Neuropsychological Test Performance: A Study of Non-Hispanic White Elderly*

Pegah Touradji , Jennifer J. Manly , Diane M. Jacobs & Yaakov Stern

To cite this article: Pegah Touradji , Jennifer J. Manly , Diane M. Jacobs & Yaakov Stern (2001) Neuropsychological Test Performance: A Study of Non-Hispanic White Elderly*, Journal of Clinical and Experimental Neuropsychology, 23:5, 643-649, DOI: [10.1076/jcen.23.5.643.1246](https://doi.org/10.1076/jcen.23.5.643.1246)

To link to this article: <https://doi.org/10.1076/jcen.23.5.643.1246>

Published online: 09 Aug 2010.

Submit your article to this journal [↗](#)

Article views: 87

View related articles [↗](#)

Citing articles: 6 View citing articles [↗](#)

Neuropsychological Test Performance: A Study of Non-Hispanic White Elderly*

Pegah Touradji^{1,2}, Jennifer J. Manly^{1,2}, Diane M. Jacobs¹, and Yaakov Stern^{1,2}

¹Cognitive Neuroscience Division, Taub Institute for Research on Alzheimer's Disease and the Aging Brain, Departments of Neurology and Psychiatry, and the G.H. Sergievsky Center, Columbia University, College of Physicians and Surgeons, New York, NY, USA, and ²Department of Neurology and the G.H. Sergievsky Center, Columbia University, College of Physicians and Surgeons, New York, NY, USA

ABSTRACT

This study examined within-group differences in neuropsychological test performance between US versus foreign-born English-speaking White elders. Participants included 193 randomly selected English-speaking elderly community residents who self-identified as non-Hispanic White. Participants were classified as US ($n = 106$) or foreign-born ($n = 87$). All participants were independently diagnosed by a physician as nondemented. After controlling for years of education, participants born in the United States obtained significantly higher scores on measures of verbal abstract reasoning, naming, and fluency than foreign-born elders. These results suggest that although non-Hispanics White are often treated as a homogeneous group, performance differences exist even within this group. Effects of acculturation level and language use on cognitive styles may help explain these findings.

INTRODUCTION

Accurate assessment of dementia and the diagnosis of Alzheimer's disease in the elderly depend to a great extent on neuropsychological testing. Neuropsychological tests must be able to distinguish normal aging from the cognitive deficits associated with dementia. In order to make this distinction, neuropsychologists must understand the impact of potential confounds such as age, gender, education, and the effects of racial, ethnic, and cultural factors on cognitive test performance.

Previous research has focused primarily on the cognitive test performance differences between African Americans and Whites. Typically in these studies, African Americans obtained lower scores than Whites on both verbal and nonverbal cognitive tasks, even after controlling for demographic variables such as years of education. For example,

Manly et al. (1998b) found that White, non-demented elders obtained significantly higher scores than age and education-matched, non-demented African Americans on measures of figure memory, verbal abstraction, category fluency, and visuospatial skill. Racial differences were also found for confrontation naming, where African American elders obtained lower scores on a naming task compared to Whites after controlling demographic and health factors (Whitfield et al., 2000; Lichtenberg, Ross, & Christensen, 1994). Among patients with Alzheimer's disease, Welsh and co-workers (1995) found that Blacks obtained lower scores than Whites on tests of visual naming and visuospatial and constructional abilities, after controlling for age, education, and duration and severity of dementia.

In each of these investigations, the 'control' or 'comparison group' has consisted of people who

*This research was supported by NIA grants AG16206, AG07232 and the Alzheimer's Association. The authors thank Rosann Costa for her help with data management and Maria Gonzales-Diaz for her assistance with scheduling.

Address correspondence to: Jennifer Manly, Gertrude H. Sergievsky Center, 630 West 168th Street, New York, NY 10032-3702, USA. Tel.: +1-212-305-8604. Fax: +1-212-305-2426. E-mail: jjm71@columbia.edu

Accepted for publication: March 31, 2001.

self-identified as non-Hispanic White/Caucasian. It has been assumed that this group consists of individuals with homogeneous cultural and educational backgrounds. However, non-Hispanic Whites include not only US-born individuals but also those born in Europe, the Middle East and some North African countries. Theories of racial identity (Helms, 1990) and cultural values (Carter & Parks, 1992) recognize that within-group cultural differences may exist among Whites, but the effect of this variability on cognitive test performance has not been explored. Cognitive tests may not only have unacceptably low specificity (i.e., ability to detect normal performance) for ethnic/racial minorities but also for certain groups within those classified as White.

For White elders speaking English as a second language, English proficiency may be a factor that may affect their performance on cognitive tests, particularly on language-based tests. Previous research with 'limited English proficient' and bilingual children has suggested that it takes about 2–3 years to acquire 'basic interpersonal communicative skills' and about 5–7 years to acquire 'cognitive academic language proficiency' (Lopez, 1997). However, there is limited research to examine language proficiency and bilingualism on cognitive test performance (Lopez, 1997). Also, this research does not focus on the influence of language proficiency or the effect of bilinualism on the cognitive test performance of adults and elders.

The purpose of this study was to determine whether within-group differences in neuropsychological test performance exist among non-Hispanic White elders. A random community sample in an ethnically diverse area was studied to increase the generalizability of the findings. Among foreign-born versus US-born Whites, it was hypothesized that non-Hispanic White elders born in the United States would perform better than foreign-born participants on language-based neuropsychological tasks, even after controlling for years of education.

METHOD

Research Participants

Participants were drawn from the Washington Heights Inwood Columbia Aging Project (WHI-

CAP), an epidemiological study of aging and dementia in the ethnically diverse neighborhoods of northern Manhattan, New York. The WHICAP participants are a random sample of elderly Medicare recipients residing in 13 census tracts of Washington Heights and Inwood. This community comprises of individuals from several different countries of origin, and is approximately 50% Hispanic, 30% Black and 20% White.

The sample consisted of 193 (68 male and 125 female) non-Hispanic White elders. Approximately half ($n = 106$) of these were first generation immigrants, who had resided in the United States for an average of 57.3 ± 13.6 years. Within this group of foreign-born participants, 39% were born in Western Europe, 14% Austria/Hungary, 10% Poland, 6% England/Luxembourg, 6% former USSR, 3% Bulgaria/Romania, 2% Southern Europe, 2% Turkey, 1% Iraq/Jordan, 1% other Eastern Europe, 1% Scandinavia, 1% Canada, 1% Caribbean and 1% North Africa.

Inclusion/Exclusion Criteria

Participants were 65 years of age and older. Ethnicity was determined by self-report following US census criteria. Firstly, participants were asked to identify themselves as White, Black, Native-American/Indian, Asian/Pacific Islander, or 'other'. They were then asked to identify themselves as Hispanic or non-Hispanic. Those who identified themselves as (1) White and (2) non-Hispanic were included in the current study. These participants were classified as born in the United States or foreign-born. Participants were asked how well they spoke English (e.g., very well, well, not well, or not at all) and only those who reported speaking English 'very well' were included in this study. All participants were diagnosed as nondemented by a physician, whose assessment was made independent of neuropsychological test scores.

Medical Evaluation

Medical history and medications were recorded in a semistructured format. Standard neurological and brief physical examinations were performed, including assessment of extrapyramidal signs. The physician also assessed functional status using Part 1 of the Blessed Dementia Rating Scale (BDRS; Blessed, Tomlinson, & Roth, 1968) and the Schwab and England Rating Scale of Activities of Daily Living (Boller, Mizutani, Roessmann, & Gambetti, 1980). Cognition was assessed using the short version of the Blessed Memory Information and Concentration Test (Katzman, Brown, & Fuld, 1983). The physician used this information to determine whether

the participant met criteria for dementia using Diagnostic and Statistical Manual of Mental Disorders—revised third edition (American Psychiatric Association, 1987) criteria. Only those who identified as nondemented were selected for the current study.

Neuropsychological Battery

The neuropsychological battery consisted of measures used to assess the cognitive functions that are mainly affected in Alzheimer's disease. These measures included tests of verbal list learning and memory (Selective Reminding Test [SRT]; Buschke & Fuld, 1974), nonverbal memory (multiple-choice version of the Benton Visual Retention Test [BVRT]; Benton, 1955), orientation (items from the Mini-Mental State Exam [MMSE]; Folstein, Folstein, & McHugh, 1975), verbal reasoning (Similarities subtest of the Wechsler Adult Intelligence Scale—Revised [WAIS-R]; Wechsler, 1981), nonverbal reasoning (Identities and Oddities subtest of the Mattis Dementia Rating Scale; Mattis, 1976), naming (15-item version of the Boston Naming Test; Kaplan, Goodglass, & Weintraub, 1983), letter fluency (Controlled Word Association; Benton & Hamsher, 1976), category fluency (animals, food, and clothing, using procedures from the Boston Diagnostic Aphasia Examination [BDAE]; Kaplan et al., 1983), auditory comprehension (first six items of the Complex Ideational Material subtest of the BDAE; Goodglass & Kaplan, 1983), sentence repetition (high-probability phrases of the BDAE; Goodglass & Kaplan, 1983), visuo-construction (Rosen Drawing Test; Rosen, 1981), and visuo-perceptual skills (multiple-choice matching of figures from the BVRT; Benton, 1955). These measures were described in detail in other related studies (Jacobs et al., 1997; Stern et al., 1992; Stricks, Pittman, Jacobs, Sano, & Stern, 1998).

Literacy

The Reading Recognition subtest of the Wide Range Achievement Test—III (WRAT-III; Wilkinson, 1993) was used to determine participant's reading level. This task requires the participant to name letters and pronounce words out of context.

Statistical Analyses

To compare age and years of education for US and foreign-born participants, *t*-tests were used. Chi-square analyses were used to compare gender distribution between two groups.

A MANCOVA was used to compare the performance of US and foreign-born groups on all of the neuropsychological tests, using age and years of

education as a covariates. Follow-up ANCOVAs were performed to determine which of the specific neuropsychological tests contributed significantly to the overall multivariate effect.

Statistically significant univariate differences were determined using an alpha level of $p < .01$ to reduce the possibility of type I error.

Secondary Analyses

Analyses were conducted to determine if language spoken at home influenced the neuropsychological test performance of foreign-born participants. ANOVAs were used to compare the test performance of those foreign-born elders who reported speaking predominately English at home with those who predominately spoke a language other than English at home. Also, among foreign-born elders, regression analyses were performed to examine the effect of years in the United States on cognitive test performance, after controlling age and years of education. Finally, a *t*-test was used with the WRAT-III Reading Recognition to examine whether the foreign and US-born elders differed on literacy levels.

RESULTS

The US-born participants had an average age of 75.7 ± 7.2 , whereas foreign-born participants had an average age of 77.9 ± 7.3 ($t[191]$, $p = .04$). Also, the US-born participants had an average of 12.9 ± 3.5 years of education, whereas foreign-born participants had an average of 12.0 ± 3.7 years of education ($t[191]$, $p = .07$). The two groups did not differ significantly on distribution of gender or measures of functional status ($p > .05$ for all). Owing to its well-established effect on neuropsychological test performance, years of education was used as a covariate in our analyses even though the group differences in education only approached statistical significance. Age was also used as a covariate.

The omnibus test in the MANCOVA indicated that, after controlling for age and years of education, White elders born outside the United States obtained significantly lower scores on the neuropsychological battery than those born in the United States ($F[13, 162] = 5.13$, $p < 0.001$). Follow-up univariate comparisons revealed that participants born in the United States obtained significantly higher scores than participants not born in the United States on verbal abstract reasoning (Simila-

Table 1. Mean (*SD*) Cognitive Test Scores of Subjects Born in US (*n* = 106) and Foreign Born (*n* = 87).

Test	Born in US Mean (<i>SD</i>)	Foreign Born Mean (<i>SD</i>)	ANCOVA*	
			<i>F</i>	<i>P</i>
Learning / memory				
SRT total recall	41.23 (11.65)	37.43 (11.30)	2.07	0.152
SRT delayed recall	6.32 (3.31)	5.24 (2.96)	3.45	0.065
BVRT recognition	7.67 (1.73)	7.81 (1.58)	0.20	0.652
Orientation				
MMSE orientation	9.69 (.61)	9.73 (.72)	0.03	0.860
Abstract Reasoning				
WAIS-R Similarities subtest	10.59 (2.94)	8.29 (3.08)	15.10	0.000
SRS Identities and Oddities subtest	14.71 (1.55)	14.50 (1.60)	0.001	0.976
Language				
Boston Naming Test	14.48 (.73)	12.90 (1.79)	53.85	0.000
Letter fluency	12.61 (4.53)	9.89 (3.95)	10.71	0.001
Category fluency	17.49 (4.01)	14.65 (4.42)	9.99	0.002
BDAE repetition	7.72 (.72)	7.44 (.89)	1.71	0.193
BDAE comprehension	5.70 (0.87)	5.38 (1.05)	2.16	0.143
Visuospatial ability				
Rosen Drawing Test	2.91 (0.82)	2.83 (1.26)	0.26	0.614
BVRT matching	9.07 (1.26)	8.71 (1.52)	0.14	0.707

*Effect of place of birth after covarying for age and years of education $F(13, 174) = 5.36, p = .000$. SRT: Selective Reminding Test; BVRT: Benton Visual Retention Test; MMSE: Mini-Mental State Examination; WAIS-R: Wechsler Adult Intelligence Scale-Revised; DRS: Dementia Rating Scale; BDAE: Boston Diagnostic Aphasia Examination.

rities subscale of the WAIS-R), naming (15-item version of the Boston Naming Test), letter fluency (Controlled Word Association), and category fluency (animals, food and clothing).

We evaluated whether the predominant language spoken at home was an important factor in the cognitive test performance of foreign-born elders. Selecting only foreign-born participants, we entered test performance on the four-language measures that were significant in the main analysis as dependent variables into four separate ANOVAs, with language spoken at home (English versus other) as an independent variable. Age and years of education were not used as covariates in this analysis because no significant differences were found on these variables between those who spoke English at home ($n = 52$) and those who spoke another language at home ($n = 35$). There were no significant differences in test performance between foreign-born participants who reported speaking a language other than English

at home and those who reported speaking English at home ($p > 0.05$).

We also evaluated whether years residing in the United States was a significant factor in test performance of foreign-born elders. In the sample of foreign-born Whites, we used regression analysis to determine if the number of years residing in the United States was a significant predictor of test score after controlling for years of education and age. This analysis was performed for the four measures on which there were significantly lower scores in foreign-born elders. The number of years residing in the United States accounted for a significant amount of the variance in WAIS-R Similarities scores ($sr^2 = .13, p = 0.00$), letter fluency scores ($sr^2 = .05, p = 0.02$), and category fluency scores ($sr^2 = .05, p = 0.04$). Years in the United States approached significance in the prediction of naming score in foreign-born participants after accounting for years of education and age ($sr^2 = .04, p = 0.06$).

To assess the groups differed with respect to English proficiency, their reading scores on a measure of literacy were compared. No significant differences were found between foreign-born and US-born Whites using the WRAT-III reading scores ($p > .05$). Thus, foreign and US-born White elders in this study did not differ significantly on a test of English reading proficiency.

DISCUSSION

The results of this study suggest that within-group differences in neuropsychological test performance exist among nondemented White elders who were and were not foreign-born. As predicted, participants born in the United States obtained significantly higher scores on certain neuropsychological tasks requiring language skills than foreign-born participants, but the groups did not differ significantly on nonverbal measures. These findings suggest that performance differences may exist on some neuropsychological tasks even within those who self-identify as non-Hispanic White and who report that they speak English very well.

The duration of time foreign-born participants reported living in the United States was used in this study as a measure of acculturation. Acculturation refers to the process by which a racial/ethnic minority participates in cultural traditions, values, beliefs, and practices of the dominant culture (i.e., White, middle to upper-middle class American culture) versus their indigenous culture. It is likely that the longer foreign-born participants spent in the United States, the more likely they would be exposed to dominant American culture, language, values, beliefs, etc. Thus, the prediction that foreign-born elders who were more acculturated to dominant American culture, or who had been in this country longer, would obtain higher scores on the language tasks than less acculturated participants was confirmed.

Unfamiliarity with culturally-specific items may attenuate naming scores. People born and educated outside the United States may not have had the same cultural or educational exposure to certain Boston Naming Test items (e.g., hammock, cactus, and wreath) as compared with those

born in the United States. One study found that the mean score of Australian elders on the Boston Naming Test was 2–5 points lower than the reported mean scores for North Americans (Worrall, Yiu, Hickson, & Barnett, 1995). In the current study, the effect of years in the United States on naming scores within foreign-born whites approached significance after controlling for age and years of education. This finding suggests that exposure to mainstream American culture is a significant determinant in BNT performance among Whites.

Approximately 93% of the US-born participants reported that they speak English at home as compared to only 60% of the foreign-born participants. Hyltenstam and Obler (1989) suggested that older bilingual adults may revert to the use of a single language, and they may have increased problems related to ‘cross-language interference’ or the intrusion of one language while the other is being spoken. The results of this study, however, indicated that language spoken at home was not related to effect neuropsychological test performance in our sample. Instead, the number of years spent in the United States accounted for a significant amount of the variance in both letter and category fluency among foreign-born participants after controlling for age and years of education. Thus, level of acculturation, represented here as years in the United States, seems to better explain the scores obtained by foreign-born Whites on tests of fluency.

It is possible that different categorization goals may explain Similarities discrepancies. Foreign-born Whites may be more inclined to provide functional or perceptual similarities between items instead of taxonomic categories. For instance, a functional response for “In what way are a radio and a television alike?” may be “You can listen to both,” and a perceptual response may be “They both have knobs.” Although functional and perceptual responses are not necessarily incorrect, they often do not constitute two-point answers. Similarly, Helms (1997) reported that it is more common for African Americans to give pragmatic responses, which receive fewer points using standard scoring rules, on WAIS-R Similarities. Foreign-born elders who lived in the United States for a longer time obtained higher scores on the

Similarities test, even after controlling for age and years of education. Exposure to US majority culture may increase emphasis on categorization of stimuli into taxonomic sets.

These results suggest that caution should be used when interpreting cognitive test results of foreign-born White elders as well as ethnic minorities. Future studies should directly examine whether acculturation level accounts for these differences on cognitive test performance within White elders. It has been argued that cognitive tests are based on White American majority culture, and thus may not be salient to or accurate in assessing individuals from different racial and/or cultural backgrounds (Helms, 1992). Assessing level of acculturation has been suggested as one method of detecting potential cultural influences on the neuropsychological test performance of different racial or cultural groups (Helms, 1992). For example, less acculturated African Americans have been found to obtain lower scores on measures of figural memory, naming, repetition, drawing, figure matching, and general knowledge than more acculturated African Americans, after controlling for the effects of age, education and gender (Manly et al., 1998a,c). Future research could focus on the development of an acculturation scale that would measure the extent to which a foreign-born individual has been exposed to American majority culture. Exposure to dominant American culture may increase familiarity with certain cognitive styles or subtle linguistic skills necessary to perform well on traditional neuropsychological tests.

Future research should also focus on the interaction between quality of education or literacy in English, acculturation, and cognitive test performance. Education in White American schools may increase familiarity with skills needed to obtain high scores on traditional neuropsychological tests involving language. Also, level of education does not necessarily account for quality of education and/or literacy level. Manly et al. (1999) found that illiterate elders obtained significantly lower scores on neuropsychological tests than literates matched on education. Reading level has been found to be more related to MMSE scores than years of education, age or ethnicity (Weiss, Reed, Kligman, & Abyad, 1995). In the

current study, there was no difference between foreign-born and US-born White participants on a measure of English reading level. However, reading level represents only one aspect of quality of education; other literacy skills and educational experiences that were not assessed in this study may affect language-based tests.

REFERENCES

- American Psychiatric Association (1987). *Diagnostic and statistical manual of mental disorders* (Rev. 3rd ed.). Washington, DC: American Psychiatric Association.
- Benton, A.L. (1955). *The visual retention test*. New York, NY: The Psychological Corporation.
- Benton, A.L., & Hamsher, K.D. (1976). *Multilingual aphasia examination*. Iowa City, IA: University of Iowa.
- Blessed, G., Tomlinson, B.E., & Roth, M. (1968). The association between quantitative measures of senile change in the cerebral grey matter of elderly subjects. *British Journal of Psychology*, 114, 797–811.
- Boller, F., Mizutani, T., Roessmann, U., & Gambetti, P. (1980). Parkinson's disease, dementia, and Alzheimer's disease: Clinicopathological correlations. *Annals of Neurology*, 1, 329–335.
- Buschke, H., & Fuld, P.A. (1974). Evaluating storage, retention, and retrieval in disordered memory and learning. *Neurology*, 24, 1019–1025.
- Carter, R.T., & Parks, E.E. (1992). White ethnic group membership and cultural value preferences. *Journal of College Student Development*, 33, 499–506.
- Folstein, M.F., Folstein, S.E., & McHugh, P.R. (1975). 'Mini-Mental State': A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research*, 12, 189–198.
- Goodglass, H., & Kaplan, E. (1983). *The assessment of aphasia and related disorders* (2nd ed.). Philadelphia, PA: Lea & Febiger.
- Helms, J.E. (1990). *Black and White racial identity: Theory, practice and research*. New York: Greenwood Press.
- Helms, J.E. (1992). Why is there no study of cultural equivalence in standardized cognitive ability testing? *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.L. Harrison (Eds.), *Contemporary intellectual assessment: Theories, tests, and issues* (pp. 517–532). New York: Guilford Press.
- Hyltenstam, K., & Obler, L.K. (1989). *Bilingualism across the lifespan: Aspects of acquisition, maturity, and loss*. New York: Cambridge University Press.

- Jacobs, D.M., Sano, M., Albert, S., Schofield, P., Dooneief, G., & Stern, Y. (1997). Cross-cultural neuropsychological assessment: A comparison of randomly selected, demographically matched cohorts of English- and Spanish-speaking older adults. *Journal of Clinical & Experimental Neuropsychology*, 19, 331–339.
- Kaplan, E., Goodglass, H., & Weintraub, S. (1983). *Boston Naming Test*. Philadelphia, PA: Lea & Febiger.
- Katzman, R., Brown, T., & Fuld, P. (1983). Validation of a short orientation-memory-concentration test of cognitive impairment. *American Journal of Psychiatry*, 140, 734–738.
- Lichtenberg, P.A., Ross, T., & Christensen, B. (1994). Preliminary normative data on the Boston Naming Test for an older urban population. *The Clinical Neuropsychologist*, 8, 109–111.
- Lopez, E.C. (1997). The cognitive assessment of limited English proficient and bilingual children. In D.P. Flanagan, J.L. Genshaft, & F.V. Harrison (Eds.), *Contemporary intellectual assessment: Theories, tests, and issues* (pp. 503–514).
- Manly, J.J., Jacobs, D.M., Sano, M., Bell, K., Merchant, C.A., Small, S.A., & Stern, Y. (1999). Effect of literacy on neuropsychological test performance in nondemented, education-matched elders. *Journal of the International Neuropsychological Society*, 5, 191–202.
- Manly, J.J., Jacobs, D.M., Sano, M., Bell, K., Merchant, C.A., Small, S.A., & Stern, Y. (1998a). African American acculturation and neuropsychological test performance among nondemented community elders. *Journal of the International Neuropsychological Society*, 4, 77.
- Manly, J.J., Jacobs, D.M., Sano, M., Bell, K., Merchant, C.A., Small, S.A., & Stern, Y. (1998b). Cognitive test performance among nondemented elderly African Americans and Whites. *Neurology*, 50, 1238–1245.
- Manly, J.J., Miller, S.W., Heaton, R.K., Byrd, D., Reilly, J., Velasquez, R.J., Saccuzzo, D.P., Grant, I., and the HIV Neurobehavioral Research Center Group (1998c). The effect of African American acculturation on neuropsychological test performance in normal and HIV positive individuals. *Journal of the International Neuropsychological Society*, 4, 291–302.
- Mattis, S. (1976). Mental status examination for organic mental syndrome in the elderly patient. In L. Bellak & T.B. Karasu (Eds.), *Geriatric psychiatry* (pp. 77–121). New York, NY: Grune & Stratton.
- Rosen, W. (1981). *The Rosen Drawing Test*. Bronx, NY: Veterans Administration Medical Center.
- Stern, Y., Andrews, H., Pittman, J., Sano, M., Tatemichi, T., Lantigua, R., & Mayeux, R. (1992). Diagnosis of dementia in a heterogeneous population. Development of a neuropsychological paradigm-based diagnosis of dementia and quantified correction for the effects of education. *Archives of Neurology*, 49, 453–460.
- Stricks, L., Pittman, J., Jacobs, D., Sano, M., & Stern, Y. (1998). Normative data for a brief neuropsychological battery administered to English- and Spanish-speaking community-dwelling elders. *Journal of the International Neuropsychological Society*, 4, 311–318.
- Wechsler, D. (1981). *Wechsler Adult Intelligence Scales – Revised*. New York, NY: The Psychological Corporation.
- Weiss, B.D., Reed, R., Kligman, E.W., & Abyad, A. (1995). Literacy and performance on the Mini-Mental State Examination. *Journal of the American Geriatric Society*, 43, 807–810.
- Welsh, K.A., Fillenbaum, G., Wilkinson, W., Heyman, A., Mohs, R.C., Stern, Y., Harrell, L., Edland, S.D., & Beekly, D. (1995). Neuropsychological test performance in African-American and white patients with Alzheimer's disease. *Neurology*, 45, 2207–2211.
- Whitfield, K.E., Fillenbaum, G.G., Pieper, C., Albert, M.S., Berkman, L.F., Blazer, D.G., Rowe, J.W., & Seeman, T. (2000). The effect of race and health-related factors on naming and memory: The MacArthur studies of successful aging. *Journal of Aging and Health*, 12, 69–89.
- Wilkinson, G.S. (1993). *Wide Range Achievement Test 3 – Administration Manual*. Wilmington, DE: Jastak Associates.
- Worrall, L.E., Yiu, E.M.L., Hickson, L.M.H., & Barnett, H.M. (1995). Normative data for the Boston Naming Test for Australian elderly. *Aphasiology*, 9, 541–551.