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A preliminary investigation of the suitability of the WAIS-III for Afrikaans-speaking South Africans

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The standardised version of the Wechsler Adult Intelligence Scale-III (WAIS-III) for English-speaking South Africans is currently widely used. Although an Afrikaans translation of the verbal subtests of the WAIS-III is provided in the manual, this translation has not been standardised. This preliminary investigation of the suitability of the translation for use with Afrikaans-speaking South Africans indicated comparability of the performance of an urbanised sample with good quality education and similar groups tested with the English version. The results also revealed significant differences between the urbanised Afrikaans speakers and a relatively non-urbanised group of Afrikaans speakers with inadequate quality education. There were no significant relationships of performance with gender and age. University graduates/students obtained higher scores than college graduates/students and subjects without tertiary education. Multivariate analyses of the contribution of demographic variables to variations in scores confirmed the significant effect of quality of education on test performance. The reliabilities for the verbal subtests ranged from acceptable to good, and inter-subtest correlations were at the expected level. An analysis of item difficulty revealed the expected sequence of progressively more difficult items, but with some exceptions. While some scoring criteria may need to be re-examined, inconsistencies also appear to be related to the role of schooling and social background. Limitations of the study pertain to the design and the small sample size that do not allow for conclusive evidence in terms of construct validity and in terms of measurement equivalence between the Afrikaans and English versions.

Keywords: Afrikaans; intelligence testing; item difficulty; measurement equivalence; quality of education; socioeconomic status; translation; WAIS-III (Wechsler Adult Intelligence Scale III)

The use of psychological tests to assess intellectual functioning is an important aspect of technologically advanced countries. In South Africa, the first individual intelligence scale for adults was the South African Wechsler-Bellevue Adult Intelligence Scale (SAW-B), standardised in English and Afrikaans between 1954 and 1969. As the SAW-B became increasingly outdated, much debate took place about a suitable replacement. Because the Wechsler scales are still the most widely used individual intelligence scales, and other cognitive processing measures are not superior in terms of diagnostic utility and treatment validity (Claassen, Krynauw, Holtzhausen, & Mathe, 2001), the decision was made to adapt the Wechsler Adult Intelligence Scale-III (WAIS-III) for use in South Africa in preference to other options.

The WAIS-III was originally developed in English in the USA. Just as previous versions of the Wechsler scales (for example, the WAIS-R) were successfully adapted for use elsewhere, the WAIS-III is currently being translated and normed for use in various countries (Claassen *et al*., 2001). Because of the diversity of the South African population and the rapid changes taking place as a result of cultural and socioeconomic transition to a modern technological society, it was not possible to develop one test that would be suitable for the entire population. A degree of homogeneity in terms of the demographic factors that affect performance on a measure of cognitive functioning is required in a norm population. In the light of this, the decision was made to standardise the WAIS-III for English-speaking South Africans (Claassen *et al*., 2001). Although an Afrikaans translation of the verbal subtests is provided in the South African standardisation manual (Claassen *et al*., 2001), the translation has not been standardised. In other words the psychometric properties of these subtests for Afrikaans-speaking South Africans still had to be determined.

Variables such as language proficiency, culture, education, socioeconomic status, home environment, urbanisation and test-wiseness all moderate performance on psychological tests (Grieve, 2005) as illustrated in numerous South African studies on cognitive and personality tests (e.g. Abrahams & Mauer, 1999a, 1999b; Claassen & Schepers, 1990; Owen, 1991, 1992; Van Eeden & Prinsloo, 1997; Van Eeden & Visser, 1992). In line with the view that sociocultural background plays an important part in what is learned and when it is learned (Ferguson, 1954; Grieve, 2005), it has been shown that experience (particularly schooling) and context are important determinants of performance on the kind of tasks generally found in tests of intelligence (Jansen & Greenop, 2008; Nell, 2000). For example, early comparative studies on the performance of white English- and Afrikaans-speaking South Africans on intelligence tests revealed that the performance of Afrikaans speakers was poorer (e.g. Biesheuvel, 1952) and this was ascribed to their relative educational and socioeconomic disadvantage at the time (Claassen, 1997). However, the gradual cultural convergence of English and Afrikaans groups over successive generations has been accompanied by a decrease in the gap in test performance between them (Claassen, 1997; Murphy, Te Nijenhuis, & Van Eeden, 2009). Urbanisation and education are regarded as two of the most important factors influencing the skills required for successful performance on intelligence tests (Nell, 2000), and there is continuing evidence of the role of quality of education in test performance (Shuttleworth-Jordan *et al*., 2004). It is anticipated that, just as the US norm tables were found to be suitable for use in the UK, the performance of urbanised Afrikaans speakers who received a reasonably good quality of education would be similar to that of similar groups tested with the English version if the former are tested in their home language.

The aim of the present study was to undertake a preliminary investigation of the suitability of the Afrikaans translation of the WAIS-III for use with Afrikaans-speaking South Africans. The translated version would be regarded as suitable if accepted standards in terms of item functioning and subtest reliability were met and if this version measured the construct as conceptualised by the developers of the test. The focus was on Afrikaans speakers, as the performance on the translated subtests at a single-group level needs to be evaluated before confirmation of equivalence to the English version by means of multi-group analyses is attempted. The latter is important given that testing usually occurs in diverse groups. In addition, similarity in performance to that of the English speakers would point towards but not provide conclusive evidence for a common norm group. The role of demographic variables in performance on the subtests was also considered as this would inform decisions on the norm group.

METHOD

The participants were selected on the basis of the following criteria:

- home language Afrikaans
- age between 20 and 55 years
- completion of Grade 12
- absence of current psychiatric disorder or neurological insult

The inclusion of a fairly broad age range was based on the assumption of the constancy of IQ during adulthood (particularly among people still active in the educational or occupational sphere), with the cut-off prior to the expected relative decline in test performance observed in older adults. The decision to include only participants who had completed high school education was made to eliminate the confounding effects of below average ability or lack of educational experience.

The first sample comprised 52 participants studying or working in Pretoria. All of the participants were white, grew up in an urbanised environment and had attended government schools where they received good quality education (former model C schools). In order to investigate a possible difference in test performance associated with a difference in quality of education, a second sample was obtained from Stellenbosch. This sample comprised 30 students, most of whom grew up

in rural towns. The participants in this group were coloured and had received education that was of inadequate quality. The latter can be related to the socio-political history of South-Africa and the resultant relationship between quality of education and population group (criteria described in Claassen *et al*., 2001 in terms of per capita expenditure on learners from different ethnic groups). Because these were convenience samples, they were not matched. A description of the characteristics of the two samples is provided in Table 1.

Table 1. Demographic characteristics of the two samples

	Pretoria sample (*N* = 52)	**Stellenbosch sample (*N* = 32)**
Age:		
20-29 years	34 (65.4%)	24 (80%)
20-39 years	12 (23.1%)	3 (10%)
40-49 years	4 (7.7%)	1 (3.3%)
50-55 years	2 (3.8%)	2 (6.7%)
Gender:		
Males	20 (38.5%)	16 (53.3%)
Females	32 (61.5%)	14 (46.7%)
Level of tertiary education:		
Postgraduate degree	6 (11.5%)	0
Undergraduate degree	13 (25%)	4 (13.3%)
Postgraduate student	2 (3.8%)	0
Undergraduate student	11 (21.2%)	2 (6.7%)
Diploma	11 (21.2%)	3 (10%)
Certificate	3 (5.8%)	2 (6.7%)
None (matric)	6 (11.5%)	19 (63.3%)
Tertiary institution:		
University	31 (59.6%)	4 (13.3%)
Technikon	7 (13.5%)	1 (3.3%)
College	9 (17.3%)	21 (70%)
None	5 (9.6%)	4 (13.3%)
Background environment:		
Farm	4 (7.7%)	5 (16.7%)
Rural town (or town)	7 (13.5%)	24 (80%)
Peri-urban	9 (17.3%)	1 (3.3%)
City	32 (61.5%)	0

Biographical information was obtained and respondents completed a consent form briefly explaining the aim of the study, confidentiality and the intended use of group statistics rather than individual results. Participation was voluntary. The WAIS-III subtests were administered individually by trained and experienced examiners who are fluent Afrikaans speakers. The Afrikaans translation of the verbal subtests from the WAIS-III, developed by the HSRC during the standardisation of the test for use in South Africa, was utilised (Claassen *et al*., 2001). In addition to the verbal subtests (Vocabulary, Arithmetic, Similarities, Information and Comprehension), one of the non-verbal subtests, Block Design, was included as a measure of general level of ability. The translated South African versions of the subtests were administered and scored according to the instructions in the manual (Wechsler, 1998). The norms for English-speaking South Africans were used for converting raw scores to scaled scores for the different subtests as well as the Verbal Comprehension Index (VCI).

RESULTS

The scaled scores obtained by the two samples are provided in Table 2. The results indicate that the Pretoria sample obtained scaled scores slightly above the average (but within one standard deviation) of the standardisation group. Given the small sample size, one should avoid over-interpretation. It should also be noted that the standardisation sample (from which the norms for English-speaking South Africans were obtained) comprised participants from different population groups with a diversity of home languages and backgrounds, including a considerable number from disadvantaged environments and with poor quality education, thus being more representative. The Pretoria participants came from advantaged backgrounds and had good quality education. In contrast to the Pretoria group, the Stellenbosch sample obtained scores slightly below average (but within one standard deviation). The Stellenbosch participants received poorer quality education. There were significant differences between the groups on all the subtests as well as the VCI (see Table 2).

Table 2. Differences between subtest scaled scores and VCI for the Pretoria *(N* = 52) and Stellenbosch samples (*N* = 30)

Measure	Stellenbosch mean (*SD*)	Pretoria mean (*SD*)	*t* df *	Sig (2 tailed)
Vocabulary	9.63 (1.88) **	11.62 (2.50)	3.77 (80)	0.000
Arithmetic	8.10 (2.73)	10.94 (2.65)	4.61 (79)	0.000
Similarities	8.37 (2.97)	11.69 (2.92)	4.94 (80)	0.000
Information	8.50 (2.84)	12.15 (2.52)	6.04 (80)	0.000
Comprehension	8.97 (2.22)	12.61 (2.52)	6.56 (79)	0.000
VCI	93.73 (11.43) ***	117.78 (12.97)	7.16 (51)	0.000
Block design	9.47 (2.18)	13.83 (2.32)	8.39 (80)	0.000

* Levene's Test for equality of variance was performed to determine the appropriate *t* statistic to use to compare the means

** The subtest scaled score mean = 10 and the standard deviation = 3

*** The index scaled score mean = 100 and the standard deviation = 15

The reliabilities for the verbal subtests ranged from acceptable to good. Coefficient alpha values for the various subtests were as follows: Vocabulary 0.84, Similarities 0.73, Arithmetic 0.82, Information 0.84 and Comprehension 0.75.

Item difficulty was calculated for all responses to the subtests. In general, the expected sequence of easier items followed by progressively more difficult items was found. There were, however, some exceptions, and these differed for the two groups. For the Stellenbosch group, several difficult items in the Vocabulary subtest were out of sequence (i.e. difficult items followed by notably easier items), such as 'verbruik' (item 10), 'gekompliseerd' (item 14), 'finansieël' (item 16), 'heiligdom' (item 17), 'kolonie' (item 20), 'genereer' (item 21), 'ballade' (item 22), 'pandemonium' (item 23) and 'ontwikkel'(item 26). Items 14, 16 and 23 were replaced items for the South African version. There were also easy items out of sequence (that is, easier items preceded by notably more difficult items), such as 'divers' (item 25) and 'tasbaar' (item 27). For the Pretoria group, items 10 ('gekompliseerd'), 17 ('heiligdom') and 29 ('epies') were difficult items followed by notably easier ones. However, the sequence for the latter items in particular was mixed if not as pronounced. These sequencing problems are not unexpected since the words were translated without any investigation into the difficulty equivalence of the words. For both groups scoring was problematic for items 10 ('verbruik') and 20 ('kolonie'), with very few respondents obtaining the maximum of two marks and the majority obtaining one mark. Scoring provisions were found to be inadequate for 'herstel' (item 6). The English word 'repair' has one general meaning, but in Afrikaans it could mean to recover (from an illness, for example) as well as to repair or restore, the latter being the meaning given in the

manual. In the present study, the scoring was adjusted so that a respondent was given two marks for either interpretation.

Calculations of item difficulty for responses to the Information subtest indicated that there were items out of sequence and again these differed for the two samples. For the Stellenbosch group, difficult items followed by easier items were item 9 (Brazil), item 12 (Cleopatra), item 14 (Einstein), item 15 (Olympic games), item 19 (Gandhi) and item 22 (blood vessels). Easy items preceded by more difficult ones were item 17 (Genesis), item 20 (Koran) and item 23 (Steve Biko). Item 23 was a replacement in the South African version. For the Pretoria group, only item 22 (blood vessels) was difficult in relation to subsequent items, and there were five easy items interspersed with more difficult items, being item 11 (oceans), item 16 (Sahara), item 17 (Genesis), item 18 (oldest city) and item 21 (boiling point).

There were fewer problems with the Comprehension subtest, with only one difficult item (item 8, professional licences) being out of sequence and the last two items (proverbs) being relatively easy.

The expected levels of item difficulty were found with the remaining subtests (Arithmetic and Similarities). In the Arithmetic subtest, item 13 tended to be more difficult for both groups and this appears to relate to the wording of the item, which is rather convoluted.

Inter-subtest correlations were all significant at the 99% level (see Table 3). Numerically high correlations were found between the subtests and the VCI. Moderate correlations were found between the verbal subtests and scores on the Block Design subtest. The correlation coefficients obtained are comparable to those obtained during the original standardisation process of the WAIS-III (The Psychological Corporation, 1997).

Table 3. Intercorrelations of subtests and VCI ($p < 0.001$)

	Vocab	Arith	Sim	Inf	Comp	VCI	Blocks
Vocab		0.62	0.76	0.69	0.76	0.93	0.59
Arith			0.56	0.71	0.67	0.75	0.63
Sim				0.67	0.77	0.90	0.55
Inf					0.78	0.92	0.53
Comp						0.91	0.55
VCI							0.73

Table 4. Differences between subtest scaled scores and VCI for males ($N = 36$) and females ($N = 46$)

Measure	Males mean (*SD*)	Females mean (*SD*)	*t* df *	Sig (2 tailed)
Vocabulary	10.58 (2.49) **	11.13 (2.46)	0.99(80)	0.323
Arithmetic	9.91 (3.36)	9.87 (2.74)	0.07 (79)	0.948
Similarities	10.06 (3.58)	10.80 (3.13)	1.01 (80)	0.316
Information	10.56 (3.31)	11.02 (3.07)	0.66 (80)	0.511
Comprehension	10.74 (3.18)	11.65 (2.79)	1.37 (79)	0.175
VCI	101.48 (19.20)***	105.94 (15.44)	0.93 (51)	0.355
Block design	11.89 (3.14)	12.50 (3.05)	0.89 (80)	0.377

* Levene's Test for equality of variance was performed to determine the appropriate *t* statistic to use to compare the means

** The subtest scaled score mean = 10 and the standard deviation = 3

*** The index scaled score mean = 100 and the standard deviation = 15

Investigation of the relation between gender and test performance revealed no significant differences between males and females (see Table 4). The results of the investigations of the relations

between test performance and other demographic variables are provided in Table 5. As expected, there was no notable interaction between age and test performance, the only significant relationship being that between age and scores on the Vocabulary subtest, with younger subjects tending to obtain higher scores than older subjects. There were significant correlations between subtest scores and the type of tertiary education, with higher scores being obtained by university students and graduates in comparison with college students/graduates or those with no tertiary level experience. The area where participants grew up appeared to be especially related to performance on the Comprehension and Block Design subtests, with participants from rural backgrounds obtaining lower scores than participants from urban backgrounds. The role of quality of education (group membership) is elaborated on below.

Table 5. Correlations between test performance and demographic variables

Measure	Age	Tertiary institution (reverse scored)	Area	Group
Vocabulary	–0.22*	0.55**	0.18	0.39**
Arithmetic	–0.01	0.45**	0.23*	0.46**
Similarities	–0.02	0.54**	0.28*	0.48**
Information	–0.12	0.51**	0.30**	0.56**
Comprehension	–0.10	0.49**	0.43**	0.59**
VCI	–0.14	0.67**	0.43**	0.71**
Block design	–0.19	0.57**	0.35**	0.68**

* $p < 0.05$; ** $p < 0.01$

On the basis of the correlations obtained, stepwise multiple regression analyses were used to investigate the contribution of the relevant demographic variables (group, age, type of tertiary education and area where the participants grew up) to variation in test performance. Because all the participants in the Pretoria sample had relatively good quality of education and all the participants in the Stellenbosch sample had inadequate quality of education, the variable of group membership was regarded as representing quality of education. The results are given in Table 6. For the VCI, quality of education (group membership) and type of tertiary education together explained 65% of the variance in scores. None of the other variables made a significant contribution. The contribution of quality of education was somewhat larger than type of tertiary institution attended. Looking at each subtest individually, both quality of education and type of tertiary institution made significant contributions to test scores in most instances (see Table 6). Quality of education (group) was the variable that contributed the most to scores for VCI, Arithmetic, Information, Comprehension and Block Design. Type of tertiary education institution was the only variable that made a significant contribution to Vocabulary scores and contributed slightly more than quality of education to scores on the Similarities subtest. Age was an additional significant influence on performance on the Block Design subtest. However, the amount of variance explained by the relevant variables was small but acceptable in the case of Arithmetic (28%) and Vocabulary (31%), somewhat better for Similarities (36%), Information (40%) and Comprehension (41%) and good for Block Design (59%).

CONCLUSIONS

The results obtained from this preliminary investigation provide suggestions for future research, for example in terms of issues at item level that need to be addressed. These results also provide support for the reliability of the translated subtests as well as some support that the Afrikaans version is measuring intelligence in a manner similar to the English version. The present study thus contributes in a context where information on individual intelligence tests is not as readily available to the practitioner as that based on large-scale testing in industry with, among others, group tests of ability

and personality questionnaires.

While there are particular difficulties experienced when translating into an African language, including a lack of the appropriate concepts required for equivalence in the target language and difficulty in translating idiomatic expressions (Van Eeden & Mantsha, 2007), these issues are less relevant in an English-Afrikaans translation and experience and social background probably played a greater role in problems at item level than translation *per se*. For example, familiarity with the content of problematic items in the Comprehension subtest could be influenced by schooling and social background rather than translation *per se*. However, the item difficulty sequence implies that

Table 6. Results of stepwise multiple regression analyses

Criterion variable	Step	Variables	*B*	*SE B*	*B*
VCI	1	Constant	63.59	5.91	
		Group	24.83	3.47	0.71**
	2	Constant	56.14	5.23	
		Group	17.64	3.30	0.50**
		Tertiary (reversed)	6.76	1.45	0.44**
		R^2 = .50 for Step 1; R^2 = .15 for Step 2 ($p < 0.001$)			
Vocabulary	1	Constant	7.37	0.64	
		Tertiary (reversed)	1.24	0.21	0.55**
		R^2 = .31 for Step 1 ($p < 0.001$)			
Arithmetic	1	Constant	5.26	1.05	
		Group	2.84	0.62	0.46**
	2	Constant	4.35	1.06	
		Group	1.99	0.67	0.32*
		Tertiary (reversed)	0.81	0.29	0.30*
		R^2 = .21 for Step 1; R^2 = .07 for Step 2 ($p < 0.01$)			
Similarities	1	Constant	5.85	0.87	
		Tertiary (reversed)	1.63	0.28	0.54**
	2	Constant	3.70	1.11	
		Tertiary (reversed)	1.21	0.31	0.40**
		Group	2.04	0.70	0.30*
		R^2 = .29 for Step 1; R^2 = .07 for Step 2 ($p < 0.01$)			
Information	1	Constant	4.85	1.03	
		Group	3.65	0.61	0.56**
	2	Constant	3.83	1.02	
		Group	2.67	0.65	0.41**
		Tertiary (reversed)	0.93	0.28	0.32*
		R^2 = .31 for Step 1; R^2 = .08 for Step 2 ($p < 0.01$)			
Comprehension	1	Constant	5.29	0.95	
		Group	3.65	0.56	0.59**
	2	Constant	4.50	0.96	
		Group	2.89	0.61	0.47**
		Tertiary (reversed)	0.72	0.27	0.27*
		R^2 = .35 for Step 1; R^2 = .06 for Step 2 ($p < 0.01$)			

Table 6. Continued

Criterion variable	Step	Variables	*B*	*SE B*	*B*
Block design	1	Constant	5.11	0.89	
		Group	4.36	0.52	0.68**
	2	Constant	4.13	0.86	
		Group	3.42	0.55	0.54**
		Tertiary (reversed)	0.89	0.24	0.32**
	3	Constant	5.18	0.92	
		Group	3.64	0.53	0.57**
		Tertiary (reversed)	0.77	0.23	0.28*
		Age	–0.75	0.28	–0.20*
		R^2 = .47 for Step 1; R^2 = .08 for Step 2 ($p < 0.001$); R^2 = .04 for Step 3 ($p < 0.01$)			

* $p < 0.01$; ** $p < 0.001$

the translated version can be improved. This is especially true in the case of the Vocabulary subtest, where level and understanding of words should also be considered. Aston (2006, in Foxcroft & Aston, 2006) refers to differences in the meaning of words used as well as words in the Afrikaans version being less commonly used. It may also be that the scoring criteria need revision. In practice, problems with the item-difficulty sequence should be overcome with the provision of the generous discontinue rules for the various subtests. The emphasis on subtest scores as part of the diagnostic use of individual intelligence tests (e.g. Cockcroft & Blackburn, 2008), nevertheless implies a need for further investigation. A literal translation allows for direct comparison of the different language versions (Van de Vijver & Tanzer, 1997), but some extent of adaptation might have to be considered. This involves a combination of literal translation, changes in items, and the development of new items. Adaptation of non-verbal tasks also needs to be investigated.

The reliabilities of the verbal subtests are generally good and the inter-subtest correlations are at the expected level. The obtained scores on the subtests for the two samples furthermore correspond with findings in the literature relating to the effects of quality of education and social environment on test performance as discussed earlier. The above average scores obtained by the Pretoria group are comparable to the scores obtained by the English-speaking subjects with good quality education in the standardisation study (Claassen *et al*., 2001). This is consistent with the view that subjects from relatively technologically advanced social environments and who have benefited from good quality education are likely to obtain scores comparable with UK and US subjects. Although all the Stellenbosch subjects completed high school, their scores reflect the undermining effect of inadequate quality of education and socioeconomic background. As expected, their scores are still better than those obtained by students with disadvantaged backgrounds and poor quality education, as reported by Shuttleworth-Jordan *et al*. (2004). Additional multivariate analyses of the contribution of demographic variables to variations in scores confirm the significant effect of quality of education on test performance.

The results of the study by Shuttleworth-Jordan *et al*. (2004) showed a greater effect for quality of education than for ethnicity and language. However, the historical connotation of quality of education and population group cannot be separated (as illustrated in the present study). This relationship as well as other background variables such as class should be considered in forming an Afrikaans-speaking norm group.

The limitations pertaining to small sample size, also, apply to the present study and the findings should be verified with a larger sample. A large sample is also indicated for the analyses needed for conclusive evidence on model fit, that is, the construct validity, of the translated version for an

Afrikaans-speaking sample. Once the latter has been established, multi-group analyses to determine equivalence between the Afrikaans and English versions should be done (Van de Vijver & Tanzer, 1997). Although Foxcroft and Aston (2006) conclude that norms should be developed specifically for the Afrikaans version, the results of this study partially support the use of common norms in the case of a specific subgroup of Afrikaans speakers, but this has to be confirmed as indicated. Consideration for the individual's background and context when interpreting test scores remains a necessity — as confirmed by the results of this preliminary investigation — and responsible test practice rests ultimately with the practitioner.

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