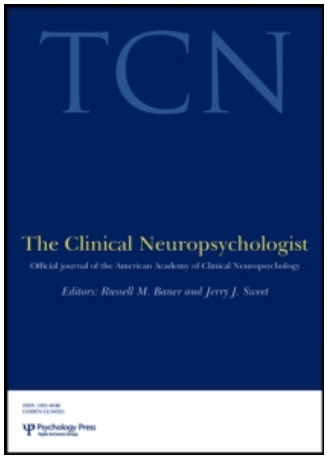
This article was downloaded by:[Razani, Jill]
On: 7 August 2007
Access Details: [subscription number 781142055]
Publisher: Psychology Press
Informa Ltd Registered in England and Wales Registered Number: 1072954
Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



The Clinical Neuropsychologist
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713721659

The Effects of Culture on WASI Test Performance in Ethnically Diverse Individuals

Online Publication Date: 01 September 2007
To cite this Article: Razani, Jill, Murcia, German, Tabares, Jose and Wong, Jennifer (2007) 'The Effects of Culture on WASI Test Performance in Ethnically Diverse Individuals', The Clinical Neuropsychologist, 21:5, 776 - 788
To link to this article: DOI: 10.1080/13854040701437481
URL: http://dx.doi.org/10.1080/13854040701437481

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: http://www.informaworld.com/terms-and-conditions-of-access.pdf

This article maybe used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

© Taylor and Francis 2007

The Clinical Neuropsychologist, 21: 776–788, 2006
http://www.psypress.com/tcn
ISSN: 1385-4046 print/1744-4144 online
DOI: 10.1080/13854040701437481

Psychology Press
Taylor & Francis Group

Downloaded By: [Razani, Jill] At: 00:55 7 August 2007

THE EFFECTS OF CULTURE ON WASI TEST PERFORMANCE IN ETHNICALLY DIVERSE INDIVIDUALS

Jill Razani, German Murcia, Jose Tabares, and Jennifer Wong
California State University, Northridge, CA, USA

The objective of this study was to examine differences between fluent English-speaking ethnically diverse (ED) individuals (from Hispanic, Asian, and Middle-Eastern descent) and monolingual English-speaking Anglo-Americans (MEAA) on the Wechsler Abbreviated Scale of Intelligence (WASI). A sample of 86 (50 ED and 36 MEAA) healthy individuals participated. The results revealed that the MEAA group outperformed the ED group on the verbal (i.e., Vocabulary and Similarities), but not the nonverbal (i.e., Block Design and Matrix Reasoning) subtests. Various cultural factors such as the level of acculturation and the degree to which the English language was used correlated with verbal skills. Number of years the education was obtained outide of the US was an important predictor of verbal and some nonverbal performance in the ED group. The findings from this study underscore the importance of taking cultural factors, particularly level of acculturation, into account when interpreting test scores of ED individuals.

INTRODUCTION

One of the most serious challenges facing the field of neuropsychology currently is that of assessing cognitive functioning of individuals from diverse ethnic backgrounds. According to the United States Bureau of Census (Census of Population, 1990) it is estimated that 50% of the US population will be from a non-Anglo background by the year 2050. The majority of neuropsychological and IQ tests have been developed and normed for White, monolingual, English-speaking individuals within the United States or Canada, and therefore the suitability of their use with ethnically diverse individuals is questionable. There are undoubtedly a host of factors that are likely to affect the cognitive test performance of ethnic immigrant individuals such as acculturation and bilingualism (Gonzales & Roll, 1985; Whitworth, 1983), however very few studies have systematically examined these factors.

The Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999) was developed in response to the need for a brief, reliable version of the Wechsler Adult Intelligence Scale-III (WAIS-III; Hays, Reas, & Shaw, 2002; Kaufman & Kaufman, 2001). Administering the WASI in lieu of the WAIS-III is particularly

Address correspondence to: Jill Razani, Ph.D., Department of Psychology, California State University, Northridge, 18111 Nordhoff Street, Northridge, CA 91330-8255, USA. E-mail: jill.razani@csun.edu
Accepted for publication: July 1, 2005. First published online: July 16, 2007.

© 2006 Psychology Press, an imprint of the Taylor & Francis group, an Informa business

Downloaded By: [Razani, Jill] At: 00:55 7 August 2007

attractive to neuropsychologists given that valuable information regarding IQ as well as verbal and nonverbal skills (such as reasoning abilities) can be obtained, while shortening a lengthy test battery by over an hour. However, as with many other neuropsychological tests, the normative sample consists of primarily White individuals, and no information regarding the level of acculturation or linguistic characteristics (e.g., English fluency) for the Hispanic and "other" ethnic groups used in the normative sample is available. Additionally, the data are not stratified by ethnicity, and perhaps more importantly, culturally relevant information is not provided for the non-White samples. Similar to the WAIS-III, the data are only adjusted by age groupings. Thus, it is unclear whether or not the White and non-White normative samples reported in the WASI manual performed similarly on all verbal and nonverbal subtests, and what, if any, cultural factors might account for test score variability in the non-White sample.

One of the earliest studies by Mercer (1973), examining the effects of acculturation on intellectual functioning in Hispanic and African-American children, demonstrated higher IQs in those who possessed greater "Anglo" sociocultural characteristics. In fact, in this study children sharing most or all of the Anglo cultural characteristics displayed mean IQs at or above that of the Anglo norms. Gonzales and Roll (1985) cite a related unpublished master's thesis by Gonzales (1980) that found that Mexican-American and Anglo-American university students did not differ from one another on nonverbal intellectual abilities, but that a correlation between level of acculturation and verbal skills on the ACT (high school scholastic achievement test) was found. In their own study, Gonzales and Roll (1985) examined verbal and nonverbal intellectual functioning of Mexican-American, African-American, and Anglo-American children (4th through 12th graders) and young adults (college students). They found that the Anglo-Americans outperformed the minority groups on verbal (WAIS Vocabulary subtest), but not the nonverbal (measures similar to matrix reasoning) tests. Additionally, the greater the acculturation level of the Mexican-Americans, the higher their verbal abilities were, and in fact those who identified themselves as Anglo-American on the acculturation measure had higher scores on the Vocabulary subtest than those who identified themselves as Mexican-American. This was not the case for the nonverbal measures. Arnold and Orozco (1989) examined the relationship between acculturation and specific verbal and nonverbal psychological tests in a group of disabled Mexican-American patients. They found that as acculturation level increased, so did performance on tests that require verbal processing (such as the Peabody Picture Vocabulary Tests-Revised). Acculturation was also found to correlate with a measure of functional/adaptive behavior. However, no relationship between acculturation and tests of sensory or motor functioning was found.

Other studies examining the relationship between level of acculturation and traditional neuropsychological tests have also revealed some interesting findings. Arnold, Montgomery, Castaneda, and Longoria (1994) examined the relationship between level of acculturation and performance on the overall impairment index and various subtests of the Halstead-Reitan. The authors found a significant effect of acculturation on the Seashore Rhythm Test, the Halstead Category Test, Tactual Performance Test (TPT) total score, TPT Dominant hand, and TPT Nondominant hand. No effects of acculturation were found for TPT Localization and Memory, Finger Tapping, and Trail Making Test. In a more recent study, Touradji, Manly, Jacobs, and Stern

Downloaded By: [Razani, Jill] At: 00:55 7 August 2007

(2001) revealed that US-born English-speaking, non-Hispanic White elders outperformed their foreign-born counterparts on a number of verbally mediated neuropsychological measures, such as verbal reasoning, naming, and verbal fluency tasks. These authors used length of residence in the US as a measure of acculturation and found that this factor did in fact account for significant variability in specific verbal tests, such as verbal fluency. Harris and colleagues (Harris, Tulsky, & Schultheis, 2003), using 151 non-native English speakers from the standardization sample of the WAIS-III and WMS-III, found that cultural factors such as language preference, years of residence in the US, and length of education within the US all accounted for significant portions of variability in the joint WAIS-III–WMS-III Verbal Comprehension Index, Processing Speed Index, Auditory Memory Composite, and Visual Memory test score performance once the effect of age and education had been statistically removed. The only test that did not correlate with the cultural measures was Visual Memory.

Acculturation factors appear to affect test performance in even monolingual, English-speaking ethnic minority groups within the United States. Manly et al. (1998) found that in a sample of older African-Americans level of acculturation, assessed with the African American Acculturation Scale, was related to various neuropsychological test scores, including tests of memory, naming, and figure matching. Additionally reading level, not educational attainment, appears to attenuate difference between older African-Americans and Caucasians on a large number of neuropsychological tests, suggesting that the quality of the education (or educational experience) is a more important variable to measure than the actual education level (Manly, Jacobs, Touradji, Small, & Stern, 2002).

The purpose of the present study was to examine the performance of a group of fluent, English-speaking individuals from varied ethnic and cultural backgrounds in comparison to that of a group of monolingual English-speaking Anglo-Americans. Further, the aim was to examine the relationship between cultural factors such as acculturation, degree of English-language usage, and the number of years one's education was obtained outside of the United States and performance on the WASI. To the best of our knowledge, the current study is the first to examine the performance of ethnically diverse groups on the WASI, as well as to examine how acculturation and other cultural factors affect test performance on this intelligence measure.

METHOD

Participants

A total of 86 healthy people were recruited from the greater Los Angeles community. Of these, 36 participants were monolingual English-speaking Anglo-Americans (MEAA) between the ages of 20 and 72 years with 10 to 16 years of education; 50 participants were an ethnically diverse (ED) group of participants of Hispanic, Asian, or Middle-Eastern descent between the ages of 18 and 69 years of age with 9 to 18 years of education. The demographic information for participants presented in Table 1 shows that the MEAA group was slightly older than the ED group, $F(1, 84) = 8.9$, $p = .004$.

Within the ED group, 37 were of Hispanic descent from Mexico, Central America (El Salvador, Guatemala, and Honduras), or South America (Paraguay

Downloaded By: [Razani, Jill] At: 00:55 7 August 2007

Table 1 Means and standard deviations (in parentheses) for demographic information and other measures

Measures	ED group	MEAA group
N	50	36
Male/Female ratio	19/31	13/23
Age*	34.92 (±13.05)	43.86 (±14.61)
Years education	13.08 (±2.09)	12.89 (±1.51)
Years education outside US	8.14 (±5.16)	0.00
Years residence in US	24.00 (±11.20)	–
Acculturation	59.68 (±14.47)	–
% English growing up	39.96 (±36.53)	–
% English currently	63.88 (±33.62)	–
WRAT-III Reading (raw score)*	45.76 (±5.65)	49.71 (±4.55)
WASI		
FSIQ	99.65 (±13.85)	103.86 (±14.10)
VIQ*	95.20 (±12.46)	105.09 (±14.41)
PIQ	101.10 (±11.30)	103.86 (±12.81)
VIQ-PIQ*	−5.73 (±12.53)	1.71 (±14.63)
Vocabulary Raw Score*	51.00 (±10.02)	60.06 (±9.92)
T-Score*	44.28 (±10.13)	53.71 (±8.96)
Similarities Raw Score*	34.67 (±7.09)	37.91 (±6.26)
T-Score	47.82 (±9.81)	51.94 (±10.38)
Block Design Raw Score	42.29 (±12.97)	37.89 (±15.61)
T-Score	50.80 (±8.00)	49.72 (±9.70)
Matrix Reasoning Raw Score	25.68 (±8.58)	26.86 (±9.92)
T-Score	50.62 (±10.80)	51.97 (±12.35)

*$p < .01$; D = ethnically diverse, MEAA = monolingual English-Speaking Anglo-American.

and Columbia), 7 were of Asian descent from Indonesia, Vietnam, or Korea, and 6 were of Middle-Eastern descent from Iran or Turkey. In this ED group, 18 were born in and 32 were born outside of the US, and English was the first language for 12 and the second language for 38. Additionally, 18 of the ED participants obtained all of their education inside of the US, 6 obtained all of their education outside of the US, and 26 obtained a portion of their education in their native country and a portion within the US. Unfortunately, we do not have data regarding whether any of the participants who obtained any portion of their education outside of the US attended English-speaking schools. However, closer examination of data regarding the age they entered the US, years of education obtained outside of the US, and age at which they learned English indicates that at least 5 participants had some (ranging from 1 to 6 years) experience with the English language prior to entering the US (but it is unclear whether this was within an educational context).

All participants were carefully screened with an examiner-administered health questionnaire for the following factors known to affect cognitive functioning: history of neurological or psychiatric illness, head injury resulting in $\geq$5 minutes of loss of consciousness, learning disability, and chronic untreated medical illness (e.g., diabetes, hypertension). While we recognize that the prevalence of medical illness (e.g., hypertension and diabetes) may be greater in certain ethnic (e.g., specific Hispanic populations) and age groups, the literature indicates that these untreated conditions are likely to result in cognitive impairment. Thus, given our desire to

Downloaded By: [Razani, Jill] At: 00:55 7 August 2007

measure the effects of cultural factors on IQ test performance in healthy individuals (i.e., those without cognitive compromise), we excluded individuals with untreated chronic illnesses, rather than include medical conditions as a variable in this study. Additionally, to participate in the study, all participants were required to be fluently conversant in English, and able to communicate clearly with the examiner, understand test instructions, and carry out the tasks.

Instruments

Wechsler Abbreviated Scale of Intelligence. All participants were administered the Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999). The WASI consists of four subtests, two measuring verbal (Vocabulary and Similarities) and two measuring nonverbal/performance (Block Design and Matrix Reasoning) abilities. Raw scores for each subtest are then converted into age-corrected T-scores. The sum of the T-scores for all four subscales can be used to obtain age-corrected Full Scale IQ. Similarly, Verbal IQ is obtained by summing the T-scores from the two verbal subtests, and Performance IQ can be obtained by summing the T-scores from the two performance subtests.

For the purposes of this study raw scores rather than age-corrected T-scores for the four individual subtests were used for in the statistical analyses, along with FSIQ, VIQ, and PIQ.

It should be noted that for various reasons (e.g., a few participants were not able to complete testing, or slight misadministration of various subtests of the WASI) there are some missing data points. One MMA participant was missing the Vocabulary subtest, one MEAA and one ED participant were missing the Similarities subtest, and one ED participant was missing the Block Design.

Wide Range Achievement Test-III (WRAT-III) Reading. The Reading subtest of the WRAT-III (Wilkinson, 1993) was used to determine literacy and reading level for all participants. The WRAT-III is a standardized test consisting of 15 letters that are to be identified and 42 words that range in pronunciation difficulty. Given that some of the ED participants had foreign accents, slightly less stringent pronunciation criteria were used for this group. Testers were trained on a procedure in which word recognition was the scoring criterion, not speech or diction. Consistent with the WRAT-3 manual, unusual pronunciations due to colloquialisms, foreign accents, and defective articulation were accepted as correct if the peculiarity was consistent throughout. In general, when a participant stumbled with pronunciation of a word and it was clear that they were attempting to sound out the word phonetically, and did so inaccurately, the item was scored as incorrect.

The WRAT-III Reading subtest was of particular interest in this study for better understanding the relationship between English reading fluency and performance on the WASI in the ED group.

Acculturation and other related measures. Since specific acculturation measures are unavailable for each individual ethnic group used in the current study, the Acculturation Rating Scale for Mexican Americans (ARMSA; Cuellar, Harris, & Jasso, 1980) was adapted and administered to the ethnic participants. At least one study has demonstrated that the ARMSA can be reliably and validly adapted for

Downloaded By: [Razani, Jill] At: 00:55 7 August 2007

Asian groups (Suinn, Rickard-Figueroa, Lew, & Vigil, 1987). Using similar methods to that of Suinn et al. (1987), wordings such as "Mexican" and "Spanish" were changed to the nationality and the language of origin that were applicable to the participant. As an example of the type of adaptations made, below are two sample items from the original ARMSA and those adapted for an Iranian individual:

ARMSA	*Adapted for Iranian*
What language do you speak?	What language do you speak?
1. Spanish only	1. Farsi only
2. Mostly Spanish, some English	2. Mostly Farsi, some English
3. Spanish and English about equally	3. Farsi and English about equally
4. Mostly English, some Spanish	4. Mostly English, some Farsi
5. English only	5. English only
How would you rate yourself?	*How would you rate yourself?*
1. Very Mexican	1. Very Iranian
2. Mostly Mexican	2. Mostly Iranian
3. Bicultural	3. Bicultural
4. Mostly Anglicized	4. Mostly Anglicized
5. Very Anglicized	5. Very Anglicized

The ARSMA is a 20-item scale that requires the participant to rate each question on a 5-point Likert scale ranging from original heritage/language (1) to Anglo/English (5). The ARSMA assesses four acculturation domains: (1) language familiarity, usage, and preference; (2) ethnic identity and generation; (3) reading, writing, and cultural exposure; (4) ethnic interaction. In adapting this instrument for a broader range of ethnic groups, three of the items had to be limited to a 3-point Likert scale, since distinctions such as "Mexican" versus "Chicano" were not relevant for all ethnic groups. All other items were rated on the original 5-point Likert scale. The ARMSA also has two questions regarding culture and language that are also rated on a 5-point scale, but which are not included in the overall score. Given our interest in learning about cultural and language affiliation in our ED participants, we included these two questions in the overall total score. Thus, individuals could receive a score of 22 (lowest level of acculturation) to 104 (highest level of acculturation) on this acculturation measure.

We were also interested in collecting additional information regarding language usage and greater detail about educational attainment from the ED sample. For language, participants were asked to estimate the percentage of English they spoke when they were growing up and the percentage they use currently. Additionally, participants informed us about the length of time (in years) they were educated outside of the United States. It should be noted that all of the Anglo-American participants were monolingual English-speaking and obtained all of their education within the United States. Table 1 presents means and standard deviations for the acculturation, language, and education factors for the ED group.

Procedure

Participants were recruited via newspaper advertisements, flyers posted in public agencies and buildings, and word of mouth. The WASI was administered as part

Downloaded By: [Razani, Jill] At: 00:55 7 August 2007

of a larger neuropsychological test battery, which took approximately 2½ hours to complete. All participants were administered a health questionnaire as part of the screening procedure, and the ED group was administered an additional questionnaire which contained more detailed questions regarding language usage and educational attainment, as well as the acculturation instrument. All participants were paid $50 for their participation.

Data Analyses

Due to the multiple analyses, the p value required for statistical significance was lowered to .01 rather than the standard .05 value for the omnibus group comparison tests. Significance values for the follow-up group analyses were set at the .025 level. Alpha levels were also reduced to .025 for the correlation and regression analyses. While we recognize that this may not entirely protect against Type I error, more stringent criteria would increase Type II error due to the relatively small sample size.

RESULTS

Given that there were age differences present between the ED and MEAA groups, a Multivariate Analysis of Covariance, using age as the covariate, was performed in order to compare the MEAA group to the ED group on the four WASI subscale measures (Vocabulary, Similarities, Block Design, and Matrix Reasoning). The analyses revealed a significant difference between the groups on the WASI subscales, Wilk's Lambda $F(4, 76) = 4.51$, $p = .003$. Follow-up, one-way ANCOVAs revealed that the MEAA group outperformed the ED group on the Vocabulary subtest, $F(1, 82) = 15.42$, $p < .0001$ and the Similarity subtest, $F(1, 81) = 7.15$, $p = .009$. As expected, an ANCOVA also revealed that the MEAA group outperformed the ED group on VIQ, $F(1, 80) = 9.75$, $p = .001$. Conversely, no differences were found on the Block Design subtest, $F(1, 82) = 0.15$, $p = .70$ or Matrix Reasoning, $F(1, 83) = 1.81$, $p = .18$. No differences were found between the groups on PIQ, $F(1, 81) = 0.86$, $p = .36$ or FSIQ, $F(1, 79) = 1.28$, $p = .26$. Differences between the groups in the discrepancy between PIQ minus VIQ discrepancy, were examined using a one-way ANCOVA, with age as the covariate. The results revealed a significant difference, with the mean of the MEAA resulting in a negative and the ED group resulting in a positive value on the PIQ-VIQ measure, $F(1, 79) = 5.67$, $p = .02$.

In order to further assess the effects of language, the ED group was divided into two groups: those for whom English was a first language and those for whom English was a second language. The four WASI subscale performance of these two groups was then compared to that of the MEAA group with a MANCOVA, using age as the covariate. The results revealed a significant difference between the groups on the WASI, Wilk's Lambda $F(8, 152) = 3.09$, $p = .002$. Follow-up analyses revealed that the groups differed on VIQ, $F(2, 79) = 4.83$, $p = .01$, with the MEAA (mean = 105.09, $SD = 14.41$) outperforming both English-as-first-language ED (mean = 95.58, $SD = 15.35$) and the English-as-second-language ED (mean = 95.08, $SD = 11.61$), but that there was no difference between the two ED groups. Similar differences were found on the Vocabulary subtest, $F(2, 81) = 8.78$,

Downloaded By: [Razani, Jill] At: 00:55 7 August 2007

$p = .001$, again with the MEAA (mean = 60.06, $SD = 10.89$) outperforming both the English-as-first-language ED (mean = 53.67, $SD = 10.40$) and the English-as-second-language ED (mean = 50.46, $SD = 9.89$). The analysis was nearly significant for Similarities, $F(2, 80) = 3.82$, $p = .025$, with the MEAA (mean = 37.91, $SD = 6.26$) outperforming both the English-as-first-language ED (mean = 34.75, $SD = 9.74$) and the English-as-second-language ED (mean = 34.65, $SD = 6.17$). However, the two ED (English-as-first or second language) groups did not differ from one another on the verbal subtests. These findings suggest that cultural factors aside from first language alone affected performance of the ED group on verbal subtests of the WASI. None of the three groups (MEAA and the two ED groups) differed on FSIQ, PIQ, Block Design, or Matrix Reasoning (p values ranged from .16 to .76).

Bivariate Pearson r correlation analyses were performed for the ED group in order to examine the relationship between the WASI measures and cultural factors. Correlation coefficients for the relationship among the demographic variables, cultural factors, and measures of the WASI are presented in Table 2. As can be seen from this table, the verbal measures (VIQ, Vocabulary, and Similarities subtests) were significantly related to acculturation, and the percentage of time participants spoke English growing up and/or currently. Additionally, the greater amount of time (in years) the education was obtained *outside* of the United States, the worse the ED participants performed on the verbal measures and Block Design. The verbal WASI measures also correlated significantly with WRAT-III Reading scores. None of the nonverbal measures correlated with the cultural/language factors—again with the exception of a significant negative relationship between the amount of time education was obtained *outside* of the US and Block Design (this relationship with Matrix Reasoning did not reach the .025 significance level).

A series of hierarchical regression analyses were performed on the WASI subscales in order to find the unique amount of variability accounted for by the cultural factors. The independent variables were entered in four blocks in the following order: the demographic variables of age and education were entered first, followed by WRAT-III Reading test (in order to isolate the effects of reading fluency on the WASI measures), number of years education was obtained outside of the US, and finally total acculturation score. This order was selected so that unique variability explained by cultural factors (years educated outside of the US and acculturation level) could be examined for each of the WASI measures above and beyond the contributions of demographic factors and reading skill. The language factors (i.e., percentage of time English was spoken when growing up or currently) were not used in any of the hierarchical regression analyses given that (1) these factors are to some degree represented in the overall acculturation score, and (2) we were attempting to reduce the number of independent variables due to our limited sample size. The results of these analyses are presented in Table 3. Essentially, the most significant findings from these analyses was that for Vocabulary, years of education outside of the US and level of acculturation accounted for significant proportions of variability, above and beyond that of age, education, and reading skills. For Similarities, the unique proportion of variability accounted for by acculturation after the other factors were entered into the model did not reach significance. Similarly, the cultural factors did not account for significant proportions of variability in any of the nonverbal subtests.

Downloaded By: [Razani, Jill] At: 00:55 7 August 2007

Table 2 Pearson *r* correlation coefficients between WASI measures, demographic and cultural/language factors

Variables/Measures	Age	Education	WRAT	Total acculturation	Years in US	Years educated outside of US	% English spoken growing up	% English spoken currently
Age	–	−0.08	−0.15	−0.12	**0.50****	**0.52****	−0.26	−0.24
Education	−0.08	–	**0.51****	0.01	−0.31	0.16	0.16	0.01
Yrs ed outside US	**0.52***	0.16	−0.12	**−0.62****	−0.29	–	**−0.68****	**−0.57****
FSIQ	−0.12	0.08	0.30^{+}	**0.41****	0.18	**−0.42****	0.22	**0.44****
VIQ	−0.14	**0.35****	**0.37****	**0.45****	0.02	**−0.32***	0.20	**0.38****
PIQ	−0.11	0.20	0.14	0.33*	0.03	−0.18	0.13	0.17
Vocabulary	−0.16	0.21	**0.46****	**0.64****	0.19	**−0.44****	**0.40****	**0.68****
Similarities	**−0.32***	0.19	0.22	**0.38****	−0.03	**−0.33***	0.04	0.21
Block Design	**−0.40****	0.02	−0.04	0.21	−0.13	**−0.31***	0.14	0.07
Matrix Reasoning	**−0.36***	0.11	0.14	0.21	−0.26	−0.27^{+}	−0.03	0.09

Variables that analyses that met the $p \leq .025$ criteria are in bold.
$^{+}p \leq .05$, $^{*}p \leq .025$, $^{**}p < .01$.

Downloaded By: [Razani, Jill] At: 00:55 7 August 2007

Table 3 Results of hierarchical regression analyses for demographic and cultural factors affecting WASI subtest performance for the ethnically diverse group

WASI subtest	Variables entered	R^2	R^2 change	F change	p value
Vocabulary	Age, Education	.073	.073	1.58	.22
	WRAT Reading	.172	.099	4.65	.04
	Years ed. outside US	**.489**	**.317**	**23.57**	**<.001**
	Acculturation	**.572**	**.08**	**7.22**	**.01**
Similarities	Age, Education	.131	.131	2.95	.06
	WRAT Reading	.152	.021	0.93	.34
	Years ed. outside US	.188	.036	1.65	.21
	Acculturation	.259	.070	3.42	.07
Block Design	Age, Education	.137	.137	3.10	.06
	WRAT Reading	.137	.000	0.01	.96
	Years ed. outside US	.155	.018	0.77	.39
	Acculturation	.166	.011	0.48	.50
Matrix Reasoning	Age, Education	.148	.148	3.48	.04
	WRAT Reading	.151	.003	0.12	.73
	Years ed. outside US	.155	.004	0.19	.67
	Acculturation	.179	.024	1.10	.30

Variables entered into the equation that met the $p \leq .025$ criteria are in bold.

DISCUSSION

The results of the present study revealed that there are differences between Anglo-Americans and fluent English-speaking individuals from ethnically diverse (i.e., Hispanic, Asian, and Middle-Eastern) backgrounds on the verbal, but not on the performance, subtests of the WASI. The ethnically diverse group performed poorer than the Anglo-Americans on VIQ, and the Vocabulary and Similarities subtests of the WASI. The difference on the verbal subtests does not appear to be related to English-as-second-language issues alone, given that those within the ED group who had English as their first and English as their second language displayed depressed scores relative to the Anglo-American group, but not relative to each other. This would suggest that perhaps other cultural/linguistic factors, such as cultural familiarity with specific testing format and items, might account for the ethnically diverse groups' test performance. Group differences between the ED and MEAA individuals were not found on either of the WASI performance subtests, suggesting that perhaps Block Design and Matrix Reasoning are less dependent on cultural factors and language skills. These findings are consistent with previous studies, which have demonstrated that the most striking differences between Anglo-Americans and other cultural groups on intelligence tests are found in the areas of verbal skills (Gonzales, 1980; Gonzales & Rolls, 1985).

The findings from the correlation analyses further confirmed the influence of cultural and linguistic factors on the verbal performance of the ED group. Acculturation, which refers to the degree to which specific racial or ethnic groups participate in a dominant group's (i.e., Anglo-American) cultural practices and/or identify with the dominant culture's values and beliefs, demonstrated a strong correlation with both Vocabulary and Similarities performance within the ED group. In fact,

Downloaded By: [Razani, Jill] At: 00:55 7 August 2007

above and beyond the demographic factors and reading level, acculturation continued to account for a significant proportion of variability in the Vocabulary subtest. These findings are not surprising given that those who are less acculturated would most likely have less experience with the language and less familiarity with the culture-specific test items. A number of previous researchers have demonstrated similar relationships between acculturation and verbal measures of intelligence (Mercer, 1973; Touradji et al., 2001) as well as with various neurocognitive measures (Arnold et al., 1994), particularly those that rely on verbal processing (Manly et al., 1998; Touradji et al., 2001). The lack of relationship between nonverbal tests and level of acculturation in this study again supports the notion that Block Design and Matrix Reasoning may be less dependent on cultural factors. However, these findings will need to be replicated with a larger sample of ethnically diverse individuals, with lower education levels. In fact, a previous study based on the WAIS-III and WMS-III standardization sample found that the WAIS-III–WMS-III joint factor-scaled score of Perceptual Organization Index, which includes subtest scores of Block Design and Matrix Reasoning, significantly correlated with cultural factors such as language preference, time of residence in the US, and years of education attained within the US for a group of 151 immigrant bilingual individuals (Harris et al., 2003). The authors did not report correlations among the individual subtests and the cultural subtests.

It has been suggested that perhaps using the length of residence in the US is an adequate measure of level of acculturation (Gasquoine, 2001). However, in the present study, the formal measure of acculturation was a far better predictor of verbal performance than length of residence in the US. The current findings indicate that a multidimensional assessment of acculturation better characterizes the influence of culture on test performance and supports Helms' (1992) assertion that such measures should accompany cognitive assessment in ethnically diverse individuals. How we best control for level of acculturation in developing norms for ethnically diverse individuals remains an empirical question. One option may be to adjust for acculturation levels in a similar fashion as we do for demographic factors such as age and education, particularly for those tests that require verbal processing. Another suggestion provided by Helms (1992) is to use Berry's (1976) "ethunits" (i.e., "specifying the demographic, typological, and psychological dimensions that make groups distinct") as a process of approaching cultural equivalence in testing. Helms further provides an example of how ethunits may be applied. It is suggested that cultural nonequivalencies in performances on Eurocentric tests may be adjusted so that, for the same correct responses, less weight is given to scores of highly acculturated individuals (regardless of cultural background), relative to those who are low-acculturated to the Anglo-American ("White") culture. The rational for this procedure is that obtaining the "right" answer is a more difficult task for those who are unfamiliar versus those who are familiar with the culture. Regardless of how adjustments are made, it is important that a formal measure of acculturation be administered to individuals from ethnically diverse backgrounds and that level of acculturation be considered in the overall interpretation of the cognitive performance.

In the current study, participants' estimate of the percentage of time they spoke English when growing up or currently was related to performance on the Vocabulary and Similarities subtests. This may be related to both lack of familiarity with the

Downloaded By: [Razani, Jill] At: 00:55 7 August 2007

test items, and/or, as suggested by Helms (1997) and Touradji et al. (2001), less-acculturated individuals or those who use formal English language less frequently may routinely receive lower points per item due to their response patterns. This notion is supported in our findings by the fact that the ED individuals who learned English as a first or as a second language performed similarly to one another, but worse than the Anglo-Americans. As indicated by Helms, and Touradji and colleagues, the ED individuals may provide more pragmatic responses and/or responses that are focused on functional/perceptual rather than conceptual or abstract aspects of test items, thereby not obtaining the maximum points per item.

Interestingly, while years of educational attainment did not correlate with most of the WASI subtests (most likely due to the limited range in this sample), the number of years the education was obtained *outside* of the US did predict how well the ED group could be expected to perform on the verbal, and to some degree on nonverbal, measures (i.e., Block Design). These findings are in line with previous studies (Harris et al., 2003) and again indicate that the degree to which education is acquired within the US educational system may increase familiarity with specific cognitive styles and enhance subtle linguistic abilities. These findings underscore the importance of obtaining information regarding the degree to which education was attained outside of the US system.

The results of the current study are intriguing and raise additional questions for future research. It is clear that we need to continue to examine the complex role of acculturation as well as other cultural factors on IQ and other cognitive test performance. We also need to determine how to best adjust for these factors in ED individuals' cognitive test scores. The individuals used for the current study had attained an average of 13 years of education. The results may differ for less educated individuals (i.e., it is possible differences in nonverbal skills would emerge in less educated individuals), thus, future research should also focus on ethnic groups with low educational levels.

ACKNOWLEDGMENTS

This study was supported by NIMH grant MH067851-01 to JR. Additional support for the project was provided by NIGMS grants GM63787 (Minority Biomedical Research Support Program-Research Initiative for Scientific Enhancement) & GM08395 (Minority Access to Research Career). The authors also thank the two reviewers for their helpful and insightful comments.

REFERENCES

Arnold, B. R., Montgomery, G. T., Castaneda, I., & Longoria, R. (1994). Acculturation and performance of Hispanics on selected Halstead-Reitan neuropsychological tests. *Assessment*, *3*, 239–248.

Arnold, B. R. & Orozco, S. (1989). Acculturation and evaluation of Mexican Americans with disabilities. *Journal of Rehabilitation*, *55*, 53–57.

Berry, J. W. (1976). *Cross-cultural research and methodology series: III. Human ecology and cognitive style: Comparative studies in cultural and psychological adaptation*. New York: Sage-Halsted.

Downloaded By: [Razani, Jill] At: 00:55 7 August 2007

Census of Population. (1990). *Current population reports*. Washington, DC: US Department of Commerce, Bureau of the Census.

Cuellar, I., Harris, L. C., & Jasso, R. (1980). An acculturation scale for Mexican American normal and clinical populations. *Hispanic Journal of Behavioral Science*, *2*, 199–217.

Gasquoine, P. G. (2001). Research in clinical neuropsychology with Hispanic American participants: A review. *The Clinical Neuropsychologist*, *15*, 2–12.

Gonzales, R. (1980). *The relationship of cognitive style to performance on a nonverbal intelligence test and an achievement test among Anglos and differentially acculturated Mexian-Americans*. Unpublished Master's thesis, University of New Mexico, Albuquerque.

Gonzales, R. R. & Roll, S. (1985). Relationship between acculturation, cognitive style, and intelligence. *Journal of Cross-Cultural Psychology*, *16*(2), 190–205.

Harris, J. G., Tulsky, D. S., & Schultheis, M. T. (2003). Assessment of the non-native English speaker: Assimilating history and research findings to guide clinical practice. In S. D. Tulsky, D. H. Saklofske, G. J. Chelune, R. K. Heaton, R. J. Ivnik, R. Bornstein, et al. (Eds.), *Clinical interpretation of the WAIS-II and WMS-II* (pp. 343–390). San Diego, CA: Academic Press.

Hays, J. R., Reas, D. L., & Shaw, J. B. (2002). Concurrent validity of the Wechsler Abbreviated Scale of Intelligence and the Kaufman Brief Intelligence Test among psychiatric inpatients. *Psychological Reports*, *90*, 355–359.

Helms, J. E. (1992). Why is there no study of cultural equivalence in standardized cognitive ability tests? *American Psychologist*, *47*, 1083–1101.

Helms, J. E. (1997). The triple quandary of race, culture, and social class in standardized cognitive ability testing. In D. P. Flanagan, J. L. Genshaft, & P. I. Harrison (Eds.), *Contemporary intellectual assessment: Theories, tests and issues* (pp. 517–532). New York: Guilford Press.

Kaufman, J. C. & Kaufman, A. S. (2001). Time for the changing of the guard: A farewell to short forms of intelligence tests. *Journal of Psychoeducational Assessment*, *19*, 245–267.

Manly, J. J., Jacobs, D. M., Touradji, P., Small, S. A., & Stern, Y. (2002). Reading level attenuates differences in neuropsychological test performance between African American and White elders. *Journal of the International Neuropsychological Society*, *8*, 341–348.

Manly, J. J., Jacobs, D. M., Sano, M., Bell, K., Merchant, C. A., Small, S. A., et al. (1998). Cognitive test performance among nondemented elderly African-Americans and whites. *American Academy of Neurology*, *50*, 1238–1245.

Mercer, J. R. (1973). *Labeling the mentally retarded*. Berkley, CA: University of California Press.

Suinn, R. M., Rickard-Figueroa, K., Lew, S., & Vigil, P. (1987). The Sunn-Lew Asian Self-Identity Acculturation Scale: An initial report. *Educational and Psychological Measurement*, *47*, 401–443.

Touradji, P., Manly, J. J., Jacobs, D. M., & Stern, Y. (2001). Neuropsychological test performance: A study of non-Hispanic White elderly. *Journal of Clinical and Experimental Neuropsychology*, *23*, 643–649.

Wechsler, D. (1999). *Wechsler Abbreviated Scale of Intelligence*. San Antonio, TX: The Psychological Corporation.

Whitworth, R. H. (1983). *Differences between Anglo and Mexican-American students classified as learning disabilities* [Report N. EC 160 402]. Washington, DC: Educational Resources Information Center, ERIC Document Reproduction Service No. ED 234–535.

Wilkinson, G. S. (1993). *Wide Range Achievement Test 3 – Administration manual*. Wilmington, DE: Jastak Associates, Inc.