasoning, also, does not hold up as a culture fair test when a low level of education aggregates with a poor quality of education within the black African first language group with a score of only 7.40 for DET Grade 12s compared with 12.10 for Grade 12s with Private/Model C education (Table 1).

Table 3. A t-test Comparison of WAIS-III Subtest Scaled Scores, Factor Indexes and IQ Scores for BlackAfrican First Language Graduates with Private/Model C versus DET Education

	African First Lang. Graduate Private/Model C $n = 10$		African First Lang. Graduate DET $n = 10$		t - Value
	Mean	(*SD*)	Mean	(*SD*)	
Picture Completion	11.20	(2.30)	8.90	(3.31)	1.80
Vocabulary	13.10	(1.66)	9.30	(2.63)	3.86**
Digit Symbol	10.90	(2.73)	9.10	(2.23)	1.62
Similarities	12.60	(2.32)	10.30	(2.83)	1.99
Block Design	9.60	(1.78)	8.70	(3.09)	0.80
Arithmetic	11.70	(2.98)	9.40	(2.37)	1.91
Matrix Reasoning	12.40	(3.41)	9.60	(2.88)	1.99
Digit Span	11.40	(2.99)	9.80	(1.62)	1.49
Information	13.10	(1.66)	9.90	(2.28)	3.58**
Picture Arrangement	12.00	(3.62)	6.60	(1.90)	4.18**
Comprehension	13.90	(2.42)	10.70	(1.89)	3.29**
Symbol Search	10.40	(2.01)	7.80	(2.15)	2.79*
Let-Numb. Sequencing	12.10	(2.51)	10.80	(2.04)	1.27
Object Assembly	8.30	(1.57)	6.30	(2.26)	2.30
Verbal Comprehension Index	116.00	(8.78)	99.00	(12.30)	3.56**
Perceptual Organisation Index	105.90	(10.87)	94.10	(15.92)	1.94
Working Memory Index	109.70	(11.46)	99.50	(6.59)	2.44
Processing Speed Index	103.30	(11.07)	91.20	(9.32)	2.64*
Verbal IQ	116.10	(7.50)	98.80	(9.43)	4.54**
Performance IQ	107.80	(11.82)	90.40	(12.63)	3.18*
Full Scale IQ	113.40	(9.03)	94.90	(11.67)	3.96**

Significant Difference (*$p < 0.025$; **$p < 0.005$ with Bonferroni's adjustment)

DISCUSSION

The purpose of this research was to provide a preliminary probe into the effect of level, and particularly quality of education on WAIS-III test performance (English administration), using a largely Eastern Cape South African-based sample of white English and black African first language individuals who were studying or working in the medium of English, or speaking English most of the time at home. This was in response to the cautionary comment by Nell (1999) that quality of education might be a potent influential factor in respect of such data. Thus the purpose was to provide initial normative guidelines for clinical use, as well as to produce awareness of trends that need to be followed up by further research and taken into account for standardization purposes.

Albeit preliminary, the results of the present study gain potency in view of their clear support for outcome anticipated from the literature. Thus the well-documented effect for level of education was in evidence across both the white English and black African first language groups in the direction of poorer performance for lower versus higher levels of education. Further, in accordance with the anticipated but under-researched influence of quality of education, an even more extensive effect than for level of education was demonstrated within the black African first language group in the direction of profoundly depressed scores for poor versus good quality of education. As would logically be expected, for both the white English and black African first language groups, verbal IQ scores were consistently depressed in association with lower levels of

Table 4. A t-test Comparison of WAIS-III Subtest Scaled Scores, Factor Indexes and IQ Scores for Black African First Language Grade 12s with Private/Model C versus DET Education.

	African First Lang. Grade 12 Private/Model C $n = 10$		African First Lang. Grade 12 DET $n = 10$		t - Value
	Mean	(*SD*)	Mean	(*SD*)	
Picture Completion	10.10	(2.60)	6.50	(2.12)	3.39**
Vocabulary	8.50	(3.31)	4.40	(1.08)	3.73**
Digit Symbol	11.30	(2.91)	6.10	(1.85)	4.77**
Similarities	10.20	(3.08)	6.10	(1.60)	3.73**
Block Design	8.40	(2.71)	6.10	(2.18)	2.09
Arithmetic	10.40	(3.62)	7.40	(1.35)	2.45*
Matrix Reasoning	12.10	(3.35)	7.40	(3.13)	3.24**
Digit Span	10.60	(3.24)	6.70	(2.58)	2.98*
Information	8.40	(2.37)	6.10	(2.23)	2.24
Picture Arrangement	8.90	(1.91)	4.20	(1.69)	5.83**
Comprehension	11.00	(3.16)	6.50	(2.55)	3.50**
Symbol Search	8.50	(2.27)	5.50	(2.46)	2.83*
Let-Numb. Sequencing	11.40	(2.50)	8.00	(3.74)	2.39
Object Assembly	7.10	(3.67)	4.90	(1.60)	1.74
Verbal Comprehension Index	94.50	(13.66)	75.20	(8.24)	3.82**
Perceptual Organisation Index	100.90	(14.64)	80.10	(9.76)	3.74**
Working Memory Index	104.50	(16.11)	83.60	(14.61)	3.04*
Processing Speed Index	99.20	(12.54)	77.60	(9.22)	4.39**
Verbal IQ	98.90	(14.98)	77.20	(6.70)	4.18**
Performance IQ	100.80	(14.28)	74.90	(7.89)	5.02**
Full Scale IQ	99.90	(14.28)	74.40	(7.00)	5.07**

Significant Difference (*$p < 0.025$; **$p < 0.005$ with Bonferroni's adjustment)

education and poor quality of education. However, of note is that performance tasks were pervasively lowered, almost as much as verbal tasks, for black African first language groups with low level and/or less advantaged quality of education. Commensurate with the caution from Rosselli and Ardila (2003) referred to earlier, this implies that the procedural factor of test-taking skills in association with differential educational opportunities does indeed have a significant influence on IQ test performance over and above pure language ability and crystallized knowledge.

Generally, the results are in keeping with other cross-cultural research reviewed in the introduction, which reveals IQ scores in the borderline range for black disadvantaged groups in South Africa and Zimbabwe (Avenant, 1988; Zindi, 1994, respectively), Performance IQ to be depressed almost as much as Verbal IQ for black participants (Avenant, 1988; Overall & Levin, 1978), which repeatedly indicates not only Vocabulary but also Block Design as the most culturally sensitive tasks (for example, Ardila & Moreno 2001; Insua, 1983; Kaufman et al., 1988; Manly, Miller, et al., 1998; Marcopulos et al., 1997;), and which has identified Digit Symbol and a matrix reasoning type test to be depressed for educationally disadvantaged groups (Insua, 1983; Zindi, 1994, respectively). Thus overall the results of the present research provide strong support for Nell's (1999) warning about the profound deleterious effect that is likely to occur on IQ test performance due to poor quality of education. The implication is that whilst verbal tasks and tasks of acquired knowledge are invariably culture sensitive, all performance tasks are ultimately culturally sensitive given sufficient deprivation due to the variable of test-wiseness.

Comparisons with WAIS-III Standardization Data

To the author's knowledge, aside from the study of Manly et al. (2002) there has been speculation but no substantial research in the cross-cultural arena which targets influences on cognitive test performance due to quality of education. Neither the US standardization nor the South African standardization for the WAIS-III (Wecshsler, 1997; Claassen et al., 2001, respectively) have controlled for the effect of quality of education. Hence it is useful to consider the outcome on the present study in relation to these other two WAIS-III data sets.

Since the present sample was stratified for two relatively high levels of education (Grade 12 mean 12.45 years; Graduate mean 16.50 years), it is not representative of the general population. Thus for comparative purposes with U.S. standardization data, a sample stratified for educational level is required. It appears that such data are not reported as yet for the WAIS-III, but are available for the highly equivalent WAIS-R (Matarazzo & Herman, 1984) (see Table 5). These authors report a WAIS-R Full Scale IQ of 100.1, and 115.3 for years of education attained of 12, and 16+ respectively (being the two most comparable educational levels for the present study). In the present study, Full Scale IQ for the black African first language Grade 12 group with disadvantaged DET education is 74.40, falling a massive 25+ points below the WAIS-R IQ of 100.1 for the comparable 12 year category of education. By contrast, the Full Scale IQ for black African first language Grade 12 group with advantaged Private/Model C schooling is 99.90, which is entirely equivalent with the WAIS-R indication of 100.1 for 12 years of education. The Full Scale IQ for the black African first language Graduate group with disadvantaged DET education is 94.9, which falls 20+ points below the WAIS-R IQ of 115.3 for their comparable 16+ years category of education. By contrast the Full Scale IQ for the black African first language Graduate group with advantaged Private/Model C schooling is 113.4 which is only 2 points lower than the WAIS-R standard of 115.3 for 16+ years of education.

It is of note (Table 5) that the IQ scores in the present study for the white English first language groups consistently suggest a small degree of superiority over the WAIS-R standardization. The IQ for the white English first language Grade 12s is 106.57 compared with 100.1 for the comparable WAIS-R group with 12 years of education; the IQ for white English first language Graduates is 123.00 compared with 115.3 for the comparable WAIS-R group with 16+ years of education. Wechsler (1997) reports that individuals score three IQ points higher on the WAIS-R when compared to the WAIS-III, a difference which is not sufficient to change the overall implication of the present results in respect of WAIS-III test performance. In sum, it appears that when black African first language individuals who are proficient in English have been exposed to high quality of education, they are able to perform at a level broadly equivalent to the U.S. standardization. However, when such individuals have been exposed to inferior quality of education, a profound disadvantage is noted in respect of WAIS-III performance relative to the U.S. standardization. This comprises a lowering of 20–25 points for those with a school leaving qualification (i.e. Grade 12s), as well as for those who have tertiary education (i.e. Graduates).

Further, for comparative purposes with the present study, the IQ scores for the HSRC South African standardization data reported in Claassen et al., 2001) appear in Table 6. Here it is apparent that the HSRC South African white group achieves an IQ of 101.35 that is marginally above the American standard of 100. This is commensurate with the trend of marginal superiority of white English first language groups in comparison with U.S. standardization data which was identified also in the present study (see discussion above). In relation to blacks, however, there is a discrepancy between the South African standardization data and those of the present study. The Full Scale IQ score for the HSRC South African black group is in the low average range (IQ = 86.41), which does not fit with either of the IQ scores achieved for the black African first language Grade 12 groups in the present study. These comprised a low borderline IQ score of 74.40 for black Grade 12s with disadvantaged DET education, and a good average IQ of 99.90 for black Grade 12s with advantaged Private/Model C education. (Grade 12 groups are used for

Table 5. A Comparison of WAIS-R IQ Scores from Matarazzo & Herman (1984) Stratified for Level of Education, with WAIS-III IQ Scores from the Present Study Stratified for Language of Origin, Level and Quality of Education.

	WAIS-R		PRESENT STUDY					
SAMPLE	WAIS-R American 12 years education	WAIS-R American 16 years education	WAIS-III Black African First Lang. Private/mod C Grade 12	WAIS-III Black African First Lang. DET Grade 12	WAIS-III Black African First Lang. Private/mod C Graduate	WAIS-III Black African First Lang. DET Graduate	WAIS-III White English First Lang. Private/mod C Grade 12	WAIS-III White English First Lang. Private/mod C Graduate
FSIQ	100.1	115.3	99.9	74.4	113.4	94.9	106.57	123

Table 6. A Comparison of WAIS-III IQ Scores for the HSRC South African Standardization (Claassen et al. 2000; 2001) Stratified for Race, with IQ Scores from the Present Study Stratified for Language of Origin, Level and Quality of Education.

	HSRC		PRESENT STUDY					
SAMPLE	SouthAfrican Black	SouthAfrican White	Black African First Lang. Private/mod C Grade 12	Black African First Lang. DET Grade 12	Black African First Lang. Private/mod C Graduate	Black African First Lang. DET Graduate	White English First Lang. Private/mod C Grade 12	White English First Lang. Private/mod C Graduate
FSIQ	86.41	101.35	99.9	74.4	113.4	94.9	106.57	123

comparative purposes with the HSRC sample, in that these are arguably more consistent with a generally representative standardization sample than Graduate groups).

The discrepancy in these results is explicable as follows. As noted in the introduction, the Claassen et al. (2001) standardization did not build in empirical control for quality of education within their black group as was done in the present research. These authors argue that the majority of the blacks in their study will have been exposed to poor education, and on that basis treat them as a homogenous group even labeling them the 'poor education' group compared with the white 'good education' group. However the results from the present study point to the non-homogenous nature of the South African black ethnic group. Whilst it is true that the majority of black participants within the HSRC group are likely to have attained a relatively poor quality education due to their historically disadvantaged situation, the group is also likely to contain a proportion of black participants with good education that are inflating the results of their black so-called 'poor education' sample. Hence, it appears that in the South African WAIS-III standardization, the subgroup norms attained for the black group which fall in the low average range, are probably too high for black individuals with poor quality of education who should score in the borderline range in relation to the US WAIS-III standardization, and too low for those black individuals with good quality of education who should score in the mid-average range in relation to the US WAIS-III standardization.

CONCLUSIONS

Whereas previously a number of researchers have speculated about the probable significance of quality of education over and above level of education as a moderating variable on cognitive test performance (Claassen et al., 2001; Fillenbaum et al., 2001; Grieve & Viljoen, 2000; Manly, Miller, et al., 1998; Nell, 1999; Shuttleworth-Jordan, 1996; Stricks et al., 1998), the present research provides empirical support for its effect in association with WAIS-III test performance, albeit the results must be considered preliminary until replicated on a larger sample. Reports cited earlier of Manly et al., (Manly, Miller, et al., 1998; Manly et al., 2000), and Shuttleworth-Jordan (1996), suggest that when proxy variables such as levels of language ability and/or reading ability and/or quality of education are equivalent, racial differences are likely to be minimized such that categorization in terms of ethnicity loses its relevance. Conversely, when these variables are not equivalent race groups are unlikely to be homogenous in respect of psychometric test performance. Manly et al. (2002) provide a measure of confirmation for this proposition by adjusting for reading level (used as an estimate of quality of education), in a study comparing African American and white elders on a series of neuropsychological tests. In the present study this proposition has been further demonstrated, in that African and white English first language participants with equivalent advantaged education performed at a comparable level. In contrast, black African first language subgroups that were discrepant in respect of quality of education, differed markedly in their performances.

Thus, in the present milieu of rapid globalization, accompanied by an explosion of cultural shifts in the form of previously disadvantaged or rural populations making the transition towards westernization, an interesting conceptual shift is occurring in the psychometric test arena. As reviewed above, numerous cross-cultural research studies over the years have revealed differences in respect of racial groupings on the basis of which there has been a call for separate standardization data. However, cross-cultural researchers in recent times are leaning towards a more universalist approach which cuts across racial divisions (Gasquoine, 2001; Manly, Miller, et al. 1998; Manly et al. 2000; 2002; Shuttleworth-Jordan, 1996). These three authors suggest that there is questionable support from their research for the separation of test battery norms purely in terms of ethnicity. Rather, as has also been highlighted by the present research, the indication is that stratification is necessary in respect of both level and quality of education. In the Manly et al. (2002) study quality of education was operationalized via a test of reading ability, whereas in the present study it was possible to operationalize this variable

more directly due to marked disparities in South African educational system as a legacy of the Apartheid system.

A cautionary note in the interpretation of the present results concerns the question of cause and effect, which only longitudinal research can finally address. From this cross-sectional research it would be fallacious to assume that enhanced quality education is the entire cause of the raised WAIS-III scores amongst the black African first language advantaged Private/Model C schools groups compared with the disadvantaged DET groups. It is probable that black individuals with higher intellectual capacity in the first instance would be more likely to access advantaged educational opportunities, due to inherent ability and/or due to the fact that their parents have higher intellectual capacity, a higher level of education, and associated improved financial means. Such factors, in addition to advantaged educational input in itself, may serve to explain the extreme divergence between IQ scores identified in this study between groups with poor and good educational backgrounds within the black African first language group. However, it was not the purpose of the present practitioner-oriented study to unravel the nature and extent of such inter-related factors that are likely to have contributed to group outcome. Rather, the objective was to examine the combined set of influences on IQ test performance that occurs for a designated race group stratified for level and quality of education, for diagnostic and placement purposes.

In light of the small number of subjects in the present study, the results do not provide a normative base for fine interpretive analysis except tentatively for Eastern Cape South Africans with at least Grade 12 education in the 19–30 age range. Generally, however, for practitioner purposes, the present research lends support to the caution that poor quality of education is likely to be associated with lowering of both verbal and performance functions on the WAIS-III, whereas those individuals with good quality of education (as exemplified in this study by black southern African individuals) are likely to reveal equivalence in WAIS-III test performance in relation to the U.S. standardization.

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