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Gender and ethnic group differences in neuropsychological test performance in an urban, older adult population

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GENDER AND ETHNIC GROUP DIFFERENCES IN NEUROPSYCHOLOGICAL TEST PERFORMANCE IN AN URBAN, OLDER ADULT POPULATION

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Abstract

The association of gender and ethnicity within a sample of older adults referred for neuropsychological assessment in an outpatient setting was investigated. Neuropsychological and functional measures included the Boston Naming Test (BNT), reading subtest of the Wide Range Achievement Test-3 (WRAT-3), and Money Management (MM) subscale of the Independent Living Scales (ILS). This study replicated and expanded on Baird et al. (2007). European-American men performed significantly better than African-Americans and European-American women on the BNT & WRAT-3, and better than African-Americans on the ILS MM. Findings could not be attributed to discrepancies in age, years of formal education, and cognitive impairment severity and replicated the findings of Baird et al. (2007). Demographic group differences remained on the BNT and ILS MM after covarying on WRAT-3 score. Results highlight that oral word reading ability alone cannot accurately explain demographic group differences on some neuropsychological and functional measures.

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Background

Investigation of ethnic group differences in neuropsychological test performance of neurologically normal participants has demonstrated considerable score discrepancies between European Americans and other ethnic groups, even when these groups are comparable on other demographic factors (Manly et al., 1998; Ross, Lichtenberg & Christensen, 1995). Prior research has also highlighted the lack of standardized normative data for older adults from non-European cultural and ethnic backgrounds and/or who have low levels of education (Boone et al., 2007; Horton, Carrington, & Lewis-Jack, 2001; Lichtenberg et al., 1998; Lucas et al., 2005; Manly et al., 2002; Manly, 2005; Ross et al., 1995; Ross & Lichtenberg, 1998; Teng & Manly, 2005). Additionally, there is a lack of understanding as to how cultural experiences impact neuropsychological test performance, and systematic study in this area is proliferating rapidly (Baird, Ford & Podell, 2007; Pérez-Arce, 1999; Wolfe, 2002).

The purpose of the present study was to investigate the association among several demographic factors, including gender, and ethnic status, within a sample of older adults referred for neuropsychological assessment in an urban outpatient clinical setting. Baird et al. (2007) found ethnic and gender differences on select neuropsychological and functional measures, including the Boston Naming Test (BNT), the Benton Visual Form Discrimination Test (VFD), the reading subtest of the Wide Range Achievement Test-3 (WRAT-3), and the Independent Living Scales (ILS). Few studies investigating demographic factors and neuropsychological test performance in a clinical sample had included functional

measures, such as the ILS Money Management (MM) and Health and Safety (HS) subscales. The current study attempted to replicate the findings of Baird et al. (2007) and extended their findings by exploring the basis of ethnic group difference on a visual discrimination test. Specifically, I explored whether ethnic group differences in VFD performance are related to poor scanning in the lower visual world in individuals with lower reading levels.

There has been significant scholarly debate over how terms such as *race* and *ethnic group* should be defined (Fought, 2006; Morning, 2005; Zelinsky, 2001). This debate rages within the fields of psychology, anthropology, sociology, ethnic studies, biology, and linguistics and it is with some trepidation that writers define these terms (or, alternatively, choose not to define them) (Fought, 2006). For the purpose of the present research, Zelinsky's (2001) definition has been selected. He succinctly defines ethnic group as "any substantial aggregation of persons who are perceived by themselves and/or others to share a unique set of cultural and historical commonalities" (Zelinsky, 2001, p. 43). It is also noted that ethnic group is a modern social construct that undergoes constant flux (Morning, 2005; Zelinsky, 2001).

While the idea of ethnic group takes an individual's history and culture into account, the concept of race has historically been viewed from a biological standpoint. Recent genetic studies have shown that differences in human phenotypes (e.g., skin colour, facial features, or hair form) cannot solely be used to create racial categories (Feldman, Lewontin, & King, 2003). While significant genetic differences do exist between populations from different geographic areas, the authors stress that "most genetic diversity occurs *within* groups, and that very little is found between them" (Feldman et al., 2003, p. 374, emphasis added).

It is vital to stress that the present study is exploring differences in neuropsychological and functional test performance between European American and African American *ethnic* groups, as opposed to groups categorized on the basis of race. The majority of normative studies for standard neuropsychological tests have been collected from largely European American samples, and have not included sufficient members of diverse cultural groups (Byrd et al., 2006; Teng & Manly, 2005). As a result, it cannot be assumed that the standard test instruments used in neuropsychological assessment are free from cultural and educational biases (Horton et al. 2001; Wong & Baden, 2001; Wolfe, 2002). These potential biases are especially important for clinicians to consider when working with a diverse array of older adults (Wong & Baden, 2001). Normative data attained from a primarily European-American sample are likely to reflect the traditions, values, ideals, and educational experiences of that group (Boone et al., 2007; Horton et al., 2001; Wong & Baden, 2001). As Cosentino, Manly and Mungas (2007) succinctly point out, "valid interpretation of neuropsychological performance depends largely on the extent to which raw test scores can be evaluated in the context of an individual's personal characteristics and background" (p. 228). Thus, older adults who were not raised in the United States or Canada may be at a disadvantage on standard cognitive tests; the same may be said for groups who had limited access to formal education, such as older women and ethnic minorities (Byrd et al., 2005; Teng & Manly, 2005; Wong & Baden, 2001).

As a group, African Americans often score lower than European Americans on a variety of neuropsychological tests, even after correcting for demographic variables such as age, gender, and years of education (Manly et al., 2002). As a result, the growing consensus is that currently available normative data may not be suitable when working with groups *other* than European American individuals. Ethnic group differences have been noted on

neuropsychological tests of language, attention, processing speed, constructional skill, and select executive functioning skills (Boone et al., 2007; Lichtenberg et al., 1998; Lucas et al., 2005; Teng & Manly, 2005; Wong & Baden, 2001). In particular, neuropsychological test results for less well-educated older adults from other non-European cultural and ethnic backgrounds should be viewed with caution (Lichtenberg et al., 1998).

The lack of sufficient normative data for older adults in minority ethnic groups carries significant risk. Neuropsychological test scores from elders in minority groups are sometimes mistakenly interpreted as being in the impaired range; these scores may lead clinicians to over-diagnose cognitive disorders such as dementia (Boone et al., 2007; Byrd et al. 2004; Byrd et al., 2005; Horton et al., 2001; Lucas et al., 2005; Ross et al., 1995; Teng & Manly, 2005; Wong & Baden, 2001). The cost of misdiagnosis to patients, family members and the medical field is sizable and clearly demonstrates the need for a greater understanding of neurocognitive function in older adults from minority ethnic groups (Lucas et al., 2005). Collecting normative data from individuals who are demographically similar to a specific clinical population is thought to improve the accuracy of clinical diagnosis within that group (Manly, 2005).

Fortunately, the call for normative data from a more diverse older adult population is slowly being answered. Lucas et al. (2005) published BNT data from a sample of 309 neurologically normal African Americans aged 55+ as part of the Mayo's Older African Americans Normative Studies (MOAANS). Their aim was to provide data to assist in the clinical interpretation of neuropsychological test performance in older African Americans. Reducing the probability of misdiagnosing cognitive impairment and dementia in neurologically normal older adults was a goal of particular interest (Lucas et al., 2005). Study limitations included a limited sampling of the oldest old, and a normative sample limited to a

single region of the United States that may not be representative of "the full range of cultural and educational experiences" for African Americans (Lucas et al., 2005, p. 266). Ross & Lichtenberg (1998) also have published normative data for the BNT. Their study included 233 African American and European American neurologically normal older adults who were inpatients at an urban rehabilitation center.

Gathering normative data specific to ethnic group membership may be the "realistic remedy for psychologists who evaluate older African Americans for cognitive complaints" (Lucas et al., 2005, p. 266). However, the number of studies with normative samples from ethnically diverse samples is far from sufficient (Boone et al., 2007).

D'Andrade (1984) states that "culture [consists] of learned systems of meaning, communicated by means of natural language and other symbol systems, having representational, directive and affective functions, and capable of creating cultural entities and particular senses of reality" (p. 116). Pérez-Arce (1999) has argued that the cultural lenses of individuals "both enable and constrain a person's processes for making sense of the world" and therefore impact an individual's thoughts, actions, and emotional state (p. 584). Therefore, reasoning and problem-solving abilities are in part guided by cultural experience (Pérez-Arce, 1999).

Manly (1998) noted that the majority of past research on ethnic group differences categorized participants based on physical appearance or self-report and did not focus on cultural factors. Additionally, some authors have suggested abandoning the practice of grouping individuals by race or ethnic group membership, as it may promote the idea of racial classification, stereotyping, and stigmatization (Fullilove, 1998). Categorizing groups in this way also does not take into account considerable within-group heterogeneity for additional factors that impact test performance, such as years of education, vocabulary,

reading level, and acculturation (Teng & Manly, 2005). Some authors have promoted the idea that ideally normative data from ethnically diverse groups would be arranged according to specific geographical and cultural factors, as opposed to race or ethnic group membership (Boone et al., 2007; Fullilove, 1998). By focusing on the diverse array of cultural experiences that impact performance on neuropsychological tests "we may reduce the importance of racial classifications and raise awareness of the distinctiveness and depth of culture" (Manly, 2005, p. 271). The present study strove to look at African American and European American ethnic group differences on select neuropsychological and functional measures through a cross-cultural neuropsychological perspective. This aim has been concisely described by Pérez-Arce (1999): "to identify and differentiate between what is universal, what is culturally variable and what is unique to the individual" (p. 584).

Level of acculturation, defined as "the level at which an individual participates in the values, language, and practices of his or her own ethnic community *versus* those of the dominant culture" may also influence neuropsychological test performance (Manly et al., 1998, p. 292). Manly et al. (1998) found that neurologically normal African American individuals who self-reported higher levels of acculturation and participated in more traditional African American practices performed significantly lower than individuals who reported lower levels on tests of verbal abilities, even after controlling for age and education. A wide variety of factors may be related to acculturation, including age at the time of exposure to a new culture, educational and occupational status, gender roles, and interaction with native-born members of the dominant culture, relationships with extended family, linguistic fluency, and the presence of other cultural support systems (Horton et al., 2001). Overall, failing to take acculturation into account may call into question the validity of the neuropsychological evaluation (Horton et al., 2001). Older adults from minority ethnic

groups may also be unfamiliar with test-taking in general, leading to fewer test-taking skills and feelings of anxiety, both of which can impair neuropsychological test performance (Teng & Manly, 2005).

Potentially affecting neuropsychological performance is *stereotype threat*, described by Steele & Aronson (1995) as

> ...A social-psychological predicament that can arise from widely-known negative stereotypes about one's group...[meaning] that anything one does or any of one's features that conform to it make the stereotype that anything one does or any of one's features that conform to it make the stereotype more plausible as a self-characterization in the eyes of others, and perhaps even in one's own eyes (p. 797).

Stereotype threat has been demonstrated in a variety of contexts. For instance, it has been shown to have a negative impact on cognitive test performance in African American university students and on math performance in female high school and university students (Keller, 2007; Kiefer & Sekaquaptewa, 2007; Stelle & Aronson, 1995). The literature is sparse regarding stereotype threat and performance in older adults from specific ethnic backgrounds. Stereotype threat did not impact neuropsychological test performance in a group of neurologically normal African American elders, but the author cites numerous methodological limitations of the study (Touradji, 2003).

Factors of Interest

Gender

Gender is an important demographic variable to consider in the assessment of older adults. In comparison to the present times, women in the early to mid twentieth century were not always welcomed into formal educational settings and often lacked access to higher education (Eisenmann, 2001). There may be significant discrepancies in years of formal education between older men and older women, and clinicians should consider this factor when analyzing neuropsychological test data. As Lezak, Howieson, & Loring (2004) wrote,

> The effects of education on neuropsychological functioning are potent and pervasive. While education effects have been amply demonstrated for verbal tests, they also show up on just about every other kind of test involving cognitive abilities, including some that that would seem to be relatively unaffected by schooling. (p. 315)

The literature regarding gender differences in neuropsychological test performances in older adults with an equivalent level of formal education is mixed. Discrepancies based on gender have been found in the total BNT score. In two separate samples of neurologically intact, ethnically diverse older adults, men performed at significantly higher levels than women (Ross & Lichtenberg, 1998; Lichtenberg et al., 1998). European-American men scored significantly higher than European-American women in a neurologically normal sample and in a clinical sample of individuals diagnosed with probable Alzheimer's disease (AD); these gender discrepancies were not due to age or education (Randolph et al., 1999). After controlling for reading level, a clinical sample of European-American men also out-performed European-American women on the BNT (Baird et al., 2007).

Randolph et al. (1999) concluded that the frequency of a word in a person's lexicon can impact BNT performance and hypothesized that a greater number of items on the 50-item BNT are familiar to men (e.g., *volcano*, *dart*, *noose*, and *compass*) as compared to women. However, a number of studies report no gender differences in visual naming performance in neurologically normal samples (Henderson et al., 1998; Lichtenberg et al., 1994b; Ross et al., 1995; Tsang & Lee, 2003) or clinical samples (Lichtenberg et al., 1998).

The literature is sparse regarding gender differences in performance on the VFD, a test that requires patients to make fine visual discriminations between non-linguistic targets (Benton et al., 1983). Gender effects were not found in a sample of approximately 200 Spanish-speaking, neurologically normal adults aged 18-59 (Campo & Morales, 2003) on the

VFD task, although gender accounted for a small but significant amount of raw score variance in a sample composed of 516 cognitively normal Caucasian adults aged 65-95+ (Machulda et al., 2007). European-American men performed significantly better than European-American women, African-American men, and African-American women in a clinical sample after controlling for age and years of education (Baird et al., 2007).

Gender effects have not been reported for oral-word reading ability on the Wide Range Achievement Test-R (WRAT-R) (Kareken et al., 1995). Strauss, Sherman and Spreen (2006) report no gender effects for the WRAT-3. Effects for gender have been noted on only select functional measures. Baird et al. (2007) found that after controlling for age, years of education, and level of cognitive decline in a clinical sample, European-American men performed significantly better on the ILS MM subscale than European-American women and African-American men and women. No differences in performance on the ILS HS subscale were found for the same group, however (Baird et al., 2007).

Ethnic Group Membership

Overall, there is a lack of data from individuals who are not of European-American descent (Byrd et al., 2006). Normative data on VFD performance for older adults are limited, particularly normative data from diverse cultural and ethnic groups (Campo & Morales, 2003; Lichtenberg et al., 1994a). Machulda et al. (2007) noted that VFD norms that stem from populations of restricted cultural and ethnic diversity maybe of limited use for clinicians working with patients from more diverse backgrounds.

A survey of limited research available reveals mixed results. Benton's initial normative sample (Benton, 1983) was comprised of 85 neurologically normal subjects aged 19 to 74 years. No effect of age, education or gender was found on VFD performance in the original sample (Benton et al., 1983). Lichtenberg et al. (1994) examined VFD

performances in a sample of demented and non-demented African-American and European American older adults at an urban physical rehabilitation center. While age, education, gender and ethnic status were not significantly related to total VFD score, both the demented and non-demented groups scored significantly lower than those in Benton's original normative sample (Lichtenberg et al., 1994). Total VFD score differed in a group of 89 cognitively impaired older adults from a geriatric medical rehabilitation program in Detroit, Michigan; with African Americans scoring significantly lower than European Americans (Lichtenberg, Ross, Youngblade & Vangel, 1998). This finding is especially important considering the findings of Lichtenberg, Millis & Nanna (1994), stated above.

However, normative data from non-European American populations is slowly being collected and published. Prior to the late 1990s, normative data for the BNT with older participants was severely limited, specifically normative data considering the impact of education, gender, or ethnic group membership. Very few older adults, specifically adults over the age of 75, were included in normative data for the BNT (Ross et al., 1995). Mitrushina and Satz (1989) published widely used normative data for the BNT; however their sample was comprised of 156 healthy European American participants and was ethnically homogeneous.

Several attempts have been made to collect BNT norms from a variety of ethnic groups, specifically African American older adults (e.g., Ross et al., 1995; Lichtenberg et al. 1998; Ross & Lichtenberg, 1998; Lucas et al., 2005). Ross et al. (1995) published normative data from 123 ethnically diverse older adults; patients were neurologically normal and inpatients at an urban rehabilitation center. Data collected from this population differed significantly from prior normative samples, with mean BNT scores lower than values reported by the other major normative studies available at the time (e.g., Mitrushina & Satz,

1989). The authors warn that, "clinicians who treat ethnically diverse samples may falsely ascribe lower scores to naming deficits that in fact may actually reflect variance due to demographic sample" (Ross et al., 1995, p. 325). The authors hypothesize that the lower scores could be explained by various factors. Their inpatient population was experiencing medical illness, was more culturally diverse, and had fewer years of education in comparison to Mitrushina and Satz's (1989) sample (Ross et al., 1995).

Several studies document an association between ethnic group membership and BNT scores. In several studies this relationship has remained after controlling for age and education. Investigation of BNT performance in an ethnically diverse sample of neurologically intact older adults found that on average, European Americans scored significantly higher than African Americans (Fillenbaum, Huber, & Taussig, 1997; Lichtenberg et al., 1994b; Ross et al., 1995; Ross & Lichtenberg, 1998), though ethnicity accounted for only 2% of total score variance after controlling for age and education in the latter study. After controlling for reading level and age and education, European Americans and African Americans within a clinical population still differed significantly in BNT performance (Baird et al., 2007). In an ethnically diverse group of 161 outpatients seen for neuropsychological assessment, the total BNT score for European Americans was 9-10 points higher than the total score for African-Americans, Hispanics, and Asians after adjusting for both age and total years education (Boone et al., 2007). In response to this finding, the authors state that this significant discrepancy in total BNT score suggests that, "the test stimuli themselves may be systematically biased against those groups" (Boone et al., 2007, p. 361). It has been suggested that in order to interpret BNT test scores reliably for African Americans, a substantial number of African Americans should be included when compiling normative data (Lichtenberg et al., 1994b; Lichtenberg et al. 1998).

However, ethnic status has not significantly impacted scores in all cases. In a sample of 100 neurologically normal European American and African American adults, ethnicity did not have a significant effect on total BNT score (Henderson et al., 1998). Manly et al. (2002) did not find significant differences in BNT performance between neurologically normal African American and European American older adults after matching on years of education.

Possible explanations for ethnic group differences in naming ability other than formal education variability have been explored in the literature, including levels of acculturation and English as a second language (Boone et al., 2007; Manly et al., 1998; Teng & Manly, 2005). In a non-clinical sample, African Americans who reported a higher level of acculturation and engaged in a greater number of traditional African American practices significantly underscored African Americans who reported lower levels of acculturation; these differences were present after controlling for gender, education and age (Manly et al., 1998). Those reporting lower levels of acculturation may be able to gain exposure to both testing and the stimuli used in assessment through cultural and educational experiences; this may help account for discrepancies in naming ability seen within an individual ethnic group (Manly et al, 1998). In addition, in a sample of 161 ethnically diverse outpatients seen for neuropsychological assessment, native English speakers were found to score significantly higher than those who spoke English as a second language (Boone et al., 2007).

Literacy & Education

Literacy, as defined by the National Assessment of Adult Literacy (NAAL), is "the ability to use printed and written information to function in society, to achieve one's goals, and to develop one's knowledge and potential" (NAAL, 2008, ¶ 1). Literate individuals can have skills that fall on a wide continuum, and in the U.S. and Canada a person who is

described as "illiterate" will probably be "literate" to some extent (e.g., able to recognize individual letters or words [Boudard & Jones, 2003; NAAL, 2008; Rogers & Herzog, 1966]). Defining degrees of literacy in behavioural terms can help classify individuals in terms of literacy proficiency. Someone who is *functionally illiterate* "is not able to read well, calculate and write to be integrated as an individual with full rights in society" and has a less than adequate ability to use written information in daily life (Austrian Commission for UNESCO, Vienna et al., 1989, p. 6). As part of the International Adult Literacy Survey (IALS) conducted in 2003, Boudard and Jones describe *functional literacy* as the development of literacy skills necessary for adults to successfully function in their everyday life.

Multiple factors play a role in an individual's literacy level, including native ability and educational experience (Manly et al., 2003). Cognition is impacted by literacy, as multiple studies have demonstrated that literacy can affect brain structure and functional organization (Matue et al., 2000; Ostrosky-Solís, 2004). Almost half of the world population is illiterate, yet illiterate participants are infrequently included in investigations of cognitive functioning (Dellatolas et al., 2003; Matute et al., 2000). Matute et al. (2000) have called for separate normative criteria for use when clinicians assess functionally illiterate individuals.

Recent literature has focused on neuropsychological test performance for neurologically normal and brain damaged individuals with varying degrees of literacy (e.g., Dellatolas et al., 2003; Deloche et al., 1999; Herlitz & Kabir, 2006; Manly et al., 1999; & Matute et al., 2000). The results of these studies suggest that literacy affects performance on both verbal and non-verbal neuropsychological tasks even after controlling for demographic factors (Manly, 2007). Literacy has been shown to significantly affect performance on a stick construction task, reading aloud and performing mental calculations in functionally illiterate, semiliterate, and functionally literate neurologically normal adults (Matute et al., 2000;

Deloche et al., 1999). Effects of literacy were also present on naming, comprehension, verbal abstraction, and figure matching and recognition tasks in a group of neurologically normal African American and European American older adults who had between one and three years of formal education (Manly et al., 1999). Deloche et al. (1999) also noted that neurologically normal illiterate and semi-literate adults in Brazil had poor phonological processing abilities compared to neurologically normal, literate adults from the same area.

Explanations for these differences in both verbal and non-verbal task performance have been proposed. Matute et al. (2000) hypothesize that functionally illiterate and functionally literate individuals utilize different cognitive problem-solving strategies. Individuals who are functionally illiterate may also be unfamiliar with testing situations and may have had differing educational experiences compared with literate individuals (Ardila et al., 2000). Functionally literate individuals may perform better than functional illiterate individuals on visuospatial tasks because they are better able to organize and analyze information mentally or because they use their language skills to help them complete nonverbal tasks (Manly et al., 1999). Additionally, Ardila et al. (2000) hypothesize that a "lower level of cognitive stimulation results in a slower cognitive development" (p. 507). The authors are careful to note that individuals who are functionally illiterate or have few years of formal education do not perform as well as individuals with more education in part because cognitive tests evaluate skills and abilities taught in educational settings. They state, "It is not totally accurate to assume that people with low levels of education are somehow 'deprived.' It may be more accurate to assume that they have developed different types of learnings" (Ardila et al., 2000, p. 510).

Increased years of formal education impact the oral-word reading level of individuals across ethnic groups (Cosentino et al., 2007). Cosentino et al. (2007) assessed oral-word

reading performance in 342 older adults as part of the Spanish and English Neuropsychological Assessment Scales (SENAS). Participants ranged from neurologically normal to demented. European American, African American, and Hispanic individuals were assessed; each group had, on average, between 11-14 years of formal education. Results from Cosentino et al. (2007) demonstrated that for each ethnic group, an analogous linear relationship was present between oral-word reading score and years of formal education

> ...Such that approximately four years of additional education were associated with a 0.5 SD [standard deviation] improvement in reading scores...despite the discrepancy in scores, which exists at every grade, each additional year of schooling provides an equivalent improvement in reading scores across ethnic groups (p. 233).

Additionally, Byrd et al. (2004) split their sample of neurologically normal African Americans and European Americans into "high" and "low" literacy groups based on WRAT-3 reading score. Each group had between 10-11 years of formal education, on average. For both the African American and European American individuals, the low literacy groups had significantly fewer years of formal education than the high literacy groups. However, the "low" and "high" literacy groups did not have significant differences in performance on shape and letter cancellation tasks (Byrd et al., 2004).

Years of education may impact performance on neuropsychological measures, and using normative data based on years of education has long been used to determine a patient's estimated level of pre-morbid functioning (Wong & Baden, 2001). In recent years, however, literature suggests that years of education may not sufficiently predict premorbid neuropsychological test performance (Byrd et al., 2004; Lichtenberg et al., 1998), as the standard normative data used are "insufficiently adjusted for education at the low end of the education range" (Teng & Manly, 2005, p. 269).

Discrepancies between reading level and formal educational level have been noted, and years of formal education are often an imperfect predictor of reading ability (Boudard &

Jones, 2003; Byrd et al., 2005). Oral word reading level was assessed in a sample of 74 cognitively intact, ethically diverse older adults at a physical rehabilitation center in an urban area. WRAT-3 mean reading level was roughly three years below self-reported years of education, and the authors stress that, "the self-reported years of education...may not adequately capture the quality of the educational experience, and thus may not capture relevant cultural factors" (Lichtenberg et al., 1998, p. 152). Byrd et al. (2005) investigated to what extent years of formal education and oral word reading level differed in a group of 100 neurologically normal African American older adults. Her group noted that only 29% of older adults had an oral-word reading score that matched their reported years of formal education, and 44% had oral word reading scores below their reported educational level (Byrd et al., 2005). These findings have direct clinical relevance as the lower 44% of the sample is "at an increased risk for false positive diagnoses" (Byrd et al., 2005, p. 255). Even more striking, 29% of the 309 neurologically normal African American older adults included in a MOAANS sample had an oral word reading score that was three or more years below their self-reported years of education (O'Bryant et al., 2007). Overall, these studies suggest that clinicians cannot years of formal education to accurately predict an individual's reading level.

The number of years of education often differs between older European Americans and African Americans (Manly et al., 2002; Manly et al., 2003). As a result, older adults from different ethnic groups are frequently matched on years of education when examining ethnic group differences in neuropsychological test performance. However, Manly et al. (2002) contended that years of education are not a sufficient determination of educational experience because,

> Matching on *quantity* of formal education does not necessarily mean that the *quality* of formal education received by each racial group is comparable...Disparate school

> experiences, and thus different bases of problem-solving strategies, knowledge, familiarity, and practice could explain why some African Americans obtain lower scores on cognitive measures even after matching groups on years of education. (p. 342-3, emphasis added)

Thus, the quality as well as the quantity of education a person receives may help explain these differences in neuropsychological test performance among ethnic groups (Baird et al., 2007; Cosentino et al., 2007; Manly et al., 2002; Manly, 2005a). Research contrasting school experiences of European and African American elders has shown that there are discrepancies on educational characteristics, including per student expenditures, teacher quality and education level, student and teacher ratios, length of school year, number of days attended, and additional student characteristics (Cosentino et al., 2007; Manly et al., 2002; Teng & Manly, 2005). School funding is also directly related to student achievement (Hedges, Laine & Greenwald, 1994). In the United States specifically, there are considerable discrepancies between years of education and reading level. This incompatibility is especially present among African American individuals, and has been linked to disparate financial resources received by African American schools, and the subsequent lower quality of education (Manly, 2005).

Recent literature has demonstrated that oral-word reading scores are a "better proxy for quality of education" than formal years of education when comparing group performance on verbal and non-verbal neuropsychological measures (Manly et al., 2003, p. 687). As Cosentino et al. (2007) note, oral-word readings scores are also a "less culturally biased proxy" than years of formal education (p. 233). When controlling for years of education, performance on a cancellation task significantly differed among African American, Hispanic, and European American older adults (Byrd et al., 2004). Controlling for word-reading performance, however, eliminated differences in performance on a shape

and letter cancellation task between the African American and European American groups (Byrd et al., 2004). Adjusting for word-reading level also eliminated significant differences among older European Americans and African Americans referred for neuropsychological assessment on the VFD, and the ILS MM subscale (Baird et al., 2007). Controlling for performance on the WRAT-3 also removed the vast majority of ethnic group differences found between neurologically normal African American and European Americans seen as part of the Washington Heights-Inwood Columbia Aging Project (WHICAP). Significant score discrepancies on neuropsychological measures of learning and memory, abstract reasoning, and language were no longer present, though significant differences in performance remained on a measure of category fluency (Manly et al., 2002).

Byrd et al. (2005) has linked oral word reading level to visual search strategy on the Benton Visual Retention Test (BVRT), a visual neuropsychological measure that assesses working memory, visuoperception, and visuoconstructional abilities. Their sample was comprised of 100 neurologically normal African American older adults studied as part of the WHICAP. Participants who had lower reading levels (as measured by the WRAT-3) were less accurate and had fewer correct responses when the correct target figure appeared in the bottom half of the 2 x 2 BVRT matrix (Byrd et al., 2005). The authors proposed that the difference in performance between those with higher and lower levels of literacy is linked to heuristics, or visual search strategies, such as methods of grouping, rehearsing, and coding visual information. Heuristics develop concurrently as literacy and word reading ability increase, leading to the development of strategies that aid in neuropsychological test taking performance (Byrd et al., 2005).

Similar results with the BVRT were also found in a sample of over 800 older adults from France. The sample was stratified by educational level (Le Carret et al., 2003). The

authors suggest that older adults with more years of education spent a great amount of time visually exploring the bottom half of a matrix and made significantly fewer errors when compared to those older adults with fewer years of education (Le Carret et al., 2003). In other words the findings of this study were consistent with Byrd's contention (Byrd et al., 2005) that more education leads to more successful and systematic test taking strategies (Byrd et al., 2005).

Investigating how literacy mediates performance on functional measures is an important area to study (Manly et al., 2007). In a sample of older adults seen for clinical neuropsychological assessment in an urban medical setting, the ILS MM score for the African American sample was almost one full standard deviation below the score obtained by the European American sample. This score discrepancy existed despite controlling for age, years of education, and level of cognitive impairment. These differences were no longer significant after controlling for oral word reading ability, suggesting that financial skills and knowledge are "mediated by literacy" (Baird et al., 2007, p. 315). Ethnic and gender group differences were not found for the ILS HS subscale, however (Baird et al., 2007).

Neuropsychological and Functional Measures of Interest

Confrontation Naming

The BNT is a confrontation naming task (Mitrushina et al., 2005). Both visual recognition systems and language processing systems are involved in visual naming; successful completion of a visual naming task depends on the interaction between these two systems (Reis, Petersson, Castro-Cakdas & Ingvar, 2001). With literacy, one acquires more efficient strategies for processing visual and verbal information. These acquired strategies aid in visual naming performance (Reis et al., 2001). Performance on naming tasks in both neurologically normal and cognitively impaired samples is positively correlated with multiple

factors, including literacy (Reis et al., 2001; Reis, Guerreiro & Petersson, 2003) and number of years of education (Randolph et al., 1999; Hawkins et al., 1993; Henderson et al., 1998; Inouye et al., 1993; Lichtenberg et al., 1994b; Ross et al., 1995; Ross & Lichtenberg, 1998; Lichtenberg et al., 1998) and reading vocabulary (Hawkins et al., 1993). Several explanations for these correlations have been proposed; several researchers have proposed that as years of education increase, an individual is exposed to a greater variety of vocabulary words, which in turn leads to a higher overall test score (Henderson et al., 1998; Inouye et al., 1993; Strauss, Sherman & Spreen, 2006).

Visual Perceptual Discrimination

The VFD is a task that requires visual scanning and the detection of non-linguistic targets. Performance on a non-linguistic, visuo-motor integration task with 21 illiterate participants who had received no formal schooling and did not have any reading or writing skills and 20 literate controls from Portugal demonstrated that literate participants used a faster "systematic visual scanning strategy...a scanning pattern more in agreement with a behavior modulated by reading and writing skills" (Bramào et al., 2007, p. 363). VFD performance was assessed in a group of 237 African American and European American older adults in an urban rehabilitation setting. VFD performance was significantly correlated with level of education in the cognitively impaired group, but level of education was not correlated with VFD performance in neurologically normal individuals (Lichtenberg et al. 1998). The VFD task is also a valid measure for identifying visuospatial and attentional deficits found to be present in even the earliest stages of AD (Kaskie & Storandt, 1995) and may be useful as a dementia screening measure (Lichtenberg et al., 1994).

Oral Word Reading

Tests of oral word reading, such as the Reading subtest of the Wide Range Achievement Test (WRAT), are often used to estimate premorbid intellectual functioning (Strauss et al. 2006; Kareken, Gur, & Saykin, 1995), because word reading is relatively spared in cases of mild dementia (Baird, Podell, Lovell, & McGinty, 2001) and in other neurological disorders acquired in adulthood (Lezak et al., 2004). Oral word reading tests are frequently used in adult neuropsychological evaluations (Baird et al., 2007; Byrd et al., 2004; Teng & Manly, 2005). Although ethnic group differences on various neuropsychological test measures remain after adjusting for years of education, adjusting for reading level frequently eliminated these differences. (e.g., Baird et al., 2007; Byrd et al., 2004; & Manly et al., 2002). Manly et al. (2005) also proposed that word reading is more indicative of the *quality* of education than the years of education for older adults in minority ethnic groups.

Functional Measures: Financial Capacity and Health and Safety

Accurately assessing knowledge and skills of personal health, safety, and finances is of great importance to older adults. The ILS MM subscale was developed to assess financial skills and ability in older adults (Loeb, 1996). The number of elderly adults in the US is increasing, and the ILS MM subscale is one of many new measures created to gather information relevant to financial decision-making capacity in both research and clinical populations (Moye & Marson, 2007). Loss of financial capacity can have both economic and psychological consequences and is closely related to the financial exploitation of older adults (Marson et al., 2000). Accurate assessment and the detection of the loss of financial capacity are also necessary when determining conservatorship, guardianship, and one's ability to live independently (Golden et al., 1997; Marson et al., 2000). Marson et al. (2000) has shown that patients with mild AD demonstrate significantly impaired financial capacity. Additionally, Marson (2001) states that his own clinical experiences have revealed that,

"family complaints of financial declines in AD patients (neglecting bills, paying bills twice...(and) poor judgment about money matters are often concurrent with the first symptoms of significant memory loss" (p. 165).

The HS subscale of the ILS assesses awareness and responses to real-world health problems, medical emergencies, and safety issues (Loeb, 1996).

Hypotheses

Based on Baird et al. (2007), it was expected that older European-American men presenting for neuropsychological assessment would have higher scores on the WRAT-3, BNT, VFD, and the ILS MM subscale in comparison to European-American women, African-American women, and African-American men seen in the same setting after controlling for age, years of education, and severity of cognitive impairment. Based on the work of Baird et al. (2007), I did not expect to see gender or ethnic group differences on the ILS HS subscale after controlling for age, years of education, and severity of cognitive impairment. (*Hypothesis 1*)

It was predicted that these significant differences in performance between gender and ethnic groups on the BNT, VFD, and ILS MM subscale would no longer exist after controlling for level of word reading. (*Hypothesis 2*)

It was hypothesized that the WRAT-3 reading score would be significantly associated with performance on the VFD. Further, it was expected that ethnic and gender group differences in task performance would be present only for those items in which the target figure was in the lower half of the test booklet. Statistical control for word reading was expected to eliminate group differences in performance. Group differences in VFD performance were not expected for VFD items in which the target figure is in the upper half

of the test booklet (*Hypothesis 3*). This hypothesis was based on the work of Byrd et al. (2005) and Le Carret et al. (2003).

Method

Participants

Archival data were collected from Henry Ford Health System in Detroit, Michigan (USA). Patients were seen between 2003 and 2004. The sample was comprised of 63 European American (28 men and 35 women) and 58 African American (25 men and 33 women) individuals aged 65+. Groups were aggregated by sex and ethnicity into four demographic groups: African-American men, African-American women, European-American men, and European-American women. The aim was to code consecutive cases until there were at least 25 cases in each of the four demographic groups. One hundred and nineteen cases from 2003 were coded from readily available files. To obtain the quota of 25 profiles from African-American men, data from the first two African-American men seen in 2004 were coded. Some files listed (3 men and 20 women) were not readily available and no attempt was made to locate these files. These individuals were probably re-evaluated more recently and were not located because they were not necessary to fulfill the quota of 25 cases per group.

Inclusion/Exclusion Criteria

Participants were referred to an urban outpatient medical facility for clinical neuropsychological assessment due to suspected cognitive impairment. Patients at or above the age of 65 at time of assessment were included in the coded sample. For the sake of privacy, all patients over the age of 89 were coded as 89 years old. Patients were coded by the examiner as being African American, European American, or of other ethnic status or

origin, based on the person's appearance or by inquiring about an individual's ethnic status. Individuals who were coded as being of other ethnic status or origin, hospital inpatients, and those who spoke English as a second language were not included in the coded sample. However, patients whose first language was not English, but who attended school in English from third grade were included in the coded sample. Patients referred for evaluation with respect to known non-neurodegenerative disorders, such as acute or sub-acute traumatic brain injury or acute or sub-acute focal stroke in the last 6 months, were excluded. Patients with well-characterized, ongoing major depression or psychosis were excluded. Patients for whom the neuropsychologist suspected an ongoing substance abuse affecting performance on the test battery were also excluded. Patients with fewer than four years of formal education were excluded from the coded sample, based on the UNESCO standard that, at minimum, four years of schooling is necessary to obtain a level of functional literacy (Rogers & Herzog, 1966). Occupational status and imaging information (if present in the neuropsychological file) were also coded and the latter information was used to screen out cases of focal neurological disorder such as trauma and major stroke. Only data from patients who completed the DRS, VFD, BNT, WRAT-3, and ILS MM and HS subscales were coded and included in the data analysis (See Table 1). The number of patients excluded based on these criteria were recorded (See Table 2).

Measures

The BNT is a confrontation-naming task composed of 60 simple, line-drawn pictures (Mitrushina et al., 2005). Patients are shown individual drawings and asked to state the common name of each item. Items at the beginning of the test (e.g., "tree" and "pencil") are typically more common than items at the end (e.g., "sphinx" and "trellis") (Lezak et al.,

2004). If patients are not able to name an item, they are given a semantic cue; if they are still unable to name the item, then a phonetic cue is provided (Lezak et al., 2004).

Benton's VFD test requires patients to make fine visual discriminations among four items (Benton et al., 1983). Participants must match a stimulus figure with a correct target figure. The correct target figure is one of four geometrically similar stimuli placed below the stimulus figure. There are three incorrect responses: peripheral errors, major rotations, and major distortions. Two stimuli options are in the upper half of the test booklet, and two stimuli options are in the lower half of the test booklet (Benton et al., 1983). Participants can either vocalize or point to their response. Kaskie and Storandt (1995) and Benton et al. (1983) suggest that the VFD places few demands on visual memory. A total VFD score that was not corrected for age or gender was used in data analyses.

The WRAT-3 is a test of oral-word reading, and requires participants to pronounce individual written words out of context (Wilkinson, 1993). Individuals are asked to read each word aloud; the 84-item list is composed of individual regular and irregular words that get increasingly more difficult (Lezak et al., 2004). Oral-word reading tests such as the WRAT-3 are constructed on the idea that "correct pronunciation of the more difficult items requires previous exposure to such words" (Cosentino et al., 2007, p. 229).

The ILS MM subscale is a measure of financial skills and knowledge and is an important component related to independent functioning in older adults (Loeb, 1996). The ILS was "created to provide a direct, more objective assessment of functioning in daily life" (Loeb, 1996, p. 1) and has clinical utility for older adults with very mild to moderate cognitive impairment (Baird et al., 2001). Examinees are given questions about financial decision-making and asked to perform simple, everyday tasks related to managing money (e.g., writing a check or balancing cheque book after paying a bill) (Loeb, 1996). Other

domains measured by the ILS include memory in daily activities, household management, personal health and safety, and psychosocial adjustment (Loeb, 1996). The Health and Safety subscale evaluates an individual's capacity to assess personal health concerns and safety issues, such as medical emergencies (Loeb, 1996).

Procedures

Neuropsychological test measures were administered as part of a standard test battery for older adults referred for clinical cognitive complaints. A staff neuropsychologist interviewed patients, often in conjunction with neuropsychology interns or postdoctoral fellows. Typically, a psychometrician, psychology intern, or postdoctoral fellow administered tests. The DRS, VFD, BNT, WRAT-3, and ILS MM and HS subscales were part of a larger flexible test battery for older adults which also included the Wechsler Abbreviated Scale of Intelligence (WASI), the Trail-Making Test (Trails A & B), the Controlled Oral Word Association Test (COWAT), the Wisconsin Card Sorting Test (WCST) and the Wechsler Memory Scale--Revised (WMS-R).

Results

Preliminary Analyses

Levene's test suggested homogeneity of variance for age, level of cognitive impairment (as measured by total DRS score), WRAT-3 raw score, VFD total score, and total ILS MM & HS scores. Levene's test suggested significant heterogeneity of variance in years of education and BNT scores. However for these variables the ratios of variance for the ethnic groups were less than 1:4 proportion often used as a threshold for concern.

Background Variables

In total, 121 individuals were included in the coded sample. The participants had a mean age of 75.9 (SD = 6.0) and a mean educational level of 12.2 years (SD = 3.3). The

average Dementia Rating Scale (DRS) score was 121 (SD = 12.7); this score is suggestive of mild dementia (Mattis, 1998). Groups were aggregated by sex and ethnicity into four demographic groups. Gender ratios did not differ significantly by ethnicity, according to Fisher's Exact Test (two-sided) (p = 1.0). Mean age, years of education, and DRS score for each group is shown in Table 3. Initial analyses demonstrated that age at time of testing and total DRS score did not differ significantly between ethnic and gender groups. Years of education differed significantly between ethnic and gender groups (See Table 3).

Main Analyses

Sex and ethnicity.

Demographic group differences were expected for the BNT, WRAT-3, VFD, and ILS MM subscale after controlling for age, years of education, and severity of cognitive impairment (as measured by total DRS score). Since there were no differences among groups on age and overall level of cognitive impairment, only years of education was controlled for statistically. A one-way analysis of covariance was run for each neuropsychological and functional measure of interest using education as a covariate. As seen in Table 4, BNT, WRAT-3, and ILS MM scores differed significantly between demographic groups.

The first research question addressed whether older European-American men presenting for neuropsychological assessment have higher scores on the BNT, VFD, WRAT-3, and ILS MM in comparison to European-American women and African-American men and women seen in the same setting after controlling for age, years of education, and severity of cognitive impairment. Using years of education as a covariate, a series of planned contrasts were run, comparing the performance of European-American men to each of the other three demographic groups. Planned contrasts revealed that on the

BNT, European-American men performed significantly better than African-American women $F(1, 116) = 9.6, p = .00$, but not significantly better than African American men $F(1, 116) = 9.6, p = .13$ and European-American women $F(1, 116) = 9.6, p = .21$. The overall test for the BNT was significant $F(3, 116) = 9.3, p = .00$. For WRAT-3 raw score, European-American men performed significantly better than African-American men $F(1, 116) = 12{,}1, p = .0$ and African-American women $F(1, 116) = .12.1, p = .02$.; European-American women performed significantly better than European-American men, however $F(1, 116) = 12.1, p = .02$. The overall test for WRAT-3 raw score was significant $F(3, 116) = 12.1, p = .00$. For the ILS MM, European-American men performed significantly better than European-American women $F(1, 116) = 4.5, p = .02$ and African-American women $F(1, 116) = 4.5, p = .001$, but not significantly better than African-American men $F(1, 116) = 4.5, p = .12$. The overall test for the ILS MM was significant $F(3, 116) = 4.5, p = .005$. On the VFD, European-American men did not perform significantly better than African-American men, $F(1, 116) = .04, p = .78$, European-American women $F(1, 116) = .04, p = .76$, or African-American women $F(1, 116) = .04, p = .76$. The overall test for the VFD was not significant $F(3, 116) = 0.04, p = 0.99$ (See Table 4).

Post hoc analyses were run for all possible pair-wise comparisons for the BNT, WRAT-3 reading score, and ILS MM using Gabriael's test to maintain a group wise alpha level of 0.05. Some results of the post hoc comparisons were redundant with the planned contrasts as previously discussed, and are not mentioned here. European-American women performed significantly better than the African-American men $F(3, 117) = 15.4, p = .000$ and African-American women $F(3, 117) = 15.4, p = .000$ on the WRAT-3. There were no significant gender group differences for WRAT-3 score for the African American $F(3, 117) = 15.4, p = 1.0$ or European American participants $F(3, 117) = 15.4, p = .98$ (See Table 4).

On the BNT, African-American men performed significantly better than African-American women $F(3, 117) = 14.1$ $p = .012$; no gender group differences on the BNT were present for the European American sample $F(3, 117) = 14.1$ $p = .20$. European-American women performed significantly better than African-American woman $F(3, 117) = 14.1$ $p = .000$ on the BNT.

No significant gender group differences were present for the African American sample $F(3, 117) = 7.1$ $p = .283$ for WRAT-3 raw score. There were no significant gender group differences for either African Americans or European Americans for the VFD or ILS HS subscale (See Table 4).

Ethnic group differences after adjusting for word reading level.

It was also predicted that significant differences in performance between gender and ethnic groups on the BNT and ILS MM subscale would no longer exist after controlling for word reading ability as measured by the WRAT-3 reading score. Analyses of covariance were performed. After statistical adjustment for WRAT-3 reading raw score, there were still significant demographic group differences on the BNT $F(3, 117) = 8.1$, $p = .00$ and ILS MM subscale scores $F(3, 117) = 5.3$, $p = .00$ (see Table 5).

Literacy level.

We also hypothesized that the WRAT-3 reading score would be significantly associated with performance on the VFD, and that ethnic and gender group differences in task performance would be present only when the target figure was in the lower half of the test booklet after controlling for age, years of education, and severity of cognitive impairment. Statistical control for word reading was expected to eliminate group differences in performance. Because there were no demographic group differences on total VFD score, these analyses were not run (See Table 4).

Exploratory analyses

It was hypothesized that literacy level, as measured by WRAT-3 reading score, would be significantly associated with performance on the VFD. Based on Byrd et al (2004), to explore the influence of WRAT-3 scores on VFD performance, I collapsed across the four demographic groups and created three reading groups based on WRAT-3 raw score: "low" (scores ranged from 24-38, $n = 40$), "medium" (scores ranged from 39-44, $n = 38$), and "high" (scores ranged from 45-57, $n = 43$). A one-way analysis of variance was run. The three reading groups differed significantly on total VFD score $F(2, 118) = 8.3, p = .00$. Participants in the "low" literacy group had a mean VFD score of 23.3 ($SD = 4.9$), the "medium" literacy group had a mean VFD score of 25.0 ($SD = 6.1$), and the "high" literacy group had a mean VFD score of 27.8 ($SD = 4.4$).

One-way analyses of variance were run. The three reading groups did not significantly differ in age $F(2, 118) = 0.99, p = .38$, though there was a significant difference for years of education $F(2, 118) = 20.4, p = 0.00$ (See Table 6). Chi square analyses found no significant differences in the gender ratios for the three groups $\chi^2(2, N = 121) = 0.4, p = 0.8$, but a significant effect for ethnicity was found $\chi^2(2, N = 121) = 0.34, p = 0.0$. The gender and ethnic breakdown of literacy level based on WRAT-3 reading score is shown in Tables 7 and 8.

Discussion

Summary

The purpose of the present study was to explore the influence of gender and ethnic status on neuropsychological and functional measures within an archival sample of older adults seen for neuropsychological assessment in an urban, outpatient clinical setting. This clinical sample was divided into four demographic groups: African-American men, African-

American women, European-American men, and European-American women. Results from this study demonstrated demographic group differences on measures of word reading, confrontation naming, and money related skills and knowledge; these findings could not be attributed to discrepancies in age, years of formal education, and severity of cognitive impairment. The differences on measures of confrontation naming and money related skills and knowledge were present after adjusting scores for oral word reading ability as well. Previous research has shown that adjusting for oral word reading ability has eliminated ethnic group differences on specific neuropsychological measures of learning and memory, abstract reasoning, visuospatial ability, language (Manly et al., 2002), a shape and letter cancellation task (Byrd et al., 2004) and financial skills and knowledge (Baird et al., 2007); therefore, demographic differences present on confrontation naming and financial skills and knowledge tasks, after adjusting for oral word reading ability were not entirely expected. In cases where oral word reading ability has removed demographic group differences, researchers have interpreted it to mean that level of oral word reading is a better predictor of performance than years of education on select neuropsychological and functional measures (e.g., Baird et al., 2007; Byrd et al., 2005; Manly et al. 1999). Since adjusting for oral word reading did not eliminate group differences on measures of confrontation naming and financial skills and knowledge in the present study, this findings highlight the need for further research in this area, especially pertaining to the impact of literacy, and the skills and heuristics associated with literacy, on financial knowledge and skills in older adults.

Demographic group differences were not present on a pattern-matching task, counter to a study hypothesis. Demographic group differences were not found on a measure related to personal health and safety. The latter finding supported the study hypothesis and replicated the results of Baird et al. (2007).

General Discussion

Hypothesis 1

The first main analysis investigated whether older European-American men seen in a clinical setting for neuropsychological assessment had higher scores on select neuropsychological and functional measures than European-American women and African-American men and women seen in the same setting, after controlling for age, years of education, and severity of cognitive impairment. Analyses demonstrated that European-American men performed significantly better than the other three demographic groups on measures of confrontation naming, word reading, and money related skills and knowledge, replicating the findings of Baird et al. (2007). It was noted that in virtually every instance, with the exception of oral word reading score, European-American men demonstrated the best performance on all neuropsychological and functional measures. On the confrontation naming task and a measure assessing financial knowledge, European-American men demonstrated the highest scores, European-American women and African-American men performed at similar levels, and African-American women had the lowest scores.

No score differences on a visual perceptual discrimination task were found between the four demographic groups. This finding was not expected, and differs from the demographic group differences found when assessing performance on similar visual perceptual measures (Baird et al., 2007; Byrd et al., 2004; Lichtenberg et al. 1998). The present findings are consistent with Lichtenberg et al. (1994) when they investigated visual perceptual discrimination task performance for African American and European American individuals with dementia. In Lichtenberg's study these patients also were seen at an urban physical rehabilitation center (Lichtenberg et al., 1994). A number of studies have noted discrepant findings. Lopez et al. (2005) examined psychometric properties of the VFD and

determined that it is not a very discriminating or reliable measure, and called the clinical utility of the VFD into question. The findings of Lopez et al (2005) could partially explain these discrepant findings, and when future research in this area is conducted, it is recommended that another visual perceptual discrimination measure be used.

Hypothesis 2

It was hypothesized that any significant demographic group differences present on the confrontation naming, and money related skills and knowledge and visual perceptual discrimination tasks would not be present after controlling for oral word reading. As noted earlier, results showed that demographic group differences were present only for the first two measures, and these differences remained after adjusting for word reading.

Baird et al. (2007) also found that demographic group differences remained after controlling for word-reading score in a clinical sample using the same confrontation-naming task. Henderson et al. (1998) has hypothesized that specific items on the confrontation-naming task (e.g., *yoke, trellis,* and *abacus)* are familiar to individuals only if they have a comprehensive reading vocabulary. The present findings suggest that factors beyond reading vocabulary are necessary for higher scores on this measure.

Level of acculturation in African-American individuals is one factor that may impact confrontation-naming scores. Manly et al. (1998) demonstrated that neurologically normal African-American adults who reported higher levels of acculturation and were involved in a higher number of traditional African American practices scored significantly lower on a confrontation naming task in comparison to individuals with lower reported acculturation levels, despite controlling for age and education. The present study did not include a self-report measure for level of acculturation, and further research in this area may help

determine why demographic group differences on this confrontation-naming task persist after controlling for word reading score.

Statistical adjustment for word reading score did not remove demographic group differences present on a measure of financial knowledge. In contrast, in a study using data from participants seen several years earlier in the same clinic, Baird et al. (2007) found that controlling for word-reading score eliminated demographic group differences on the same measure; these inconsistent results highlight the need for further research using this measure. A strong positive correlation between reading level and performance on a financial subtest of the Direct Assessment of Functional Status (DAFS) has been noted in a neurologically normal, urban, African American older adult population (Schafer Johnson, 2008).

Pairwise comparisons demonstrated gender differences within the European-American group in financial skills and knowledge. European-American men performed significantly better than European-American women on a measure of financial skills and knowledge, despite being statistically comparable on age, years of formal education, level of cognitive impairment, and being inferior to European-American women on oral word reading ability. However, scores for African-American men and African-American women in this sample did not differ significantly. Worthington (2006) used the 2003 ANZ Survey of Adult Financial Literacy measure in order to predict financial literacy in a neurologically normal adult population in Australia. His findings suggested that in comparison to men, women were more likely to have a low level of financial literacy. The present study supports this finding, within the context of our European American sample but not for the African-American sample.

The Money Management subscale of the ILS was designed specifically to draw on financial skills and knowledge that are necessary for independent living in older adults (Loeb,

1996). Loss of financial capacity is highly associated with the financial exploitation of older adults, and is one of the first symptoms of cognitive decline and significant memory loss in the aging population (Marson et al., 2000; Marson, 2001). Decreased financial capacity is also likely to negatively impact day-to-day functioning (Marson, 2001). If European-American women demonstrate significantly lower skills and knowledge related to finances, this is quite noteworthy as this population may be more vulnerable to financial exploitation in comparison to men. The results of the present study suggest that these differences cannot be ascribed entirely to years of formal education, severity of cognitive impairment, or literacy as measured by an oral word reading test. Other experiences over the course of an adult's life, such as occupational status or familiarity with and experience managing personal finances could impact an individual's level of financial knowledge and subsequently impact performance on measures like the ILS. Stereotype threat may also help explain the gender group differences seen in the present study. Kiefer & Sekaquaptewa (2007) have successfully demonstrated that women may have implicit stereotypes about their own mathematical abilities, and this in turn can negatively impact their personal performance on a mathematical task.

Hypothesis 3

It was hypothesized that oral word reading score would be significantly associated with demographic group performance on a visual perceptual measure. However, in the present clinical sample there were no differences among demographic groups on this measure before adjustment for oral word reading level.

Exploratory analyses

Further analyses were conducted to investigate how oral word reading ability impacted performance on a measure of visual perception. Based on the work of Byrd et al.

(2004), I collapsed across the four demographic groups and created three reading groups (low, medium, and high). My method differed from Byrd's in that her group collapsed across gender groups only and created "low" and "high" literacy groups for both her African American and European American samples. The results demonstrated that oral word reading ability was significantly associated with performance on the visual perceptual task. Participants in the "low" literacy group had the lowest overall score on the visual perceptual task, participants in the "medium" group had the next highest scores, and those in the "high" literacy group performed the best. This significant trend in performance on a visual perceptual task supports the work of Byrd et al. (2005) who demonstrated that higher reading level "is associated with enhanced accurate perception of salience of shapes" (p. 256). The present findings differ from Byrd et al. (2004) who noted that the "low" and "high" literacy groups within African American and European American samples did not perform significantly different from one another on shape and letter cancellation tasks.

Methodological Limitations

Limitations are present in the current study. The current sample was a sample of convenience, with data collected from individuals seen for neuropsychological assessment in an urban outpatient medical facility. The results from the current study may not extend to individuals not being seen for clinical neuropsychological assessment, or to individuals seen in other clinics. Additionally, these findings may be specific to the particular test measures used, and may not generalize to other neuropsychological and functional measures. Lastly, there were 96 individuals excluded from the final coded sample due to incomplete data files (See Table 2). It is not clear how these excluded files could have impacted our results, had their data been included in statistical analyses.

As well, in a small number of cases, scores on test of oral word reading, such as scores on the WRAT-3, may reflect not quality of formal education but the presence of a reading disability. Difficulty in single-word decoding is a prime skill deficit for individuals diagnosed with a word-level reading disability (dyslexia) (Fletcher et al., 2007). In the present sample, it is feasible that for some individuals, lower scores on the oral-word reading measure reflect the presence of an undiagnosed word-level reading disability and are unrelated to quality of formal education. As part of the International Adult Literacy Survey (IALS), Vogel and Holt (2003) analyzed data collected from over 20,000 individuals aged 16-65 in six English-speaking countries. Their results showed that 15.7% of adults aged 55-65 in the US self-reported having a learning disability or dyslexia (as compared with ~2.0% of English-speaking Canadian adults aged 55-65). The number of individuals in the US with learning disabilities may be higher than the 15.7% of adults aged 55-65 reported by Vogel and Holt (2003), as older adults in particular may not be aware they have learning disabilities.

Implications and Recommendations for Future Research

As hypothesized, demographic group differences are present on measures of confrontation naming and financial skills and knowledge. Counter to expectations, these demographic group differences are present even after controlling for years of formal education, level of cognitive impairment, age, and oral word reading ability. These findings have implications for training and treatment. First, clinicians and students of neuropsychology must be aware that scores on oral word reading measures better reflect quality of education in comparison to years of formal education. However, oral-word reading ability alone cannot accurately explain differences in performance between demographic groups on all neuropsychological and functional measures. If clinicians and neuropsychology students are aware of these factors, there is increased likelihood of taking a

cross-cultural neuropsychological perspective when examining patterns of scores, and be better able to consider the universal, culturally variable, and unique factors that impact performance (Pérez-Arce, 1999).

Subsequent research could expand upon the present study and help clarify the results. First, future studies could further investigate demographic group performance on the VFD and/or other visual perceptual measures, given the discrepancies between the findings of Baird et al. (2007) and the present study. Additionally, experimental studies exploring the connection between reading and visual perception could also be performed. Research regarding financial knowledge is also recommended, specifically addressing the interaction between gender-based self-stereotypes, occupational status, experience managing personal finance, and performance on measures of financial literacy.

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APPENDIX

List of Acronyms Used In-Text

AD	Alzheimer's disease
BNT	Boston Naming Test
BVRT	Benton Visual Retention Test
COWAT	Controlled Oral Word Association Test
DAFS	Direct Assessment of Functional Status
DRS	Dementia Rating Scale
IALS	International Adult Literacy Survey
ILS	Independent Living Scales
HS	Health and Safety subscales
MM	Money Management subscales
MOAANS	Mayo's Older African Americans Normative Studies
NAAL	National Assessment of Adult Literacy
SENAS	Spanish and English Neuropsychological Assessment Scales
VFD	Benton Visual Form Discrimination Test
WASI	Wechsler Abbreviated Scale of Intelligence
WCST	Wisconsin Card Sorting Test
WHICAP	Washington Heights-Inwood Columbia Aging Project
WMS-R	Wechsler Memory Scale-Revised
WRAT-3	Reading subtest of the Wide Range Achievement Test -3
WRAT-R	Reading subtest of the Wide Range Achievement Test- Revised

Table 1.

Coded Neuropsychological and Functional Test Measures

Measure	Variables Coded
Dementia Rating Scale	Total Raw Score
	Total SS 1 (age adjusted)
	Total SS 2 (age and education corrected)
Boston Naming Test	Total Raw Score
	Total SS
	Number of Phonetic Cues Given
	Number Correct from Phonetic Cues
	Number of Semantic Cues Given
	Number Correct from Semantic Cues
WRAT-3 Reading	Total Raw Score
	Total SS
Visual Form Discrimination	Total Number Correct (UQ)
	Total Number Correct (LQ)
	Total Errors (UQ)
	Total Errors (LQ)
	Total Peripheral Errors (UQ)
	Total Peripheral Errors (LQ)
	Total Major Rotation Errors (UQ)
	Total Major Rotation Errors (LQ)
	Total Distortion Errors (UQ)
	Total Distortion Errors (LQ)
	No Response (UQ)
	No Response (LQ)
Independent Living Scales	
	Money Management Total SS
	Health and Safety Total SS

Note. SS: Standard Score; WRAT-3: Wide Range Achievement Test-3; UQ: Upper Quadrant; LQ: Lower Quadrant

Table 2.

Patients Excluded from the Final Coded Sample

Exclusion Criteria	n
Excluded Participants (N = 171)	
Incomplete data file	96
Re-evaluation	27
TBI	15
Primary language not English	13
Active major depression/schizophrenia	4
Stroke ≤ 6 months	3
Epilepsy	3
Hydrocephalus	2
Other ethnic status/origin	1
< 3 years formal education	1
Recent neurosurgery	1
Intraventricular shunt	1
Possible Toxic Exposure	1
Post-operative encephalitis	1
Aneurysm	1
Hospice care	1

Note. TBI: Traumatic Brain Injury

Table 3.

Age, Years of Education, and Dementia Rating Scale (DRS) Total Scores for African American and European American Older Adults

	Mean (*SD*)						
	AA Men (n = 25)	AA Women (n = 33)	EA Men (n = 28)	EA Women (n = 35)	*df*	*F*	*p*
Age	73.7 (6.0)	76.5 (5.8)	75.1 (6.3)	77.4 (5.7)	3	2.1	0.1
Edu.	11.1 (3.1)	11.1 (3.0)	14.4 (4.0)	12.4 (2.2)	3	6.8	0.00
DRS	123.1 (10.8)	116.8 (15.1)	124.8 (12.2)	120.1 (11.1)	3	2.4	0.08

Note: AA: African American; EA: European American; Edu: Education; DRS: Dementia Rating Scale total score.

Table 4.

Performance on Neuropsychological and Functional Measure by Ethnicity and Gender

	Mean (*SD*)						
	AA Men (n = 25)	AA Women (n = 33)	EA Men (n = 28)	EA Women (n = 35)	*df*	*F*	*p*
WRAT	37.9_a (6.9)	37.7_a (6.1)	44.3 (5.0)	45.3_b (5.1)	3	12.1	0.00
BNT	41.7_a (13.2)	32.2_c (13.5)	50.5 (9.8)	44.4_b (8.6)	3	9.3	0.00
VFD	24.8_a (5.1)	24.8_a (5.2)	26.5 (6.6)	24.8_a (5.2)	3	0.42	0.99
MM	42.7_a (10.3)	36.6_c (12.8)	50.7 (9.7)	41.8_b (13.7)	3	4.5	0.01
HS	45.2_a (12.8)	40.9_a (14.8)	48.0 (12.8)	40.3_a (13.8)	3	1.6	0.20

Note: AA: African American; EA: European American; WRAT: Wide Range Achievement Test 3 Reading Raw Score; BNT: Boston Naming Test score; VFD: Benton Visual Form Discrimination Total Test score; MM: Independent Living Scales Managing Money subscale *T* score; and HS: Independent Living Scales Health and Safety subscale *T* score. The overall tests reported were performed without covariate analysis. Post hoc tests were completed using the Gabriel technique. For these tests, means having the same subscript are not significantly different at $p < .05$. Post hoc comparisons were omitted if they were done as planned contrasts, and results are discussed in text. Although the Gabriel technique demonstrated that European-American men and European-American women did not differ on WRAT-3 raw score, these two groups did differ when tested at a significance level of $p < 0.05$ for the planned contrast. The results of the planned contrasts are discussed in-text.

Table 5.

Performance on Neuropsychological and Functional Measures by Ethnicity and Gender Adjusted for Word Reading

	Adjusted Mean (*Standard Error*)						
	AA Men (n = 25)	AA Women (n = 33)	EA Men (n = 28)	EA Women (n = 35)	*df*	*F*	*p*
BNT	40.4 (2.2)	32.6 (1.9)	50.1 (2.1)	45.3 (1.9)	3	8.1	0.00
MM	41.2 (2.3)	37.0 (2.1)	50.2 (2.1)	42.7 (1.9)	3	5.3	0.00

Note: AA: African American; EA: European American; BNT: Boston Naming Test score; MM: Independent Living Scales Managing Money subscale *T* score

Table 6.

Performance on the WRAT-3 Reading Subtest Stratified by Literacy Level

	Mean (*SD*)			*df*	*F*	*p*
	Low (n = 40)	Medium (n = 38)	High (n = 43)			
Age	75.9 (5.8)	74.8 (5.9)	76.7 (6.3)	2	.99	0.38
Years education	10.1 (2.6)	12.3 (3.1)	14.1 (3.3)	2	20.4	0.00

Table 7.

Literacy Level Based on WRAT-3 Reading Score by Gender

Gender	Literacy Level		
	Low	Medium	High
Men	16	18	19
Women	24	20	24

Table 8.

Literacy Level Based on WRAT-3 Reading Score by Ethnicity

Ethnicity	Literacy Level		
	Low	Medium	High
African American	32	19	7
European American	8	19	36

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