

# Cultural Bias in the Neuropsychological Assessment of Young Maori Men

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In recent years neuropsychologists have begun to take account of the importance of cultural factors in the assessment of indigenous peoples. This study begins to explore the cultural bias, with respect to Maori, of some tests commonly used in the neuropsychological assessment of head injury. We assessed Maori men with a socioeconomic profile and age range typical of men who sustain head injuries. Twenty-four normal (non-head-injured) Maori men from rural and urban backgrounds aged from 16 to 24 yrs were assessed on the Complex Figure Test (CFT), the Selective Reminding Test (SRT), the WMS-R Logical Memory Test (LM), and the WAIS-R Vocabulary, Digit Span (Dsp) and Block Design (BD) subtests, and their scores compared with normative data for these tests. A version of Logical Memory where the stories were substituted with stories about Maori events was also trialed. The results demonstrated that Maori compared well with the "average" for the standardized population on some tests (Dsp, SRT, CFT recall), scored lower than "average" on tests that relied on formal education or had a westernised content (Vocabulary, LM), and scored above "average" on a test involving visuospatial abilities (BD). Their performance on the Maori version of LM was better than their performance on LM. The scaled score difference between Vocabulary and BD was significant at the 5% level for 67% of the group, with the Vocabulary score lower than BD for all 24 men. Suggestions are given about ways to lessen cultural bias when assessing Maori with head injuries while further research is carried out to develop tests and assessment processes valid and appropriate for Maori.

In common with all types of psychological assessment, neuropsychological assessment is subject to cultural bias. If psychometric tests are used with groups other than those on which they have been standardized, invalid and misleading conclusions may result. Kaufman, McLean, and Reynolds (1988) exposed the folly of ignoring cultural factors when they focused on the most frequently used neuropsychological test battery in the Western world; the Wechsler Adult Intelligence Scale-Revised (WAIS-R; Wechsler, 1981). The norms for the American version of this test are statistically and demographically appropriate, but hide variables such as race and its correlate, culture. Wechsler's standardization group approximated the cultural mix of the United States, with African-Americans making up 10% of the group. Using factor analysis, Kaufman et al (1988) went over the original WAIS-R data and found significant differences for sex, race and education, with considerable overlap between the latter two variables. African-Americans scored below white Americans on every subtest, with Vocabulary and Block Design showing the greatest differences. These two subtests are sometimes recommended for use as a short "IQ" test dyad. Most African-Americans will score "below average" on this dyad. Unless one accepts the antiquated notion of Black racial inferiority then the difference is an artifact of the actual tests themselves. It is not African-American intelligence being tested here but specific knowledge from the mainstream culture.

Cultural bias is of particular concern where a neuropsychological assessment is undertaken in order to decide whether or not brain damage has occurred, and if so, whether this has resulted in specific cognitive deficits. Take, for example, the case of a young Maori man who has sustained a moderately severe closed head injury. If on a neuropsychological assessment he scores

well below his age mean on some subtests of the WAIS-R, but well within his age mean on others, can we state with some degree of confidence that he is impaired in those cognitive skill areas measured by the subtests on which he did poorly? If we knew that a group of healthy Maori men matching our client on age, cultural background and educational variables produced subtest scores on the WAIS-R that had the same statistical properties as those in the WAIS-R Manual (i.e. each subtest having a mean of 10 and a standard deviation of 3) then we might feel somewhat more confident that our client's very low subtest scores reflected impairments in those areas.

Most neuropsychological tests have been developed and normed in the USA, Britain, or sometimes Australia, and rarely in Aotearoa, New Zealand (NZ). Nevertheless, clinical psychologists and neuropsychologists commonly use these tests to assess Pakeha (white New Zealanders). While this has its problems, the extensive NZ data that have been gathered on the most commonly used neuropsychological tests, both through clinical assessment and research studies, have demonstrated that Pakeha appear to perform like their European and American white, western cousins. This is probably not particularly surprising given that they share the same European roots, a similar educational system, and extensive exposure to American and British culture via the media and travel. Of course, some test items are clearly inappropriate for New Zealanders, and some efforts have been made to change these and obtain NZ normative data on the new test items. For example, Petrie et al (1986) changed several USA-specific items in the WAIS-R Information subtest to NZ-specific items, and normed these on a group of 200 New Zealanders with the same proportions of Pakeha, Maori, and other ethnic groups as in the NZ population. Even so, as Maori made up only 10.5% of the group, if they as a subgroup were less able than Pakeha to answer the new questions (for cultural reasons) then they would fall at the lower end of the range. Thus an individual Maori client, while scoring poorly relative to the mean of the NZ group, may be scoring within the average range for his own cultural group. This makes no comment on the relative "intelligence" of either group, as would be made clear if new Information test items were introduced that were likely to be more familiar to Maori than to Pakeha. For example, if the USA-specific WAIS-R Information subtest questions were replaced with questions such as "Name three Maori tribes?" or "Give one example of a circumstance in which a waiata would be performed?", it is likely that Maori would, on average score better than Pakeha, even although these questions would not be difficult for many Pakeha.

The group most likely to be referred for a neuropsychological assessment are young men who have sustained a head injury. Almost 200 people are admitted to hospital each week in New Zealand suffering head injuries, and a further 400 are treated but not admitted (Gronwall, Wrightson, and Waddell, 1990). Young men in the 16 to 24yr age group have proportionately more head injuries than any other group, primarily as a result of life-style factors that increase their vulnerability to accidents. The impact of negative life-style factors on young Maori men are apparent from the statistics for Maori males aged 15 to 24yrs (Pomare, Keefe-Ormsby, Ormsby, Pearce, Reid, Robson and Watene-Haydon, 1995). In this group of Maori males, motor vehicle crashes were the leading cause of admission to hospital in 1992 (95 per 10,000 population), and were the leading cause of death for the period 1989-1991 (6.9 deaths per 10,000 population). Alcohol-related deaths in this age group of Maori males were 2.2 times the rate of non-Maori males. Violence is also a cause of hospitalisation and death for an increasing number of Maori of both sexes and all ages (Pomare et al, 1995), and young Maori men are also prominent in contact sports such as rugby, a particularly rich source of head injuries. Maori also, of course, suffer from other types of neurological damage (e.g., brain tumours, strokes, dementias), and neuropsychological assessments can also provide helpful information and guidance to these patients, their whanau (family), and rehabilitation workers.

The development of neuropsychological tests and Maori-friendly methods of assessment is a massive and daunting task, especially in today's political climate where it is recognised that research on what is best for Maori carried out by Pakeha can only provide solutions that remain skewed by Pakeha cultural perceptions (e.g. of the make-up of different cognitive skills, definitions of cognitive impairment and so on). This study is a very small beginning, and seeks to gather information on how young Maori men perform on some of the more common tests in the neuropsychologist's arsenal. Perhaps they do perform in a way that is indistinguishable from the standardization group. For example, Prigatano and Leathem (1993) found that two groups of head-injured adults, one Maori and one Pakeha, did not differ on their overall score on a cognitive screening test, the BNI Screen for Higher Cerebral Functions (Prigatano, 1991). Screening tests aside, some tests used by the neuropsychologist seem likely to be more, and some less "culturally-fair" than others. Tests that rely on culturally-biased general knowledge or vocabulary, (e.g. the WAIS-R Information, Comprehension and Vocabulary subtests) are very likely to disadvantage non-European groups, whereas tests relying less on

cultural learning and verbal knowledge and more on attention span and mental tracking (e.g. Digit Span) should show little variation across cultures. It is more difficult to guess where Maori might fall relative to white Europeans and Americans on non-verbal "visuospatial" tests (e.g. The WAIS-R Block Design subtest). Ardila, Rosselli and Rosas (1989), in a study comparing illiterate and well-educated Spanish speaking Colombians found that their illiterate group scored well below the mean even on visuospatial tests not clearly related to formal learning (e.g. recognition of superimposed figures, copying a cube). Given that educational outcomes are poorer in the Maori population than the Pakeha population (Comer, Henare, and Thompson, 1991; Department of Statistics New Zealand, 1994; Te Puni Kokiri, 1993), Maori as a group might also be disadvantaged on these non-verbal tests.

Originally, this study was designed to include a Pakeha control group; however this was abandoned because the Pakeha men who were approached and the Pakeha managers of work skills groups that included a number of Pakeha men declined to take part. Discussions with some of the Pakeha men who declined to participate suggested a number of reasons for their reluctance, including (i) a reluctance to spend time doing a study that was designed to benefit Maori and not the Pakeha men; (ii) discomfort with being "assessed" by a Maori man with a University degree, and (iii) concern about possible unfavourable comparisons of their performance with the performances of Maori men, especially on the test designed to be Maori-friendly. The inclusion of a Pakeha comparison group would have added another dimension to the study, and increased our ability to explore any differential performance of Maori and Pakeha in terms of possible cultural bias in the tests. The possibility that young Pakeha men of a low socioeconomic group and no formal educational qualifications are also poorly served when assessed on tests standardized on a non-NZ population is, however, a separate issue. We decided that, if this study demonstrated that Maori did perform differently from the standardization population, we would follow it up with further studies assessing both Maori and Pakeha, in an attempt to clarify which tests were culturally biased against Maori but not against Pakeha from similar socioeconomic backgrounds.

Normative data is most urgently required for young Maori men from 16 to 24 years of age, given that this is the group most at risk for head injury. This age range also corresponds with the age categories used in the WAIS-R, and therefore would allow direct comparisons. Proportionately higher numbers of young Maori men than young Pakeha men are likely to come from lower socioeconomic groups, leave school with no

qualifications, and be unemployed (Comer, Henare, and Thompson, 1991). This grouping of negative statistics is common in the young head-injured Maori male (unpublished statistics, Department of Critical Care Medicine, Auckland Hospital). As we wanted to find out how young Maori men most likely to suffer a head injury performed on the tests, we recruited only men who came from a low socioeconomic background and who had left school at or before 16 years of age with no formal school or tertiary qualifications.

If we wish to obtain valid data from a neuropsychological assessment, it is important that the client feels relatively at ease with the tester, and in the testing environment. Therefore a second aim of this study was to explore with the participants what they believed would improve the comfort of the testing situation, and what would make them uncomfortable. In an attempt to maximise the comfort of the assessment process for the participants, recruitment for the study and the assessments were carried out by one of us (G. M-N), a Maori male clinical psychologist of Ngapuhi and Ngatiwhatua descent brought up in a rural Maori environment. All the participants were also from Northern iwi (tribes).

Maori raised in a rural area where many people are Maori and where traditional Maori ways still abound, may perform differently from Maori brought up in a large city like Auckland, surrounded and often engulfed by Western society and traditions. This raises the important concept of acculturation. Acculturation can be defined as the process whereby an individual from one culture takes on cultural forms of knowledge and behaviours specific to another culture. Maori who become acculturated into the Pakeha culture do not necessarily lose or subsume their own culture (deculturation), although there is a risk of this happening with increasing acculturation. Acculturation opens up new avenues of (Pakeha) knowledge and awareness, so if we develop "Maori-appropriate" tests and assessment methods we must consider whether these should only be used with traditional Maori who have not been heavily acculturated into Western society. In an attempt to look at this issue, we decided to assess two groups of young Maori men; a possibly less acculturated group from a rural background and a possibly more acculturated group from an urban background (Pomare et al, 1995; Te Puni Kokiri, 1993).

In addition to assessing the men on standardized tests, we piloted a new verbal memory test, similar to the Logical Memory Test of the Wechsler Memory Scale-Revised (WMS-R; Wechsler, 1987) but with stories about common Maori events replacing the standard stories.

## Method

### Participants

Two groups of men were assessed, one group of 14 participants from a rural environment (north of Auckland) and one group of 10 participants from an urban environment (Auckland). All participants gave informed verbal and written consent and fell within the following criteria.

- (i) Men of Maori descent and identifying as Maori. The majority of participants were from the northern tribes (Taitokerau alliance), being of Ngapuhi and Ngatiwhatua descent.
- (ii) Aged from 16 to 24 yrs
- (iii) No history of a significant head injury or other neurological or psychiatric problem. Minor concussions from rugby accidents at least six months previously were not considered significant if the participant reported that loss of consciousness was less than 5 minutes and there had been no ongoing symptoms.<sup>1</sup>
- (iv) Left school at age 15 to 16 yrs with no qualifications gained at school or since leaving school.
- (v) From a low socioeconomic background. The "Broad Socioeconomic Classification" categories from Davis (1977) were used to categorise the highest occupation level of their parents, where "1" is the highest level and "7" the lowest. The parent with the highest occupation level for all participants fell within levels 3 to 7, with 21 of the 24 participants falling within levels 5 to 7. These equate with skilled manual workers (level 5), semi-skilled manual workers (level 6), and unskilled manual workers (level 7).

The mean age was 18.7 (SD 2.7) yrs for the rural group, and 19 (SD 2.4) yrs for the urban group.

### Procedure

The rural participants were recruited from courses at workshops and on marae aimed at upskilling young

people in and around Dargaville, or they worked on marae. The urban participants were recruited from similar training courses on marae in Auckland, or they worked on marae. Four rural participants were assessed in their own homes and the remaining 20 participants were assessed at their workplace or on the site of the course they were taking. Efforts were made to ensure that the testing environment was quiet with little or no distraction and that the participant felt comfortable and at ease there. If the testing space was disrupted for any reason, the assessment was discontinued until the disruption ceased.

All participants were given a neuropsychological assessment by a Maori man (G M-N) and each session took between one to two hours. The test battery took about one hour to complete but prior to commencing the tests, 30 to 60 minutes was spent establishing rapport and reassuring the participants that they were not on trial, and that the aim of the research was to see which tests were appropriate for Maori in general so that Maori with head injuries could be more accurately and sensitively assessed.

### Neuropsychological test battery

Tests were selected because they are readily available and familiar to clinical psychologists who carry out neuropsychological assessments of adults. All the tests, or very similar tests, would generally be used when carrying out an initial assessment of closed head injury. The tests, which are briefly described in the next section, were given in the following set order: copy of the Rey Complex Figure Test (CFT; Osterrieth, 1944, Rey, 1941); WAIS-R Digit Span (DSp); WMS-R Logical Memory (LM) immediate recall; WAIS-R Vocabulary; CFT 20 minute delayed recall; LM 20 minute delayed recall; 10 minute break; Logical Memory Maori Alternative (LM-Maori) immediate recall; WAIS-R Block Design (BD); Selective Reminding Test (SRT; Buschke & Fuld, 1974); LM-Maori 20 minute delayed recall. Half the participants in each group were given the WMS-R LM test in the first half of the testing session and the LM-Maori version in the second half, and the order was reversed for the other 12 participants. With the exception of the LM-Maori test, all tests are commonly-used standardized tests. Normative data derived from NZ (mainly Pakeha) samples were available for the SRT, and age-appropriate norms for the CFT were available in Kolb and Wishaw (1985). The normative data published in the WAIS-R and WMS-R manuals were used for the other tests.

During the 10 minute break half-way through the session, the participant was asked questions pertaining to his perceptions of the test procedure, the test environment, and his attitude to health professionals.

1. It was notable that when attempting to recruit young Maori men for this study the majority recalled being concussed or dazed, often more than once, whilst playing rugby. Exclusion of men with any history of mild head injury and reports of no ongoing symptoms would have made it difficult to recruit a group of this size. Similarly it would be difficult to find a substantial group of young Maori men from this socioeconomic group who could be said with confidence to have no history of alcohol or drug abuse.

*Hypotheses relating to test performance*

(i) The WAIS-R Vocabulary subtest, while frequently used along with other tests to estimate verbal intelligence and general mental ability, is believed to be influenced both by formal educational levels and culture. Thus we hypothesised that the mean score of the Maori group would fall below the normative sample "average" for this subtest.

(ii) BD is considered the best measure of visuospatial organisation in the WAIS-R. It is the best measure of "intellectual" ability that is not as dependent on formal education as the verbal subtests, at least for younger adults (Lezak, 1995). Thus we hypothesised that the Maori men would compare well with the WAIS-R normative "average" on this test.

(iii) DSp assesses immediate memory or attention span, and mental tracking, and is considered to be independent of education and culture. The Maori men as a group should therefore score within the average range.

(iv) The CFT requires the testee to copy a complex geometrical design, and requires visuospatial perception, organisation and planning. Twenty minutes later, without prior warning, the testee is asked to draw the figure from memory, thus assessing visuospatial memory. The maximum score for both trials of the CFT is 36. The way in which the CFT is copied is also considered important. Osterreith (1944) found that 85% of normal adults copy the figure in a "logical" manner; for example the large rectangle will be drawn as a single unit. In contrast, young children and a much higher proportion of brain damaged adults construct the figure in a piecemeal or fragmented way (Binder, 1982; Visser, 1973). We hypothesised that the Maori group would perform within the average range of western populations on all aspects of the test.

(v) The SRT is a verbal memory test involving learning a spoken list of 12 high-frequency words over 12 trials. On each trial the testee is reminded only of the words he did not recall on the previous trial. We included this test because of our informal observations

that Maori often attained average or higher scores when compared with the NZ norms available for this test.

(vi) We had observed that Maori often performed poorly on the WMS-R LM test, which involves recalling two short American stories. The LM-Maori test was also given to the participants. This new test consists of one story about a hangi (feast), and a second story about a tangi (funeral), both events familiar to Maori. The stories were written using the grammar and sentence structure typical of that used by Maori from rural communities and lower socioeconomic groups, but were broken into a series of ideas for scoring purposes in a way that paralleled the standard LM stories. We hypothesised that the Maori men would not attain the average WMS-R LM scores, but they would perform at a higher level on the LM-Maori test using the same scoring criteria.

(vii) Rural Maori would perform at an even lower level than urban Maori on Vocabulary and LM, given that they may be less acculturated into Pakeha systems than urban Maori, and have found formal schooling even less conducive to learning.

**Results**

*Quantitative Results*

T-tests compared the urban and rural groups on each test. No significant differences were found between the two groups on any of the test scores, so the two participant groups were combined for all the following analyses. Where available, appropriate age norms were used for scoring each participant.

*WAIS-R subtests*

Table 1 gives the group means of the scaled scores and the age-scaled scores for the WAIS-R subtests. The population mean for each WAIS-R subtest is 10, SD 3.

On the Vocabulary subtest the Maori participants scored almost 1SD below the mean, and on the BD subtest scored almost 1SD above the mean. Kaufman et al's (1988) analysis of the demographic data from

**Table 1.** Mean WAIS-R subtest scaled scores and age-scaled scores for the 24 Maori men

Subtest*	Scaled Score		Age-Scaled Score	
	Mean	Std. Dev.	Mean	Std. Dev.
Digit Span	9.29	2.03	9.50	2.65
Vocabulary	7.16	1.99	8.70	2.15
Block Design	12.12	2.59	12.66	2.71

Note: The population mean for each subtest (scaled scores and age-scaled scores) is 10, with a SD of 3.

**Table 2.** Maori group mean scores and comparison scores for NZ unskilled adults and students (16yrs and older) (Gronwall, 1990, unpublished norms) on the Selective Reminding Test (SRT). The standard deviations are given in parentheses.

	Total Words	Max long-term storage	List Learning		
	Correct		Trials 1-4	Trials 5-8	Trials 9-12
Maori men (N=24)	119.60 (15.40)	11.40 (1.28)	1.81 (1.02)	3.10 (1.17)	3.60 (0.64)
Unskilled Adults (N=15)	110.80 (30.35)	10.73 (1.73)	1.32 (0.94)	2.57 (1.20)	3.30 (0.76)
Students (N=15)	126.13 (10.05)	12.00 (0.00)	1.97 (0.65)	3.38 (0.86)	3.97 (0.35)
Max Possible Score	144.00	12.00	3.00	4.00	4.00

the large WAIS-R normative sample demonstrated that men obtained a significantly higher score than women on the BD subtest. The BD *d* score for men vs women was, however, very small (0.26), and trivial in its effect on Performance IQ, and in clinical terms generally (Snow and Weinstock, 1990). The mean score obtained by the Maori group (2.12 scaled score points and 2.66 age scaled points above the population mean of 10), was clearly much greater than would be expected based on gender alone.

The DSp score in the WAIS-R combines the forwards and backwards digit trials. The mean scaled and age-scaled scores for the Maori group fell close to 10. The WMS-R also includes DSp but separates the forwards and backwards scores. Age percentile equivalents of the raw scores for the forwards and backwards trials separately were thus able to be derived from the WMS-R manual. The Maori participants scored at the 51st percentile on DSp forwards, and at the 46th percentile on DSp backwards.

T-tests comparing within-subject scaled scores demonstrated significant differences between all WAIS-R subtests as follows:

- i) BD vs DSp.  $t = 5.38$ ;  $df=23$ ,  $p<.0001$
- ii) Vocabulary vs BD.  $t=9.74$ ;  $df=23$ ,  $p<.0001$
- iii) Vocabulary vs DSp.  $t=4.18$ ;  $df=23$ ,  $p<.001$

Field (1960) estimated that the minimum differences between pairs of WAIS scaled scores that could be interpreted as non-chance discrepancies were in the 3.5-4.3 range at the 5% level and the 4.6-5.5 range at the 1% level. If an assumption is made that these figures would be similar for the WAIS-R, three of the 24 Maori participants had Vocabulary-BD score differences at the 5% level, and 13 at the 1% level (all with a lower Vocabulary score). Three participants had Vocabulary-DSp score differences at the 5% level, and three at the 1% level (all with a lower Vocabulary score). Four participants had a DSp-BD score difference at the 5% level, and five at the 1% level (all with a lower DSp score).

### Rey Complex Figure

According to Rey and Osterreith's scoring criteria (Osterreith, 1944; Rey, 1941), and age-appropriate Canadian norms from Kolb and Wishaw (1985), the Maori group mean for the CFT copy of 32.58, SD 2 fell 1SD below the standardized mean of 35.10, SD 1.5, and the Maori group CFT recall score of 22.39, SD 5.18, fell close to the standardized mean of 22.7, SD 7. Eight of the 24 subjects (33%) copied the figure in a piecemeal fashion.

### Selective Reminding Test

Table 2 gives the scores of the Maori participants along with New Zealand norms (Gronwall, unpublished norms, 1990) for unskilled adults (Pakeha and Pacific Island hospital orderlies) and students aged 16yrs and older (primarily Pakeha secondary school students) for three measures derived from the SRT. *Total words correct* is the number of words correctly recalled over all 12 trials. *Maximum long-term storage* is the number of words from the 12 in the word list recalled without reminding prior to the trial; this number increases across trials as more words are put into long-term storage. *List learning* refers to the number of words which, once committed to long-term storage, is consistently retrieved from that trial onwards, divided by the maximum number of words in long-term storage at that point. For each trial except Trial 1, the best score can be 1; that is all the words currently in long-term storage are consistently retrieved from that trial onwards. The list learning score is summed for each block of 4 trials, and should increase across trials as the testee consistently retrieves more words without being reminded. The Maori group's mean scores for all measures on the SRT fell between the higher scores of students and the lower scores of the unskilled adults.

### Logical Memory

The WMS-R uses age percentile equivalents of raw scores. The mean age percentile scores for the Maori group fell within the 17th to 29th percentiles for the immediate recall (mean raw score = 22.46, SD 5.48), and within the 24th to 44th percentiles for delayed recall

(mean raw score = 20.83, SD 6.34).

On the LM-Maori test, scored in a similar manner using the WMS-R LM age percentile equivalents, the mean age percentile scores for the Maori group fell within the 45th to 57th percentiles for the immediate recall (mean raw score = 27.63, SD 7.57), and within the 49th to 66th percentiles for delayed recall (mean raw score = 25.88, SD 6.11). The scores for the LM-Maori were higher than those for LM for 22 of the 24 participants. T-tests comparing the scores for the LM and LM-Maori versions showed that the scores were significantly higher on the LM-Maori test for both immediate recall ( $t=4.17$ ,  $df=23$ ,  $p<.001$ ) and delayed recall ( $t=4.56$ ,  $df=23$ ,  $p<.001$ ).

### Qualitative Results

#### *Cultural differences on Vocabulary.*

The standard procedure in giving the Vocabulary subtest is to discontinue after five consecutive failures. In this study all the words were given, and this highlighted two words, *perimeter* and *obstruct*, which were frequently defined correctly although they were more difficult (thus further down the list) than earlier unknown words. Both words were known because of the participants' knowledge of rugby. Five rural and four urban participants defined perimeter as the outside boundary, giving a rugby field as an example, and seven rural and six urban participants defined obstruct as getting in someone's way or blocking someone, giving rugby or football as an example.

Consistent but "incorrect" definitions of two words, *domestic* and *terminate* were common. Six rural and eight urban participants defined domestic as an argument of some kind, usually between a man and woman, and five rural and 12 urban participants defined terminate as to kill or destroy. None of these definitions gain marks when scored according to the WAIS-R manual.

#### *Attitudes to testing*

Four of the urban Maori and six of the rural Maori said they disliked tests. Some typical comments from different men follow.

"Teachers always gave me a hard time over tests."

"I always look stupid in tests."

"I'm not into questions and things in tests."

"I'm only doing this to help other Maoris. Don't think I'm doing it for myself or need to do it for my own benefit."

"Why do I have to do tests any more? They haven't done anything for me. I learnt more out of school than when I was there."

"Might make me look dumb."

#### *Attitudes towards health professionals*

Seven rural and three urban participants said they would have been less comfortable with a Pakeha psychologist. Typical comments from different men follow.

"I don't like the way those Pakehas look down on us."

"I couldn't relax with a Pakeha tester."

"They'd make me feel funny."

"I'd be more of a smart arse with a Pakeha."

"If you were a Pakeha I just would have said no way."

"I'd be really shy with a Pakeha."

"I don't like Pakeha tests or testers."

Four rural and three urban participants said they would not mind being tested if the Pakeha psychologist had a positive attitude towards them and was not too formal in her/his approach.

"If they act like professionals I wouldn't do it."

"I don't like that formal talk."

"Makes a difference if the person talks down to me or has an attitude about Maoris."

"Don't mind Pakeha if I've got the whanau around."

"The setting and attitude makes a big difference."

Two rural and four urban participants said they didn't mind who the psychologist was or where the testing took place.

"It don't make no difference to me."

"I don't mind the race as long as they're respectful."

"They can just take me as I am. Take it or leave it."

#### *Attitudes towards the setting*

Five rural and four urban participants said they would not like to do the tests in an institutional or clinical environment,

"It's bad enough going to the doctor."

"I hate those places."

"Those places make me nervous."

"I prefer to do this in my own surroundings."

Four rural and one urban participant said they would only take part in a testing session in a Maori environment.

"I'd want a Maori environment with the whanau around. Like this place." (in a marae).

"This is me. This is what I am." (in a marae).

"A Maori environment feels friendly to me. Why should I be tested in their world? That's not for me."

"I'm stronger in my own surroundings. When I'm with my own."

## Discussion

The results of this study in the main supported the general prediction that the performance of young Maori men on various neuropsychological tests would be affected by the degree to which the test depended on formal (western) education, and the cultural appropriateness of the content of the test. Thus the Maori group scored comfortably within the average range on four of the seven test measures standardized on Western populations (DSp, BD, CFT- recall, SRT), a finding that should be heartening to neuropsychologists faced with the dilemma of carrying out neuropsychological assessments on this group. The hypothesized difference between rural and urban Maori was not found. This could indicate that both the rural and urban men have had negative school experiences, and in addition have had sufficient exposure to Maori culture to be influenced by it. This is likely as all the participants were recruited from work skills programmes on marae or in other Maori-friendly environments, or worked on marae. Future studies should attempt to include a more valid measure of acculturation in order to assess the influence of this variable on performance on tests developed and normed on white, western populations.

Specifically, scores on DSp forward were comparable to the WMS-R average scores, but DSp backward scores were slightly depressed. One possible reason for this is that experience with mental arithmetic, a skill favoured in the classroom, develops strategies helpful in repeating digit strings backwards. The Maori men achieved their lowest score (relative to the population mean) on the Vocabulary subtest of the WAIS-R. This test is known to be influenced by formal education, and qualitative data demonstrated that scores were also lowered by the culturally-biased scoring of some words (e.g. *domestic* and *terminate*). Fourteen men defined *domestic* as "an argument, usually between a man and woman", and 17 men defined *terminate* as "to kill" or "to destroy". These definitions are in common usage within this cultural group (and possibly within the young, male, adult New Zealand population generally), but received no points.

If this test had been given in strict accordance with the manual's instructions, that is, stopping the test after five consecutive failures, then the scores of many of the group would have been even lower. Nine men correctly defined *perimeter* and 13 men correctly defined *obstruct*, even although for some of these men these words came after five consecutive failures. This points up another problem with the Vocabulary test when using it on cultures other than that on which it was standardized. The words are given in order of increasing

difficulty; however young Maori men and almost certainly young Pakeha men as well find the words *perimeter* and *obstruct* very familiar because they belong to the rugby/football culture. Fortunately it is common practice for neuropsychologists to give clients the complete Vocabulary list, or at least after five failures to ask them to read silently down the remaining words and see if there are any that they know.

While we hypothesized that the Maori men would perform at average levels on BD, it was a surprise to discover that they scored on average almost 1SD above the WAIS-R mean. These good scores may reflect the lower reliance of these tests on formal education, but in addition it seems possible that Maori have a particular aptitude for visuospatial perception, construction, and memory. The Maori culture is certainly rich in designs not unlike BD patterns (e.g. the tukutuku panels found in Maori environments such as marae, Kokiri centres and Whare Wananga [schools of learning]). That the urban Maori were as good as the rural Maori on these tests is not particularly surprising; urban Maori from Auckland as well as rural Maori are likely to be familiar with these Maori art forms. Past research has found that some other indigenous peoples perform at levels higher than the white/european residents of the same country on visuospatial tests designed to assess the specific skills of the indigenous race. Porteus (1931) found that Australian Aborigines performed at a much higher level on the Footprint Recognition Test than white Australians, and Dubois (1939) reported a similar benefit for Pueblo Indians on the Horse Recognition Test. Of course, the good performance of the Maori participants on BD may not be generalizable to all Maori if their performance is dependent on the extent of their exposure to Maori culture and art forms. Ferguson et al (1991) did not find that Maori children scored higher than Pakeha children on the BD subtest of the Wechsler Intelligence Scale for Children-Revised (WISC-R; Wechsler, 1974). This may be because they are children, or because they live in the South Island where the numbers of Maori are relatively small and Maori art forms correspondingly less common.

A surprise finding was the piecemeal approach taken to copying the CFT by 33% of the men. Osterreith (1944) found that only 15% of "normal" adults copied the figure in this way. Neuropsychologists generally assume that this approach signals a poor ability to organise and structure the drawing. Certainly a piecemeal approach is common following damage to the parietal lobe of the brain (due to impaired visuospatial function) and damage to the frontal lobes (due to poor planning and organization). These brain-damaged patients, however, obtain low scores on the copy and recall as a result of their impaired strategies. Although

the copy scores of the Maori group fell 1SD below the age-appropriate Canadian mean, their average recall suggested they were not particularly disadvantaged by using what appeared to be a piecemeal copying strategy. This may be an example of a cultural difference in visuospatial perception and organisation. A range of differences in perception have been noted in other cultures (e.g. Ardila et al, 1989; Dawson, 1967; Hudson, 1960). Alternatively, adults from lower socioeconomic groups may be more likely to take a piecemeal approach, regardless of culture.

While it is important to discover that this particular subgroup of normal Maori men did worse than the "average" on Vocabulary and better than the "average" on BD, in terms of neuropsychological assessment it is even more important to understand the significance of the difference between these two subtest scores. On average the group difference was 5 scaled score points, which could well be considered "abnormal", and 13 of the men had Vocabulary-BD scaled score differences of 7 to 11 scaled points, considered significant at the 1% level. All 24 men achieved a higher score on BD than on Vocabulary. The lesson is clear. When this pattern is found in a young Maori man following a head injury or other neurological problem, it does not necessarily signify impairment. However, when a pattern of a BD score 3 or more points below the Vocabulary score is found, then a true impairment is likely. Further testing along with an exploration of that client's specific premorbid abilities would of course be necessary before confirming this.

When a whole group of normal adults follow a score pattern on a test battery that deviates significantly from "normal", the test battery, or at least the normative data, are clearly inappropriate. That cultural patterns can contribute to wide disparities between Verbal and Performance IQ scores on the Wechsler scales has been noted previously by researchers such as Dershowitz and Frankel (1975) with Jewish subjects, and Tsushima and Bratton (1977) when comparing Hawaiians with mainland Americans. Their findings support the differential outcomes of this study between BD, Vocabulary, and Digit Span scores. In contrast, the African-Americans that made up the appropriate percentage of the standardization sample for the WAIS-R scored below the white Americans on every subtest (Kaufman et al, 1988).

On the verbal memory tests, the Maori men also performed as predicted. On the list learning test, SRT, they obtained scores that suggested their performance would fall well within the range of their Pakeha peers. That is, whilst their performance did not match the performance of Pakeha senior secondary school students, they performed at every stage of the test

somewhat better than the NZ unskilled worker comparison group. That is, they placed more words into long-term storage over fewer trials and could consistently recall more words earlier. These findings are not unexpected given that the normative unskilled group included a number of Pacific Islanders. Although this group of Pacific Islanders were fluent in English it is likely that some of them would have been less fluent than most Maori from the same socioeconomic group. Future studies should assess clearly defined cultural groups matched for socioeconomic factors on written and oral memory tests that use lists of high frequency and simple English words, as such tests can be very helpful in the assessment of the memory skills used both in formal education and in many everyday tasks.

Cole and Scribner (1974) found that different cultural groups used different memory strategies. Traditionally Maori relied exclusively on an oral as opposed to literal memory, in contrast to Pakeha. The history of the Maori is oral, embedded in mnemonic devices such as whakapapa (genealogy) and nga waiata (songs). Maori conversation still includes an abundance of story-telling and anecdotes. While oral learning has been increasingly supplemented with visual and written aids, the performance of Maori in the formal education system demonstrates that they have not mastered literacy to the same extent as their Pakeha peers. Perhaps less reliance on written material and more experience of and attention to oral knowledge has assisted present-day Maori to learn spoken lists of unrelated words with relative ease.

In contrast, the Maori men performed below the norm on the LM test, which involves recalling, both immediately and following a delay, meaningful stories. The hypothesis that these American stories would be less meaningful to Maori than to Americans or even to westernised Pakeha was explored by giving the Maori an alternative test, LM-Maori. It was written in a Maori dialect of English and scored in the same way as LM, but used two stories about common Maori situations. As hypothesised, on this test the Maori men scored at levels equivalent to "average" on the LM. Of course, the LM-Maori test may simply be easier than the LM test, and Pakeha may also score better on it. This would not be surprising as these "Maori" stories may be more familiar to Pakeha than the American stories of LM. Research is in progress to explore this by assessing groups of Maori and Pakeha matched for age, education, and socioeconomic group on both LM and an improved version of LM-Maori which includes phrases more dialectically correct for Maori such as "put down hangī" rather than the phrase used in this study, "worked making hangī". These improvements arose out of the responses and common "errors" made by the Maori

participants in our study. The concern for Maori must be that current neuropsychological practice judges their verbal memory abilities on the basis of their performance on a culturally biased and normed memory test such as the LM.

Given that the results of this study suggest that young Maori men in the lower socioeconomic group (a common profile for Maori in the closed head injury statistics), do as well or better on some neuropsychological tests and relatively worse on others when compared with American and NZ norms, the obvious question is why? Is it simply because they have had an impoverished formal education and live in a lower socioeconomic environment than the overall population, or is it because they are Maori? Research currently in progress, comparing young Maori men and women with Pakeha peers matched on age, education, and socioeconomic variables will hopefully go some way towards answering this. Tests incorporating Maori idiom and language are also being explored. Another factor that dovetails with that of being Maori, is acculturation into the dominant Pakeha culture. The new study will attempt to assess the level of acculturation of the Maori participants to see whether that influences test performance.

The question of the influence of education is complex. The comments of the Maori men in this study made it clear that many of them had a dismal experience in the NZ school system. According to their performances on BD, the CFT recall, and the SRT, their negative school experiences were not because they were as a group of below-average intelligence, or had poor memory abilities. Indeed, the majority of Maori in the wider population attest to negative school experiences and do poorly at school, yet 50% of Maori must be of "average" intelligence. The success of the recent development of Maori schools (Comer et al, 1991) where children are taught Maori-specific skills (as well as reading, writing and arithmetic) by Maori in the Maori language, utilizing Maori teaching methods in a Maori environment, goes some way towards equalizing the opportunities for and access to culture-fair education for Maori and Pakeha. Whether future adults who demonstrated average intellectual abilities when in the Maori school system could attain "average" scores on the WAIS-R Vocabulary test and LM is unlikely to be tested, as they would rightly demand a more culturally-appropriate means of assessing their verbal abilities! However, it seems unlikely that their scores on tests like BD would drop to "average" levels, if we suppose that the ability to do this test well taps into a Maori-specific skill. Indeed, their scores on BD might improve with increased exposure as children to Maori art forms.

The other issue explored tentatively in this study was the test environment. Clearly some of the Maori participants in this study felt they would have been less comfortable with a Pakeha psychologist in a less familiar environment. This finding is hardly surprising; neuropsychologists have known for years the importance of reducing client anxiety and building good rapport. In this study Maori participants may, of course, have felt constrained to make the comments they did, given they were being asked by a Maori psychologist with tribal affiliations close to their own. It is quite possible that some Maori would prefer to be assessed by a culturally-sensitive Pakeha, given tribal sensitivities and issues around understandings of confidentiality. In future research the same Maori participants could be assessed by both a Maori and a Pakeha psychologist with client comfort levels being evaluated later by an independent assessor.

The number of Maori assessed in this study is too small to enable their scores to be used confidently as "norms" for these tests, even for Maori of the same sex, age, and socioeconomic status. The study may, however, serve to alert psychologists to the types of tests that are more or less appropriate for use with this group, and provide a starting point for further research and test development and standardization for the Maori population. Hopefully in the future, most Maori clients will be able to choose whether they will be assessed by a Maori or Pakeha neuropsychologist. In the meantime, clinical psychologists who find themselves in a situation where they are required to assess a Maori client with a neurological disorder in order to ensure he or she receives adequate rehabilitation or compensation, could endeavour to refer to, collaborate or consult with Maori on the assessment and interpretation of the tests, offer to assess the client in the setting of his/her choice, and ensure that premorbid abilities are assessed by a careful exploration with the client and whanau of the client's leisure and community interests and abilities as well as formal educational abilities.

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