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Psychometrically Valid Relationships between Acculturation and Neuropsychological Factors

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Psychometrically Valid Relationships between Acculturation and Neuropsychological Factors

by

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Each person whose signature appears below certifies that this dissertation in his/her opinion is adequate, in scope and quality, as a dissertation for the degree Doctor of Philosophy.

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ABSTRACT OF THE DISSERTATION

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Neuropsychological tests play a significant role in detecting brain dysfunction and treatment planning for patients. However, discrepancies in neurocognitive tests among ethnic minorities continue to perplex neuropsychologists and place ethnic minorities at a greater risk for misdiagnoses (Byrd et al., 2006). The aim of this study was to ascertain significant acculturation predictors influencing neuropsychological performance in ethnic minorities, particularly verbally mediated tasks which were known to be more susceptible to discrepancies in acculturation level were examined (Razani et al., 2007).

Healthy participants from Hispanic (n = 52), Asian (n = 52), and Middle-Eastern (ME; n = 68) descents between the ages of 18 and 69 years were recruited. Participants were administered the acculturation scale (i.e., ARSMA) and seven neuropsychological tests (i.e., COWAT-FAS and Animals; BNT; Stroop A and B; and WASI Vocabulary and Similarities subtests).

Results from reliability and exploratory factor analyses indicated that ARSMA was a reliable measure and revealed a three-factor solution (Factor 1 = *Ethnic Identity*, Factor 2 = *Ethnic Preference,* Factor 3 = *Language/Heritage*) as well as a higher-order factor (*Acculturation*). Neuropsychological measures also produced a two-factor solution

(Factor 1 = *Verbal Abilities*, Factor 2 = *Verbal Processing Speed*) and a higher-order factor (*Language*), which were determined to be cross-culturally equivalent. When acculturation factors were regressed onto neuropsychological constructs, results indicated that *Language/Heritage* was the best predictor for *Verbal Abilities* ($\beta = .601$, $p < .001$) and *Language* ($\beta = .599$, $p < .001$); and *Ethnic Preference* was the best predictor for *Verbal Processing Speed* ($\beta = -.194$, $p < .05$). Also, *Acculturation* was a significant predictor for *Verbal Abilities* ($\beta = .528$, $p < .001$), *Verbal Processing Speed* ($\beta = -.138$, $p < .05$), and *Language* ($\beta = .371$, $p < .001$)

The findings of this study are consistent with previous research demonstrating differences between Anglo-Americans and other cultural groups in neuropsychological performance (Harris et al., 2003; Manly et al., 2002; Razani et al., 2007). It is clear that similar to other demographic factors, acculturation level also needs to be taken into account when interpreting neuropsychological assessment data, to reduce misdiagnosing ethnic minorities in clinical settings.

CHAPTER ONE

INTRODUCTION

Neuropsychological Assessment of Ethnic Minorities

Neuropsychological tests play a significant role in the detection of brain dysfunction as well as treatment planning for patients. However, the discrepancies that exist in neurocognitive test performance among ethnically diverse individuals continue to perplex neuropsychologists and place ethnic minorities at a greater risk for misdiagnoses (Byrd, Miller, Reilly, Weber, Wall, & Heaton, 2006). To address these concerns and to provide valid diagnoses, neuropsychologists have been more sensitive to the myriad of factors that influence the results, such as age, education, gender, socioeconomic status, and ethnicity (Heaton, Ryan, Grant & Matthews, 1996; Heaton, Taylor, & Manly, 2003). The challenge for cross-cultural neuropsychology is to develop measures that can empirically examine factors that influence neuropsychological assessment outcomes (Jacobs, Sano, Albert, Schofield, Dooneief, & Stern, 1997) as well as to provide insights concerning how different neuropsychological ability domains influence overall cognitive functioning for ethnic minorities (Byrd et al., 2006).

Limitations in Cross-Cultural Neuropsychology

The severe limitation of many widely used neuropsychological instruments is that they have been developed and normed for White, monolingual English-speaking individuals within the United States and Canada (Razani, Burciaga, Madore, & Wong, 2007). However, based on 2005 U.S. Census data, there were approximately 211 million Anglo-Americans, 35 million Hispanics or Latinos, 34 million African Americans, 15

million Native Hawaiian and other Pacific Islanders, 10 million Asian Americans, and 2 million American Indian and Alaska Natives. It was noted in the 2005 U.S. Census that the Hispanic and Asian populations were growing at a much faster rate and would triple over the next half-century (U.S. Census Bureau, 2005). Due to this growing number of ethnic minorities, it is essential for health professionals to have reliable and culturally fair assessment measures (LaRue, 1992). For example, studies have shown that neurologically normal African Americans earn lower scores than Whites on tests of cognitive functioning (Manly, Jacobs, Sano, Bell, Merchant, & Small, 1998a). If the discrepancies in the scores did not take demographic variables (e.g., level of education, ethnicity, gender, etc.) into account, the differences may have suggested greater prevalence of neurocognitive impairments in African Americans, thus misdiagnosing them with conditions such as dementia and learning disabilities (Gladsjo, Schuman, Evans, Peavey, Miller, & Heaton, 1999). In addition, other studies have pointed out that Spanish-speaking individuals were more likely to miss certain items regardless of their general cognitive functioning. Due to these results, they were more likely to be classified as impaired, despite being cognitively intact on clinical examinations (Jacobs et al., 1997). As previous research suggests, vast numbers of neuropsychological measures tend to be sensitive to demographic variables that, without properly adjusting to normative criteria, could dramatically affect interpretations and diagnoses (Lichtenberg, Ross, & Christensen, 1994). Particularly, verbally based measures are more susceptible to discrepancies in acculturation level (Razani et al., 2007). Research has shown that verbal abilities, also referred to as crystallized (gc) general intelligence, are significantly correlated with verbal knowledge, following instructions, information about humanities,

and culture in general. Thus gc can be conceptualized as "acculturation knowledge" (Beauducel, Brocke, & Liepmann, 2001). Therefore, individuals with discrepant cultural and linguistic backgrounds may perform differently on measures that assess "acculturation knowledge."

It has been noted in previous research that the ethnic minority individual's experience living in the United States, preferred language, and country of education are significant influential factors that affect neuropsychological test performance (Harris, Tulsky, & Schultheis, 2003). However, there is a common misconception among neuropsychologists that the length of residence in the United States for the minority individual is a valid measure of their English proficiency and thus a valid basis for deciding whether to test them in English (Echemendia & Harris, 2004). Unfortunately, a multitude of factors influence proficiency of English acquisition, thus making second language learning quite complex (Ardilla, 1998). Ardilla et al. (2002) has found that the ethnic minority individual's performance on neuropsychological tests varied depending on their level of English proficiency. In addition, aside from the examinee's proficiency, the examiner's proficiency was also a contributing factor. Thus, the mismatch in proficiency between the examinee and the examiner can lead to administration errors, misinterpretation, and misdiagnosis (Ardilla, Rodriguez-Menendez, & Rosselli, 2002). As evidenced by previous research, further investigation on the effects of bilingualism on neuropsychological test performance still remains necessary (Kroll, Michael, & Sankaranaraynan, 1998).

Contributing Demographic Factors

Age has also been recognized as a factor that influences neuropsychological test outcome. With an increase in age, there is a decrease in IQ scores (Kaufman & Lichtenberger, 2002), decrease in level of verbal fluency (Kempler, Teng, Dick, Taussig, & Davis, 1998), greater number of errors on a non-verbal test (i.e., Wisconsin Card Sorting Test; WCST) among others (Mitrushina, Boone, Razani, & D'Elia, 2005). In addition to age, education has also been noted as a contributing factor in the individual's performance on neuropsychological tests. Particularly on the measure of verbal fluency, Kempler et al. (1998) found education to be a better predictor of neuropsychological performance outcome than age alone. However, using years of education as a predictor for neuropsychological performance can be problematic. For example, Manly et al. (2002) found that years of education did not correct for the differences found on neuropsychological performance between Whites and African Americans but rather reading ability, when used as a covariate, attenuated differences between the two groups on most of the neuropsychological tests (Manly, Jacobs, Touradji, Small, & Stern, 2002). Therefore, in addition to age and education, other demographic factors, such as gender, language, place of birth, and ethnicity need to also be taken into account when interpreting neuropsychological test measures (Dick, Teng, Kempler, Davis, & Taussig, 2002). Furthermore, socioeconomic status is another influential factor that may impact the performance of individuals where poverty, poor nutrition, and lack of intellectual resources may all impact performance on neuropsychological tests (Neisser, Boodoo, Bouchard, Jr., Boykin, Brody, Ceci, Halpern, Loehlin, Perloff, Sternberg, & Urbina, 1996). Particularly for the ethnic minorities (e.g., African Americans), their motivation

to work hard on tests that highly reflect White values, time demands on certain tests that may be alien to their culture, and being tested in a standard form of English may significantly impact their performance (Neisser et al., 1996). These influential cultural factors for ethnically diverse individuals have been consistently shown in research illustrating their contribution to discrepancies on neuropsychological test measures (Nell, 2000).

Neuropsychology and Culture

As previous research has shown, there were significant ethnic group differences due to demographic influences (e.g. age, gender, years of education, etc.) on cognitive tests (Byrd et al., 2006). However, more so than these variables alone, it has become essential in cross cultural research to consider cultural variables such as cultural orientation, cultural identity, and acculturation in order to better understand cultural influences on psychological processes and assessment outcomes (Cuellar, 1998). However, there are very few studies that have actually looked at how culture influences neuropsychological test performance (Fletcher-Janzen, Strickland, & Reynolds, 2000). The potential of cultural influence is so pervasive, yet the prevailing hypothesis about culture is that there is no difference between ethnic groups. Only when sufficient empirical evidence has been gathered is this hypothesis invalidated (Malgady, 1996). The field of neuropsychological assessment, being one of the newer fields of psychology, fails to grasp the potential role of culture on psychological processes and psychological assessment. Particularly, it is important to note that regardless of the advancement in instrument development, these instruments are intended for the use in the United States

and are not sensitive to ethnicity, education (e.g., where the education was obtained), bicultural or linguistic characteristics, or acculturation characteristics. According to Cuellar, most critical deficiencies in representativeness on psychological tests occur with respect to low level of acculturation (1998). A key element in how individuals function in a multicultural society involves cultural change. This change (as a result of intercultural contact) engages in a dual process, both cultural and psychological, generating changes in "either or both groups" (Berry, 1998). This process is referred to as acculturation. The degree to which individuals accept and adopt the language, values, customs, and behaviors of the host culture represents the level of acculturation (Razani, Burciaga, Madore, & Wong, 2007). Psychologists have examined acculturation in the past in order to control for social and cultural variables that may influence psychological phenomena. However, recent cross-cultural psychologists have studied acculturation as a phenomenon for its own sake. This process of cultural change occurs in both groups, but usually the dominant group changes less than the other(s) (Berry, 1998).

In order to assess cultural influences on test scores, it is necessary to have reliable and valid cultural indexes. Some of the more recognized cultural indexes include but are not limited to: ethnic identity, ethnic orientation, behavioral (e.g., in ways of speaking, dressing, or eating) as well as psychological (e.g., adaptations that affect the sense of well-being or self-esteem) acculturation, linguistic abilities, etc. Many of these indexes have been gathered with the use of a newly developed acculturation scale called the Acculturation Rating Scale for Mexican Americans (Cuellar, Arnold & Maldonado, 1995). The adapted versions of this scale for different ethnic groups have been validated as well. Acculturation has been stated in previous research to correlate with a myriad of

research areas including intelligence scores, health status (both physical and mental), levels of social support, social deviancy, alcoholism, drug use, social attitudes, consumption of cigarettes, and the Halstead-Reitan Neuropsychological Tests, among others (Cuellar, 1998). Given the role of acculturation on behavioral outcomes, it may be necessary to mediate the test scores based on acculturation level. For instance, in Cuellar's research on Hispanics, it has proved useful to "correct" test scores by using acculturation indexes if some Hispanics perform more in accordance with White norms because of greater acculturation into White European American culture (1998).

Furthermore, with the emphasis on fairness on tests, it is important to investigate the appropriateness and effectiveness of psychological assessments when administering to culturally diverse individuals. Individuals from different cultures may perform differently based on their cognitive schemas. Cognitive schemas, such as cultural lens, assist individuals in filtering information and experiences, applying meaning to, interpreting, and understanding the world and those around us. Therefore, cognitive schemas are very culture specific and therefore fundamental to the examination of how the information is processed (Cuellar, 1998). Henceforth, each test represents cognitive schemas and without the examination of ethnocultural variables, the obtained scores may not be a good representation of culturally different ethnic minority populations. Moreover, if the tests are not capable of eliminating cultural influences from their scores, it is necessary to acknowledge and determine the extent to which specific cultural variables such as place of educational obtainment, language, acculturation, and so forth influence specific test scores (Anastasi, 1988).

Cultural Influence on Verbal Skills

With the cultural characteristics in mind, there were several studies that have examined how certain cultural variables influence neuropsychological assessment outcome. Particularly within ethnic minorities, who come from linguistically different background, it is of utmost importance to determine what neuropsychological tests are more prone to differing verbal abilities.

Previous research has pointed out several measures which tend to be more influenced by linguistic background and verbal abilities. One of the measures is called the Controlled Oral Word Association Test (COWAT). The test measures individual's phonemic fluency (measured by the number of words generated within 60 seconds for each letters – F, A, S) and semantic fluency (measured by the number of animals generated within 60 seconds). A problem for ethnic minorities lies where their differing level of English language ability/fluency/knowledge or even bilingualism may impact their scores. A study done by Johnson-Selfridge et al. (1998) found that White participants performed better than African American or Hispanic participants on both phonemic and semantic fluency tasks. African American participants generated slightly (but significantly) more words than Hispanic participants in the phonemic fluency condition, although both groups performed similarly on semantic fluency. They also found a significant relationship between ethnic group membership and COWAT performance, even after covarying for income, education, and reading scores (Johnson-Selfridge, Zalewski, & Aboudarham, 1998). However, this study had many limitations: all participants were males, and age was restricted to only 31 to 46 years. A study conducted by Gladsjo et al., (1999) found that higher education and Anglo-American

ethnicity were associated with better performance on both phonemic and semantic fluency tasks while lower education was associated with poorer performance. In addition, a study by Boone et al. (2007) of psychiatric patients demonstrated that native English speakers outperformed individuals who acquired English as a second language on phonemic fluency. Also, length of residence in the United States was negatively correlated with phonemic fluency performance. It was found that non-Hispanics scored higher on the COWAT regardless of equal level of fluency in English and education level in the United States (Boone, Victor, Wen, Razani, & Pontón, 2007). Previous studies have also found that poor performance was associated with increasing age, particularly on the semantic fluency portion of the test. Higher level of education was also associated with better performance on both phonemic and semantic fluency tasks, whereas gender appeared to have no significant effect (Gladsjo et al., 1999).

The Boston Naming Test (BNT) is frequently used in neuropsychological assessment as a test of confrontation naming ability (Kaplan, Goodglass, & Weintraub, 1983). On this test, individuals are presented with 60 pictures of commonly known objects and are asked to name the objects. Previous studies have found that verbal intelligence (as measured by expressive vocabulary) is highly correlated with the performance on the BNT (Graves & Carswell, 2003). Furthermore, it has been found that an individual's linguistic background also affects performance, where monolingual Anglo-Americans performed better than bilingual ethnic minorities (Roberts, Garcia, Desrochers, & Hernandez, 2002). Discrepancies between ethnicities have also been found where Anglo-Americans outperformed other ethnic groups (e.g., African Americans) and those ethnic minorities who were more acculturated outperformed the

less acculturated (Manly et al., 1998). A caveat to this test is that ethnic minorities may be familiar with the object but may only know the name in their own language. This may elucidate the influence of acculturation level on this test where ethnic minorities who are more acculturated may be more familiar with the names of the objects from increased exposure and greater English language ability. Other studies have shown that naming ability declined with increasing age although individuals with higher performance level at baseline showed fewer declines over time. In addition, individuals with higher education level performed better than those who were less educated (Kent & Luszcz, 2002).

The Stroop test has been commonly used in neuropsychological assessment to measure an individual's reading speed as well as information processing speed. There are three parts to this test: color naming, word reading, and interference task. The third interference task is said to be a good measure of executive function (i.e., inhibition). Previous research has shown that bilingual individuals were slower than monolinguals on the Stroop test, particularly in the color-naming task (Rosselli, Ardila, Santisi, Arecco, Salvatierra, Conde, & Lenis, 2002). The delay in processing speed in bilinguals may be from resisting constant interlanguage interference (Ben-Zeev, 1977). Research has also found that age was a contributing factor where older individuals exhibited decline in performance on the color naming and color interference tasks (Cohn, Dustman, Bradford, 1984). Also, some studies have shown that education affected test outcome, especially in African Americans (Moering, Schinka, Mortimer, & Graves, 2004), whereas other studies did not find similar education effect on the Stroop test (Trenerry, Crosson, DeBoe, & Leber, 1989). The inconsistent findings on educational influences may possibly be due to the discrepancies in quality of education.

There has not been ample research examining the Wechsler Abbreviated Scale of Intelligence (WASI), but existing research does indicate that age and education are related to the individual's performance on this test (Hays, Reas, & Shaw, 2002). In a study by Razani et al. (2007), ethnic minorities (e.g., Hispanics, Asians, and Middle Easterners) performed worse on the WASI verbal subtests (not on the non-verbal subtests) when compared to Anglo-Americans. Moreover, acculturation (measured by the Acculturation Rating Scale for Mexican Americans – ARSMA) was a significant predictor for Vocabulary (measure of word knowledge) and Similarities (measure of verbal concept formation and abstract reasoning) for ethnic minorities (Razani, Murcia, Tabares, & Wong, 2007). In regards to other measures that assess verbal intelligence, studies have shown that Anglo-Americans performed better than both Mexican-American and African-American individuals on the Wechsler Adult Intelligence Scale (WAIS) and Wechsler Adult Intelligence Scale – Revised (WAIS-R), most likely due to linguistic factors (e.g., bilingualism; Whitworth & Gibbons, 1986). Other research indicated that the discrepancies found on these intelligence tests may be due to cultural bias (e.g., misconceptions of one's ability as a result of cultural difference or wrong assumptions of one's culture that may result in discrepancies on test outcome) and that more research is still needed (Paolo, Ryan, Ward & Hilmer, 1996).

As evidenced by previous research, cultural factors, such as years of formal education, literacy, and acculturation all contribute to the discrepancies on neuropsychological assessment among ethnic minorities (Baird, Ford, & Podell, 2007). Particularly in a study by Manly et al. (1998) where Manly and colleagues studied a sample of healthy African-Americans, it is clear that acculturation level significantly

impacted performance on neuropsychological tests (e.g., BNT and WAIS-R) even after co-varying for age, education, and gender. With many cultural variables influencing the neuropsychological assessment outcome for ethnic minorities, it remains essential to examine this phenomenon more systematically to reduce future bias in clinical practice.

Theoretical Model

In order to better assess culturally diverse individuals and to validly interpret the findings, a conceptual model developed by Betancourt and collaborators (Betancourt & Flynn, 2009; Betancourt & Lopez, 1993; Betancourt, Hardin, & Manzi, 1992) in studying the role of culture in psychology has been used as a guiding theory to effectively investigate the cultural influence on neuropsychological assessment outcome. Betancourt's integrative model of culture, psychology, and behavior (Betancourt, Flynn, & Ormseth, 2011; Flynn, Betancourt, & Ormseth, 2011; Betancourt, Flynn, Riggs, & Garberoglio, 2010) is presented in Figure 1.

The underlying principle guiding this theoretical model is that the relationships between variables are structured from most distal to more proximal (moving from A to D), with more proximal variables contributing greater impact. According to the model, neuropsychological assessment outcome (D) is a function of psychological processes (C), which are the most proximal determinants and therefore have the greatest influence on the outcome. Neuropsychological assessment outcome (D) is also associated with aspects of culture, such as those involved in acculturation (B). This aspect of culture may be directly or indirectly associated with the assessment outcome through mediating psychological processes (C). Moving further away from the outcome are population

categories, such as race and ethnicity (A), which may represent sources of cultural variation. Therefore, the model highlights that it is not just race/ethnicity that influence neuropsychological assessment outcome but also culture through the mediating psychological processes.

This model has been employed in guiding different areas of research examining the role of culture and the intended measure of behavioral outcome. For instance, this model has investigated the role of culture in health behaviors and access to health care among Latinos in the United States (Betancourt et al, 2011; Flynn et al, 2011; Betancourt et al, 2010; Betancourt et al, 2009). Not only did this model examine how culture may influence the health behaviors of the patients but also how the culture of the health professionals providing health care may be influenced by the interplay of their culture and the culture of their patients. This model has allowed such research to be methodologically more systematic and easier in interpreting the research findings. Thus, this model is regarded as an efficient tool in examining and validly assessing the neuropsychological test outcome within the context of a socio-structural perspective.

Purpose

The purpose of this study was to first assess the reliability of the ARSMA in MEs to determine the appropriateness of usage in this particular ethnic group. Once the measure established sufficient reliability for the MEs, items were separated into qualitatively distinct factors for the ethnic minority group as a whole (i.e., Hispanics, Asians, and MEs). Subsequently, neuropsychological measures were then reduced to specific factors to parsimoniously investigate the phenomenon. These NP factors were

also inspected in their construct equivalence to validate appropriateness of cross-cultural examination. Following a systematic psychometric assessment, ARSMA factors were used to predict significant contribution on NP performance in ethnic minorities. Awareness of significant cultural predictors on ethnic minority performance on verbally based NP measures can promote better interpretation of assessment data, thus reducing the likelihood of misdiagnosing patients in clinical situations.

Hypotheses

Based on the extensive review of the literature in the relevant field of study as well as adhering to the purpose of this research, four hypotheses were generated.

1) Psychometric evaluation of the ARSMA will identify it as a reliable measure of acculturation for Middle Easterners.
2) Exploratory factor analysis will reveal specific acculturation factors that are qualitatively distinct.
3) Exploratory factor analysis will reveal specific neuropsychological factors that are culturally equivalent.
4) Significant relationships will prevail between the acculturation and neuropsychological factors.

CHAPTER TWO

METHOD

The dataset was obtained from Jill Razani, Ph.D., a principal investigator, examining the cultural effects on cognitive task performance (attention, memory, concentration, etc.) as part of a larger study funded by the National Institute of Mental Health.

Participants: Overview

A combined total of 259 participants, including 87 healthy monolingual English-speaking Anglo Americans (MEAA) and 172 ethnically diverse participants from Hispanic, Asian, and Middle-Eastern descents between the ages of 18 and 69 years were recruited from the greater Los Angeles Community. Education levels ranged from 9 – 20 years. Of these ethnically diverse individuals, 52 were of Hispanic descent from Mexico, Central America (El Salvador, Guatemala, and Honduras), or South America (Paraguay and Columbia); 52 were of Asian Descent from the Philippines, Indonesia, China, Vietnam, or Korea; and 68 were of Middle-Eastern descent from Iran, Turkey, Lebanon, or Armenia. These three ethnic groups were compared to 87 MEAA since most of the published norms were based on this group. The study did not include African-Americans because the purpose of the project was to examine the immigration factors that affect test performance.

All participants were carefully screened with an examiner and administered a health questionnaire for the following factors known to affect cognitive functioning: history of neurological or psychiatric illness, head injury resulting in $\geq$ 5 minutes of loss

of consciousness, learning disability, and chronic untreated medical illness (e.g. diabetes, hypertension). All participants who met the health criteria and who were from Hispanic, Asian, or Middle-Eastern descent were eligible to participate in the current study. Given that all testing was conducted in English, all participants were required to be fluent in English, to be able to communicate clearly with the examiner, understand test instructions, and carryout the tasks. An example of the health questionnaire is displayed in Appendix A.

Instruments

Demographic and Cultural Factors

Demographic information among ethnically diverse individuals regarding their chronological age, age at immigration, and years of residence in the United States was obtained. Additionally, years of education obtained in the United States and outside of United States were gathered from all participants. Further information regarding their language was obtained in two categories – estimated percentage of English spoken while growing up and estimated percentage of English spoken currently. It is important to note that all of the MEAA obtained all of their education within the United States. An example of the background inventory questionnaire is displayed in Appendix A.

Acculturation Measures

The Acculturation Rating Scale for Mexican-Americans (ARSMA) developed by Cuellar et al. was used to measure the level of acculturation in ethnically diverse individuals (Cuellar, I., Harris, L., & Jasso, R., 1980). Given that a specifically tailored

acculturation measure was unavailable for all ethnic groups, an adapted version of this test was used for Asians (Suinn, R., Rickard-Figueroa, K., Lew, S., & Vigil, P., 1987). This adapted version was shown to demonstrate sufficient level of reliability and validity when used with Asian-American group (Suinn et al., 1987). This scale has been proven to be adaptable to other ethnic groups and therefore was also adapted and validated for Middle-Eastern group in this study. To make sure each measure was representative for each ethnic origin, wordings pertaining to their nationality and language of origin were changed to what was applicable to the participant (e.g., "Mexican" and "Spanish"). An example of the adapted version for Armenian individuals as well as the original ARSMA is shown below (Table 1).

The ARSMA is a 20-item scale in 5-point Likert type items. In the process of adapting this scale to the particular ethnic groups of interest in this study, three items had to be limited to a 3-point Likert type because distinctions between "Mexican" and "Chicano" were not relevant for other ethnic groups. A score of one denoted that individuals identified themselves more with their own culture, a score of three denoted biculturalism, and a score of five denoted that the individuals identified themselves more Anglicized. Therefore, after consideration of the three 3-point Likert type items, the lowest possible score was 20 indicating a low level of acculturation, and the highest possible score was 94 indicating a high level of acculturation. This global measure was calculated by summing the total of all twenty items. Previous studies by Cuellar et al. (1980) have found that the acculturation scale may be delineated into four factors that contribute to different concepts of acculturation. *Factor one* was a measure of language familiarity, usage, and preference (Ethnic Preference) which assessed individuals'

familiarity, usage, and preference of their own ethnic language in comparison to English; *Factor two* was a measure of ethnic identity and generation (Ethnic Identity) which referred to individuals' generation status and self-indicated ethnic identity; *Factor three* was a measure of reading, writing, and cultural exposure (Ethnic Exposure) which assessed individuals' ability to read and write in their own ethnic language in comparison to English as well as a measured individuals' exposure to their own cultural heritage versus American culture; *Factor four* was a measure of ethnic interaction (Ethnic Interaction) which assessed individuals' social interaction with individuals in similar ethnic backgrounds versus differing ethnic backgrounds. A full version of the adapted ARSMA is displayed in Appendix B.

Table 1

Example of the original ARSMA and the adapted version for Armenians

Original ARSMA scale	*Adapted Acculturation scale for Armenians*
What language do you speak?	What language do you speak?
1. Spanish only	1. Armenian only
2. Mostly Spanish, some English	2. Mostly Armenian, some English
3. Spanish and English about equally	3. Armenian and English about equally
4. Mostly English, some Spanish	4. Mostly English, some Armenian
5. English Only	5. English only
How would you rate yourself?	How would you rate yourself?
1. Very Mexican	1. Very Armenian
2. Mostly Mexican	2. Mostly Armenian
3. Bicultural	3. Bicultural
4. Mostly Anglicized	4. Mostly Anglicized
5. Very Anglicized	5. Very Anglicized

Another acculturation measure that was used to gather more information on the acculturation level among ethnic minorities was the Marin Acculturation Scale. This scale consists of 13 items in 5-Likert scales where (1) represented “Only Spanish” and (5) represented “Only English.” According to Marin et al. (1997), this scale produced three factors: Language use, Media, and Ethnic Social Relations (Marin, Sabogal, & Perez-Stable, 1997). This scale was also adapted for other ethnic groups as well for the purpose of this study. According to previous research, this acculturation scale is considered to be most psychometrically accurate where it is especially agreeable for neuropsychological research (Herrera, Pontoon, Corona, Gonzalez, & Higareda, 1998). Furthermore, this scale is important to consider in addition to the ARSMA, since this scale provides additional information on the language factors. A full version of the adapted Marin Acculturation Scale is displayed in Appendix C.

Neuropsychological Tests

Controlled Oral Word Association Test (COWAT)

COWAT has been used in previous studies in order to assess individuals' cognitive flexibility, as well to measure semantic and phonemic fluency as aspects of language abilities. The most commonly used letter (phonemic) stimuli are the letters "F," "A," and "S," whereas "animals" is the most common (semantic) category stimulus (Gladsjo, et al., 1999). For the phonemic task, each participant is given three consecutive 60 second trials to name as many words as they could think of beginning with the letters "F," "A," and "S." Participants are instructed not to state any proper names (e.g., names of people or places) and plurals are not allowed. Perseverative responses, close

variations of the same word (e.g., "sit" and "sitting"), and intrusions are not counted. The total numbers of "F," "A," "S," responses are combined for a total score. For the semantic task, each participant is asked to name as many animals as they can think of in 60 seconds. The same scoring rule is applied to this task and a total score is used as COWAT-AN variable (Gladsjo, et al., 1999). According to Tombaugh et al., (1999), the Coefficient alpha for this measure was found to be high (r = .83) as was the test-retest reliability (r = .74) after an interval of more than five years in elderly individuals (Tombaugh, Kozak, & Rees, 1999).

Boston Naming Test (BNT)

The BNT has been used in previous studies to assess the individual's ability to name visually presented black and white drawings that represent common objects (Kaplan et al., 1983). There are sixty items ranging from easy to name objects (e.g., harmonica) to more difficult to name objects (e.g., abacus). Individuals are given 20 seconds to name the object on the card, followed by two prompting cues: a stimulus cue and a phonemic cue. This test requires that 8 consecutive items are identified correctly starting at item 30 and discontinued once 6 consecutive items are identified incorrectly. Previous research has shown that the internal consistency for this measure ranged between .78 and .96. The measure exhibited high reliability (r = .91) over short intervals (i.e., 1 to 2 weeks) and marginal to high reliability (.62 to .89) for longer intervals (i.e., 1 year apart; Strauss, Sherman, & Spreen, 2006).

Stroop Test (A & B)

The Stroop Test has three parts: Part A (Color) where the individual is asked to read the color blocks; Part B (Word) where the individual is asked to read the words printed in black ink; and Part C where the individual is asked to read the color of the ink that the word is printed in and not read the word. Only Part A and Part B were used for this study to assess the individual's reading speed and information processing speed. Previous studies have shown that all three parts of the test exhibited high reliability coefficients (.90, .83, .91 respectively) although there does seem to be practice effects where the performance improved by about two seconds during the second administration (Strauss et al., 2006).

Wechsler Abbreviated Scale of Intelligence (WASI; Vocabulary & Similarities)

The WASI was developed in response to the need for a brief, reliable version of the Wechsler Adult Intelligence Scale-III (WAIS-III; Hays et al., 2002; Kaufman & Kaufman, 2001). This measure has been used in lieu of the WAIS-III based on the fact that regardless of the shorter duration in test administration, the measure provided valuable information regarding IQ as well as verbal and non-verbal skills. For the purpose of this study, only the Vocabulary subtest (measuring word knowledge) and the Similarities subtest (measuring verbal concept formation and abstract reasoning) were used to examine verbal skills among ethnic minorities. For the Vocabulary subtest, individuals are given a word and are asked to explain what the word means (e.g., "tell me what winter means"). For the Similarities subtest, individuals are given two words and

are asked to explain how they are similar (e.g., “how are grapes and oranges alike?). The WASI exhibited an excellent split-half reliability (.8 -.9) as well as test-retest reliability (.92) with the interval between tests ranging from 2 to 12 weeks (Strauss et al., 2006).

Procedure

Participants were recruited via newspaper advertisements, flyers posted in public agencies and buildings, and word of mouth. The tests of language, attention, memory, visuospatial skills, and executive function were administered as part of a larger neuropsychological test battery which took approximately 3 hours to complete, sometimes lasting beyond the anticipated time frame depending on the ability and status of the participants. Before being admitted to the study, all participants were pre-screened over the phone for the purpose of excluding those individuals who may have had history of drug use, head injury, and/or psychiatric treatment. Upon arrival, all participants were administered a background inventory questionnaire which included a health questionnaire as a screening procedure. Ethnically diverse individuals were administered additional questionnaires which contained more detailed questions regarding language usage, acculturation factors, and educational experience, as well as a formal acculturation instrument. All participants were paid $50 for their participation and were treated in accordance to the "Ethical Principles of Psychologists and Code of Conduct" as well as the California State University, Northridge Advisory Committee for the Protection of Human Subjects. All participants were given an Informed Consent form prior to the study and were given a Debriefing form at the completion of the study.

Statistical Analyses

All of the dependent variables were operationally defined prior to analyses. The list of dependent variables are shown below:

$DV_{1\ \&\ 2}$ = COWAT – combined total of F, A, S and total animals raw scores

DV_3 = BNT – total spontaneous correct w/ semantic cues raw score

$DV_{4\ \&\ 5}$ = Stroop – total time for part A and total time for part B

$DV_{6\ \&\ 7}$ = WASI – total vocabulary and similarities raw scores

First, in order to check for the reliability of the ARSMA, item analysis and reliability analysis were conducted. Following the reconstruction of the measure, exploratory factor analysis was performed to reduce the items to qualitatively distinct factors. For the neuropsychological (NP) measures, exploratory factor analysis was first conducted to reduce them into qualitatively distinct factors. Once the factors emerged, they were checked for construct equivalence between ethnic groups using Tucker's phi analysis. Once all of the factors were considered to be sufficient in their reliability and validity, hierarchical regression was performed to determine significant acculturation predictors influencing neuropsychological performance.

CHAPTER THREE

RESULTS

Descriptive statistics of the sample are illustrated in Table 2. There were no significant differences in age, F (3, 257) = .561, $p > .05$) or gender, F (3, 256) = .405, $p > .05$) but a significant difference was observed in education level between groups, F (3, 256) = 9.05, $p < .01$, with the ME group having attained the highest level when compared to the other groups.

Table 2

Descriptive Statistics of the Sample: Mean (SD)

	MEAA	Hispanic	Asian	ME
Sample Size (n)	85	52	52	68
Age	35(15)	33(15)	35(15)	36(11)
Gender (n)				
Male	33	19	20	20
Female	52	33	32	48
Education Level	14(2)	13(2)	15(2)	20(3)

Hypothesis 1: Psychometric Evaluation of Measurement Reliability

Previous studies have determined that the ARSMA is a reliable measure of acculturation for Hispanics (Cuellar et al., 1980) and Asians (Suinn et al., 1987). In order to demonstrate sufficient reliability for MEs, a thorough psychometric evaluation was conducted on the ARSMA. First, item analysis was conducted to assess item difficulty, discrimination index, and difficulty distribution. The items were moderate in their difficulty ranging from 1.09 – 4.13. For this measure, moderate difficulty is equivalent to sufficient variability in answer choices, where participants endorsed variable answer

choices ranging from low (i.e., choice 1) to high (i.e., choice 5) acculturation. Item 12 was not interpreted since it asked about the participants' generation status (i.e., 1st generation, 2nd generation, etc.). Large numbers of the participants were immigrants and it was unlikely for them to answer 5 (i.e., 5th generation status – self and parents born in the U.S. and all grandparents born in the U.S.). Among the remaining items, the items that asked about the ethnic identification of the father (Item #5; M = 1.09, SD = .332) and the ethnic identification of the mother (Item #4; M = 1.13, SD = .417) had the highest difficulty, meaning most of the participants chose low acculturation answers (i.e., choice 1 or 2). In contrast, the item that asked about the participant's TV viewing preference had the lowest difficulty (Item #10; M = 4.13, SD = .784), meaning most of the participants chose high acculturation answers (i.e., choice 4 or 5). Nine out of the 16 items were negatively skewed, with the TV viewing preference (Item #10) showing the highest negative skew (-.613). Negative skew refers to questions that are higher in their choices (i.e., 4 or 5), thus higher negative skew for this measure denotes higher acculturation level. A detailed description of the item difficulty is illustrated in Table 3.

Table 3

Distribution of the Item Difficulty and Discrimination Index (DI) of the ARSMA

Items	Mean (SD)	Skew	DI	***Items***	Mean (SD)	Skew	DI
#1	2.94 (.820)	-.220	.703	*#11*	4.09 (.722)	-.374	.528
#2	2.96 (.946)	-.233	.680	*#12*	1.00 (.000)	---	---
#3	1.49 (.532)	.331	.236	*#13*	2.52 (1.61)	.344	.620
#4	1.13 (.417)	3.39	.282	*#14*	2.17 (1.37)	.487	.189
#5	1.09 (.332)	*4.15*	.165	*#15*	2.67 (.560)	.077	.371
#6	1.57 (1.21)	2.04	.525	*#16*	2.88 (1.23)	-.017	.717
#7	1.88 (1.17)	1.42	.670	*#17*	3.22 (1.11)	-.513	.740
#8	2.67 (.886)	.063	.252	*#18*	3.19 (1.13)	-.447	.686
#9	3.30 (.810)	-.447	.526	*#19*	1.71 (.806)	1.10	.037
#10	4.13 (.784)	-.613	.543	*#20*	2.33 (.869)	-.021	.158

The discrimination index (DI) for greater than half of the items was acceptable given that they were greater than .3. The highest discriminating item was regarding the language in which they can read better (Item # 17, DI = .740). The items that asked about the ethnic identification of self (Item #3; DI = .236), ethnic identification of the mother (Item #4; DI = .282), ethnic identification of the father (Item #5; DI = .165), associating ethnicities outside of own ethnic community (Item #8, DI = .234), contact with country of origin (Item #14, DI = .189), ethnic pride (Item #19, DI = .037), and biculturalism (Item #20, DI = .158), were not very discriminating. A detailed description of the discrimination index scores is illustrated in Table 3. From the difficulty distribution, items with lowest discrimination indexes were removed (i.e., items 12, 19, 20). The remaining 17-item scale indicated sufficient difficulty (M = 2.58, SD = .560, Skew = .210) and there was approximately equal number of highly discriminating as well as not as discriminating items, ranging from .174 to .773. A histogram illustrating this outcome is depicted in Figure 2.

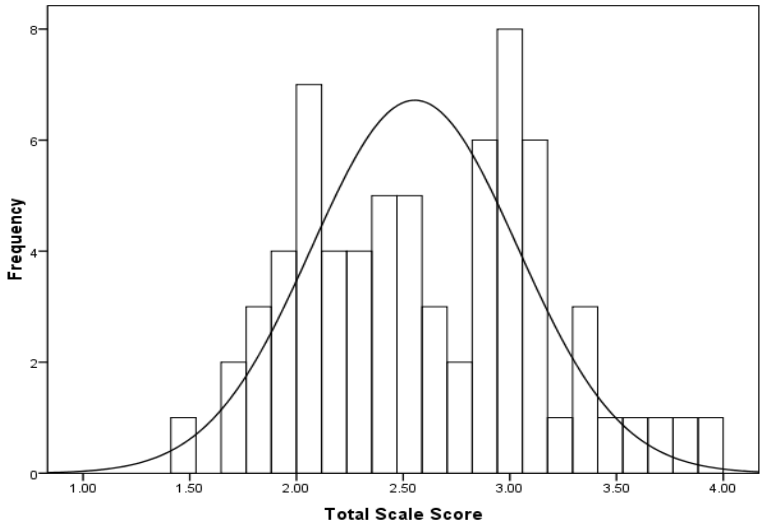

Figure 2. Histogram of Total Scale Score with 17-items

In order to examine the reliability of the original scale and to compare with the item analysis results of a 17-item reconstructed scale, a coefficient alpha was computed with all 20 items. The original 20-item scale produced a coefficient alpha of .855. This alpha level was sufficient in assessing groups for research purposes but was not sufficient enough for clinical assessment for individuals. Using the "Alpha if Item Deleted" feature of SPSS, items that were lowering Alpha were removed one at a time. First, removal of item #14, alpha level was at .865. Then removal of item #19, alpha level was at .872. Removal of item #20, alpha level was at .879, removal of item #8, alpha level was at .883, and finally removal of item #12, alpha level was at .887. After removal of 5 items, the scale resulted in 15 items with the alpha level of .887. A detailed illustration of the discrimination index scores is presented in Table 4.

Table 4

Coefficient Alpha Level for All Items

Items	Alpha if Item Deleted (Original)	Alpha if Item Deleted (5^{th} Corrected)	Items	Alpha if Item Deleted (Original)	Alpha if Item Deleted (5^{th} Corrected)
#1	.839	.874	#11	.846	.882
#2	.839	.874	#12	.857	-Removed-
#3	.855	.891	#13	.841	.881
#4	.854	.889	#14	.865	-Removed-
#5	.856	.891	#15	.852	.887
#6	.845	.879	#16	.835	.871
#7	.837	.871	#17	.834	.868
#8	.856	-Removed-	#18	.837	.870
#9	.846	.881	#19	.862	-Removed-
#10	.845	.882	#20	.859	-Removed-

To determine what the correlation between the items would be, an uncorrected Split Half reliability coefficient was produced. It is generally expected that Cronbach's

Alpha would be higher than the Split Half reliability based on the notion that Split Half reliability relies on chance – comparing odd versus even. Adhering to this expectation, the uncorrected Split Half reliability coefficient was at .791 which was lower than the Cronbach's Alpha at .887. Furthermore, with the resulting 15 items from the reliability procedure, the Spearman-Brown corrected Split Half reliability for the unequal length was at .884 which was a little lower than Cronbach's Alpha yet higher than the uncorrected Split Half reliability coefficient. The internal consistency among all of the items in the scale was higher than the two separated groups. The results are illustrated in Table 5.

Table 5

Split Half and Spearman-Brown Reliability Coefficient

Cronbach's Alpha	
Alpha if item deleted (5 items removed)	.887
Uncorrected Split Half Reliability Coefficient	
Correlation between forms	.791
Spearman-Brown Corrected Split Half Reliability Coefficient	
Unequal length	.884

In sum, the item analysis of the ARSMA revealed a 17-item reconstructed scale and reliability analysis revealed a 15-item scale. The common items removed during both procedures were items 12, 19, 20. The additional 2 items removed from the reliability analysis (i.e., items 8 and 14) were appropriate due to their low DI scores (Item 8, DI = .252; Item 14, DI = .189). The reliability analyses for 15 items of the ARSMA revealed that it is an acceptable measure of acculturation for MEs, Hispanics, and Asians (Cronbach's α = .89, .88, .93 respectively). Furthermore, the contents of the ARSMA

significantly correlated with the Marin Acculturation Scale (r = .76, $p < .001$) and years of residence in the U.S. (r = .44, $p < .001$) indicating that the ARSMA is an appropriate measure to infer level of acculturation for MEs.

Hypotheses 2: Exploratory Factor Analysis of the ARSMA

As previously described, the ARSMA has been factor analyzed for Mexican American samples demonstrating four qualitatively distinct factors. In order to first determine whether the hypothesized theoretical structure is a good fit with the current ethnic minority sample, a confirmatory factor analysis (CFA) was conducted. Results indicated that CFA did not confirm the original factor structure for our sample. In instances when a CFA does not produce a good fit between the observed factor structure and the theoretical structure, it is recommended to consider implementing exploratory factor analysis (EFA; Ozer, Firat, & Bektas, 2009). Adhering to this recommendation, an EFA using principal axes extraction method was executed.

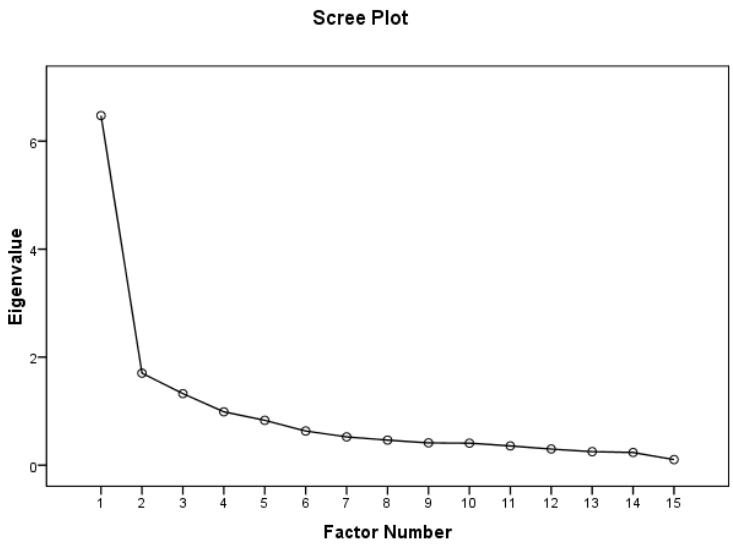

Figure 3. Scree Plot of the 15 Item ARSMA

An EFA, using a principal axes extraction method was conducted on a 15-item reconstructed scale. As indicated by Cattell, Scree plot, generated from the factor analysis, suggested 3 factors (Cattell, 1978). A detailed illustration of the Scree plot is shown in Figure 3. In order to start with clearly more factors, 50% more was added to scree number of factors resulting in 5 factors.

Table 6

Varimax Rotated Factor Matrix

Items	Factor 1	Factor 2	Factor 3
#3	.415		
#4	.742		
#5	.866		
#9		.637	
#10		.778	
#11		.789	
#1			.813
#13			.754
#16			.738
#17			.874
#18			.896

To start the factor analytic procedure, principal axes with Varimax rotation method was used to extract 5 factors. Principal axes factoring is a more preferred method since it accounts for the error term, while Varimax rotation allows the variables to be orthogonal resulting in more distinct factor structure. Once the factor loadings were generated, they were checked for salient loadings criterion (i.e., at least 3 variables with > .30 loadings). It resulted in the removal of trivial factors 4 and 5. With a reduction of 2 factors, 3 factors were extracted. All 3 factors had at least 3 variables that met the salient loadings criterion with no cross-loadings. The rotated factor matrix is illustrated in Table

6. Since all 3 factors were significant by meeting the salient loadings criterion, coefficient alpha was calculated for each factor to check for the scale-builder's criterion. It is recommended that each factor must also form a scale with a Cronbach's alpha of $\geq$ .60 for a factor to be considered significant. All factors resulted in an alpha level that was greater than .60: Factor 1 = .68, Factor 2 = .77, Factor 3 = .89.

Based on the fact that previous factor analysis resulted in more than 1 significant factor, the variables were factored again using Promax (k = 3) rotation. This method allows factors to be correlated with each other resulting in a more realistic and generalizable outcome. The oblique factors resulted in average factor correlations that were above .30 (i.e. .37) indicating a possibility of a higher-order factor. The factor correlation matrix is illustrated in Table 7 and the Promax primary factor structure is depicted in Table 8. Due to the fact that there were large correlations among the oblique factors, higher order factor analysis was performed by extracting 1 factor without any rotations. This resulted in a single higher order factor. The factor loadings of this higher order factor are illustrated in Table 8 after the Promax primary factor structure loadings.

Table 7

Factor Correlation Matrix

Factor	1	2	3
1	--		
2	.578	--	
3	.323	.216	--

While examining each factor, factor 1 was named "Ethnic Identity" since the items assessed the ethnic identification of the participants and the participants' parents.

Factor 2 was named "Ethnic Preference" since it assessed the participants' preference for media (i.e., music, television, movies). Factor 3 was named "Language/Heritage" since it assessed the participants' language abilities (i.e., speaking, reading, writing) and country where they were raised. Lastly, the higher order factor was named "Acculturation" based on the fact that all of the items dealt with the process of acculturation for ethnic minorities. Furthermore, three ARSMA factors significantly correlated with the Marin Acculturation Scale (Marin, Sabogal & Perez-Stable, 1997; r = .69, .21, .76, respectively) and years of residence in the U.S. (r = .18, .20, .49, respectively), indicating that contents of the ARSMA factors were a valid measure of acculturation for ethnic minorities.

Table 8

Promax Primary Factor Structure and Higher Order Factor Matrix

Items	Ethnic Identity	Ethnic Preference	Language/ Heritage	Acculturation*
#3	.440			.258
#4	.717			.487
#5	.881			.530
#9		.652		.411
#10		.769		.464
#11		.784		.479
#1			.811	.640
#13			.751	.532
#16			.737	.560
#17			.871	.796
#18			.906	.808

* = higher order factor

Hypothesis 3: Exploratory Factor Analysis of the Neuropsychological Measures

An EFA, using a principal axes extraction method was conducted on 7 neuropsychological (NP) measures. As indicated by Cattell, Scree plot, generated from the factor analysis, suggested 2 factors (Cattell, 1978). A detailed illustration of the Scree

plot is shown in Figure 4. In order to start with clearly more factors, 50% more was added to scree number of factors resulting in 3 factors.

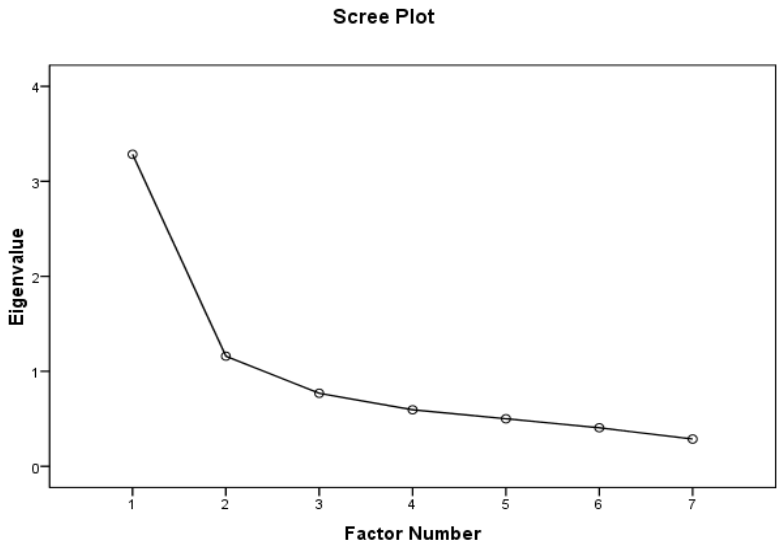

Figure 4. Scree plot of the 7 NP measures

To start the factor analytic procedure, principal axes with Varimax rotation method was used to extract 3 factors. Once the factor loadings were generated, they were checked for salient loadings criterion. It resulted in the removal of trivial factor 3. With a reduction of 1 factor, 2 factors were extracted. Each of the 2 factors had at least 2 variables that met the salient loadings criterion (i.e., >.50) with no cross-loadings. There are two ways to meet the salient loadings criterion: 1) at least 3 factors are > .30 (as it was for the ARSMA factors) or 2) at least 2 factors are > .50, both with no cross-loadings. The rotated factor matrix is illustrated in Table 9. Since each of the 2 factors was significant by meeting the salient loadings criterion, coefficient alpha was calculated for each factor to check for the scale-builder's criterion. Both factors resulted in an alpha level that was greater than .60: Factor 1 = .78, Factor 2 = .73.

Table 9

Varimax Rotated Factor Matrix

	Factor 1	Factor 2
FAS	.542	
AN	.454	
BNT	.806	
WASI-VC	.767	
WASI-SI	.586	
Stroop A		.816
Stroop B		.681

Based on the fact that previous factor analysis resulted in more than 1 significant factor, the variables were factored again using Promax (k = 3) rotation. The oblique factors resulted in an average factor correlation that was > .30 (i.e. |-.49|) indicating a possible higher-order factor. Extracting 1 factor without any rotation in higher order factor analysis resulted in a single higher order factor. The factor loadings of this higher order factor are illustrated in Table 10 after the Promax primary factor structure loadings.

Table 10

Promax Primary Factor Structure and Higher Order Factor Matrix

Items	Verbal Abilities	Verbal Processing Speed	Language*
BNT	.824		.757
WASI-VC	.782		.721
FAS	.599		.631
WASI-SI	.596		.554
AN	.522		.572
Stroop A		.815	.464
Stroop B		.740	.616

* = higher order factor

In order to evaluate the construct equivalence of the neuropsychological factors between ethnic groups, the proportionality coefficient, also known as Tucker's phi

(Tucker, 1951), was calculated. A congruence coefficient close to 1 would indicate a strong similarity between factor solutions (Fremeaux, Hosking, Metcalf, Jeffery, Voss, & Wilkin, 2011). Analysis revealed a high degree of similarity in factor solutions between all ethnic groups for both verbal abilities and verbal processing speed. A detailed description of the results is illustrated in Table 11.

Table 11

Consistency of the NP Factors Between Ethnic Groups, Measured by Tucker's Phi

NP Factors	Hispanics	Asians	MEs
Verbal Abilities	1.00	1.00	1.00
Verbal Processing Speed	1.00	.97	.99
Language (HOF)	.96	.98	.98

Note = MEAA was used as a reference group

Hypothesis 4: Hierarchical Regression of Factor Relationships

In order to examine the contribution of acculturation on neuropsychological performance, a hierarchical regression analysis was conducted. In step 1, demographic variables (i.e., age, gender, education level) were the independent variables. The ARSMA factors were then entered in step 2. NP factors (i.e., verbal abilities, verbal processing, and language) were dependent variables. Results from the regression analyses revealed that *Language/Heritage* (ARSMA Factor 3) was the best predictor for *Verbal Abilities* ($\beta = .601$, $p < .001$) and *Language* ($\beta = .599$, $p < .001$). *Ethnic Preference* (ARSMA Factor 2) was the best predictor for *Verbal Processing Speed* ($\beta = -.194$, $p < .05$). Also, *Acculturation* (ARSMA Higher-Order Factor) was a significant predictor for *Verbal Abilities* ($\beta = .528$, $p < .001$), *Verbal Processing Speed* ($\beta = -.138$, $p <$

.05), and *Language* (NP Higher-Order Factor; β = .371, $p < .001$). The results are illustrated in Table 12.

Table 12

Relationships between ARSMA Factors and NP Factors

	Verbal Abilities			*Verbal Processing Speed*			*Language (HOF)*		
Predictors	*B*	β	t	*B*	β	t	*B*	β	t
ARSMA									
Factor 1	-2.47	-.078	-1.20	-.655	-.039	-.515	-2.73	-.096	-1.28
Factor 2	1.18	.068	.952	-1.80	-.194	**-2.34***	-.974	-.063	-.771
Factor 3	4.91	.601	**.816****	-.438	-.113	-1.18	3.89	.599	**6.38****
HOF	.099	.528	**.737****	-.049	-.138	**-1.93***	.078	.371	**5.46****
	Δ $R^2 = .346$, $p < .001$			**Δ** $R^2 = .067$, $p < .01$			**Δ** $R^2 = .543$, $p < .001$		

Note: * = $p < .05$; ** = $p < .001$

CHAPTER FOUR

DISCUSSION

The purpose of this study was to examine the relationship between acculturation factors and neuropsychological factors following a systematic psychometric evaluation to determine the reliability and factor structures of the measures. The findings of this study suggest that 1) ARSMA is a reliable measure to be used to examine level of acculturation in ethnic minorities, 2) ARSMA can be reduced to factors that are specific to this sample population, 3) neuropsychological (NP) measures using raw scores can also be reduced to factors that are cross-culturally equivalent, and 4) acculturation does significantly influence aspects of verbal performance in ethnic minorities. These outcomes indicate that it is imperative for neuropsychologists to consider the contribution of cultural discrepancy when interpreting assessment outcome to reduce the likelihood of misdiagnosing ethnic minorities in clinical setting. Furthermore, this study revealed a reliable acculturation measure that can be used to infer level of acculturation for ethnic minorities and verbal NP measures that are culturally equivalent. Furthermore, it is encouraging to appreciate the parsimonious nature of examining this complex relationship.

The ARSMA has been used in previous studies to investigate different aspects of acculturation in ethnic minorities, particularly for those of Hispanic descent (Cuellar et al., 1980). In order to broaden the usage of this measure, other studies have adapted the items to reflect other ethnic groups (Suinn et al., 1987). Although analyses have been performed to gain sufficient reliability and validity of this measure to be used for different ethnic groups, there were limited studies that have adapted the measure for MEs

thus far. To address this gap in existing literature, this study examined the appropriateness of the items for MEs to reflect their level of acculturation. Results revealed sufficient reliability with the removal of 5 items. The removed items were regarded to not improve the overall reliability of the measure and did not provide much flexibility in answer choices. The resulting 15-item ARSMA was more appropriate in measuring level of acculturation and was determined to correlate highly with another type of acculturation measure (i.e., Marin Acculturation Scale) and years of residence in the U.S. Therefore, results substantiated the reliability of this measure for MEs, indicating that the contents of the ARSMA for the ethnic minority participants in this study as whole were valid.

When the ARSMA was reduced to parsimonious factors, the measure revealed factor structures that were dissimilar to previous studies. Specifically, other studies have produced four factors (Montgomery et al., 1984) but the confirmatory factor analysis of this study failed to confirm the original factor structure for this sample data. Possible interpretation of these results hinges on the fact that all of the data for this study were collected in Los Angeles area where participants' elucidation of culture may be more diversified. Furthermore, original factor structures for the ARSMA have been produced in the 1980s in which the possibility of understanding ethnic heritage, and other preferences of cultural practice may overlap with different aspects of acculturation due to greater media exposure in current times. The reconstructed scale of this study and modified factor structures seem to be more appropriate for ethnic minorities of the current generation, particularly for those living in the Los Angeles area.

Neuropsychologists have always been concerned with developing norms that are more representative of the cultural diversity in current society and producing more culturally fair tests. In order to examine aspects of this phenomenon, this study closely investigated the cognitive tests that are proposed to have strong verbal mediation. Several of the verbal measures converged into two qualitatively distinct factors to parsimoniously demonstrate aspects of verbal performance. Furthermore, these factors were regarded as cross-culturally equivalent thus measuring the same construct between different ethnic groups based on Tucker's phi analysis. This determination was essential in investigating individuals from different cultural backgrounds. Additionally, instead of having to individually indicate what the relationship was to each measure (i.e., BNT, WASI, etc.), it was simpler to elucidate the broader contribution. The resulting NP factors suggested that the verbal constructs that were being measured for this study were a valid assessment of participants' verbal performance. Specifically, the two factors appeared to be distinct in nature in which the "Verbal Abilities" factor seemed to reflect the participants' ability to verbally explain, reason, and produce verbal information; whereas the "Verbal Processing Speed" factor seemed to assess the speed by which verbal information was processed. Furthermore, when combined as a whole, both factors represented aspects of language, demonstrating overall verbal performances for the individuals. These findings provide clinical relevance to the field of neuropsychology to support the demand for more valid (i.e., culturally equivalent), less time-consuming (i.e., fewer measures to address specific aspect of functioning) measures to address the limitless scrutiny of conducting neuropsychological evaluations.

The most significant aspect of this study was the identification of significant acculturation predictors impacting the verbal performance of ethnic minorities. Numerous studies have addressed the discrepancy in assessment outcomes among ethnic minorities (Harris et al., 2003; Manly et al., 2002). In order to address this phenomenon even further, this study took steps to validate the measures used, factored them into specific variables, to parsimoniously investigate the relationship. As such, explicit relationships were ascertained. First, the relationship between language/heritage aspect of culture and verbal abilities was a valuable finding. Previous research has pointed out that language proficiency is one indication of how one has acculturated among many other factors that may contribute to the cognitive task performance (Razani et al., 2007; Ardila 2002). Consistent with previous research findings, the findings of this study indicated that the individual's language/heritage was a significant variable in predicting their verbal abilities, as well as language performance overall. Secondly, the relationship between ethnic preference and verbal processing speed was an important finding. As indicated in previous research, the way information is processed is very culture specific based on the fact that individuals filter, apply meaning to, interpret, and understand information differently (Cuellar, 1998). As such, the amount of exposure to different types of music, television, and movies due to differing preferences can highly impact the likelihood of how quickly verbal information is processed. In contrast, ethnic identity was not a significant variable in predicting verbal performance in ethnic minorities. Even though how one ethnically identifies oneself did not predict verbal performance, it may impact other aspects of performance (i.e., possibly response style). As suggested in previous research, the level of importance placed on a test, subjective value of sharing

personal information, and working with a culturally different stranger in a private room may all affect testing performance (Ardila, 2005). As such, it can be postulated that if one identifies strongly with a culture that is different from what is expected in the testing situation, it may significantly impact the assessment outcome.

In addition to the identification of specific acculturation factors which impact verbal performance of ethnic minorities, the role of acculturation as a whole and its influence on different aspects of verbal performance was also a critical finding. As previous studies have stated, the tests are not capable of eliminating cultural influences. As findings of this study suggested, level of acculturation did impact ethnic minority individuals' performance on neuropsychological tests. Therefore, it is necessary to acknowledge the influence it has on test scores (Anastasi, 1988). Instead of relying purely on quantitative test data, it may add more accuracy when other variables (i.e., acculturation level) are taken into consideration prior to coming to a diagnosis. Furthermore, there are reliable and concise measures that can be administered to assess aspect of cultural influence and cognitive functioning (i.e., verbal abilities).

In addition to the valuable findings, there were a few limitations to this study. Although this study was unique and valuable in that it represented an under-studied ethnic group, it may strengthen the generalizability if an even broader sample was added to address the greater diversity in current society. Furthermore, comparison of ethnic minority individuals' performances in their own language may have added more information on the role of bilingualism. More studies are warranted to further elucidate the complex phenomenon of how acculturation impacts the neuropsychological performance in individuals of varying ethnic groups. Furthermore, creation of norms that

are more culturally fair and/or address the contribution of culture may provide better clinical practice in the field of neuropsychology.

In the end, findings of this study were a significant addition to better serving ethnic minorities in a clinical setting. Instead of interpreting test results and providing them with diagnoses that may not be as accurate, being sensitive to cultural differences and the impact it may have had on the assessment outcome may better serve their needs. It has been stated in previous research that cultural factors play a significant role in variations in brain structures and functions. The way our brains are shaped and organized is heavily influenced by our experiences with the environment in which we grew up and our experiences with the contact of the specific culture (Johnson & Munakata, 2005). Furthermore, the brain is not the determinant of the contours of culture; it is culture which determines what we take in and places importance on brain functioning (Gergen, 2010). Henceforth, this view of the brain being "an organ that enables the realization of culturally created form of life," may open the door to a far richer and more promising domain of research and practice (Gergen, 2010).

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APPENDIX A

BACKGROUND INFORMATION QUESTIONNAIRE

Name: _____ **Date of Exam**: _____

DOB: _____ **Age**: _____ **Gender**: M / F

Race (*please check one*):

American Indian/Alaska Native_____; Asian_____;

Native Hawaiian or Other Pacific Islander_____; Black or African American_____;

White_____; Hispanic or Latino_____; other_____(specify_____)

Income: You current annual household income:

_____0 - $10,000 _____$10,001-20,000

_____$20,001-30,000 _____$30,001-40,000

_____$40,001-50,000 _____over $50,001

In your best estimation, how would you describe the economic status of your family when you were growing up:

_____Lower class _____Lower-Middle class _____Middle class

_____Middle-Upper class _____Upper class

Fluency in English language:

____poor ____fair ____good ____excellent

Language: Is English your first language?_____

If not, how old were you when you learned English?_____

What language was spoken in the home when you were growing up?_____

What % of time did you speak English?_____

What language do you speak currently in your home?_____

What % of time do you speak English currently in your home? _____

Length of Education: _____yrs

Level of School Completed: (*Please check length of education completed)*

_____Less than seventh grade _____Junior high school (9th grade)

_____Partial high school (10th or 11th grade) _____High school graduate

_____Partial college (at least one year) or specialized training

_____Standard college or university graduation

_____Graduate professional training (graduate degree)

Education: Where were you educated?_____ If not in the US, what's the length of time you were educated outside of the US? _____

How much education did you receive in the US? _____

Which grades did you study in the US?_ _____

What's the highest grade you completed (in any country)? _____

Health History:

1. Do you have any chronic medical problems (e.g. heart condition, high blood pressure, lung disease)? Yes ____No____

If yes, what is (are) the condition(s)?_____

When were you diagnosed?_____ When did you start treatment? _____

What treatment are you receiving? _____

Details of chronic medical condition:_____

2. Do you have any neurologic conditions (e.g. seizures, stroke, etc.)? Yes____No____

If yes, what is (are) the condition(s)?_____

When were you diagnosed?_____ When did you start treatment? _____

What treatment are you receiving? _____

Details of chronic medical condition:_____

3. Do you have a family history of dementia? Yes ____No____

If yes, how many family members? _____

Who are they and what were they diagnosed with (e.g. mother, father, siblings, cousins, aunts, etc.)? _____

How old were they when they were diagnosed?_____

Other information about family history of illness: _____

4. Have you ever had a head injury? Yes____No____

If yes, how many? _____ How old were you? _____

Did you lose consciousness? _____

If yes, how long did you lose consciousness for? _____

Details of head injury: _____

5. Have you had any psychiatric treatment? Yes____No____

If yes, when were you diagnosed? _____

What was your diagnosis? _____

What was the treatment?_____

Details of psychiatric illness: _____

6. Have you ever had a substance (alcohol, narcotic, etc.) abuse problem?

Yes____No____

If yes, what substance(s)? _____ How long did you abuse for? _____

During your heaviest time, how much did you use? _____

When did you stop? _____

Did you receive treatment? _____

Details of substance abuse: _____

7. Are you currently on any medications? Yes____No____

If yes, what are you taking and what is the dosage? _____

For what condition(s) are you taking the medication(s)? _____

How long have been taking each medication? _____

APPENDIX B

ACCULTURAITON RATING SCALE FOR ARMENIANS

Circle the number next to the answer that best fits the question:

1. What language do you speak?
    1. Armenian only
    2. Mostly Armenian, some English
    3. Armenian and English about equally (bilingual)
    4. Mostly English, some Armenian
    5. English only

2. What language do you prefer?
    1. Armenian only
    2. Mostly Armenian, some English
    3. Armenian and English about equally (bilingual)
    4. Mostly English, some Armenian
    5. English only

3. How do you identify yourself?
    1. Armenian
    2. Armenian American
    3. Anglo American or other

4. Which ethnic identification does (did) your mother use?
    1. Armenian
    2. Armenian American
    3. Anglo American or other

5. Which ethnic identification does (did) your father use?
    1. Armenian
    2. Armenian American
    3. Anglo American or other

6. What was the ethnic origin of the friends and peers you had, as a child up to age 6?
    1. Almost exclusively Armenians
    2. Mostly Armenians and Armenian Americans
    3. Equally Armenians, Armenian Americans, and Anglo or other ethnic groups
    4. Mostly Anglos, Blacks, or other ethnic groups
    5. Almost exclusively Anglos, Blacks, or other ethnic groups

7. What was the ethnic origin of the friends and peers you had, as a child from 6-18?
    1. Almost exclusively Armenians
    2. Mostly Armenians and Armenian Americans
    3. Equally Armenians, Armenian Americans, and Anglo or other ethnic groups
    4. Mostly Anglos, Blacks, or other ethnic groups
    5. Almost exclusively Anglos, Blacks, or other ethnic groups

8. Whom do you associate with in the outside community?
    1. Almost exclusively Armenians
    2. Mostly Armenians and Armenian Americans
    3. Equally Armenians, Armenian Americans, and Anglo or other ethnic groups
    4. Mostly Anglos, Blacks, or other ethnic groups
    5. Almost exclusively Anglos, Blacks, or other ethnic groups

9. What is your music preference?
    1. Only Armenian
    2. Mostly Armenian
    3. Equally Armenian and American
    4. Mostly American
    5. American only

10. What is your TV viewing preference?
    1. Only Armenian
    2. Mostly Armenian
    3. Equally Armenian and American
    4. Mostly American
    5. American only

11. What is your movie preference?
    1. Only Armenian
    2. Mostly Armenian
    3. Equally Armenian and American
    4. Mostly American
    5. American only

12. Please choose the generation that best applies to you.
    1. 1st generation = born in Armenia or other
    2. 2nd generation = born in the U.S., either parent born in Armenia or other
    3. 3rd generation = self and parents born in the U.S., all grandparents born in Armenia or other
    4. 4th generation = self and parents born in the U.S. and at least one grandparent born in Armenia or other with remainder born in the U.S.
    5. 5th generation = self and parents born in the U.S. and all grandparents born in the U.S.

13. Where were you raised?
    1. In Armenia only
    2. Mostly in Armenia, some in U.S.
    3. Equally in U.S. and Armenia
    4. Mostly in U.S., some in Armenia
    5. In U.S. only

14. What contact have you had with Armenia?
    1. Raised for one year or more in Armenia
    2. Lived for less than 1 year in Armenia
    3. Occasional visits to Armenia
    4. Occasional communications (letters, phone calls, etc.) with people in Armenia
    5. No exposure or communications with people in Armenia

15. What is your food preference?
    1. Exclusively Armenian food
    2. Mostly Armenian food, some American
    3. About equally Armenian and American
    4. Mostly American food
    5. Exclusively American food

16. In what language do you think?
    1. Only in Armenian
    2. Mostly in Armenian
    3. Equally in English and Armenian
    4. Mostly in English
    5. Only in English

17. Can you read Armenian? _____
    Can you read English? _____
    Which do you read better?
    1. Armenian only
    2. Armenian better than English
    3. Both Armenian and English equally well
    4. English better than Armenian
    5. English only

18. Can you write in English? _____
    Can you write in Armenian? _____
    Which do you write better?
    1. Armenian only
    2. Armenian better than English
    3. Both Armenian and English equally well
    4. English better than Armenian
    5. English only

19. If you consider yourself an Armenian, Armenian American or however you identify this group, how much pride do you have in this group?
    1. Extremely proud
    2. Moderately proud
    3. Little pride
    4. No pride, but do not feel negative toward group
    5. No pride and feel negative toward group

20. How would you rate yourself?
    1. Very Armenian
    2. Mostly Armenian
    3. Bicultural
    4. Mostly Anglicized
    5. Very Anglicized

APPENDIX C

MARIN ACCULTURATION SCALE

Please circle the appropriate number for each question:

1. In general, what language do you speak and read?

1	2	3	4	5
Only Armenian	Armenian better than English	Both equally well	English better than Armenian	Only English

2. What language did you speak as a child?

1	2	3	4	5
Only Armenian	Armenian better than English	Both equally well	English better than Armenian	Only English

3. In general, what language do you speak at home?

1	2	3	4	5
Only Armenian	Armenian better than English	Both equally well	English better than Armenian	Only English

4. In general, what language do you think in?

1	2	3	4	5
Only Armenian	Armenian better than English	Both equally well	English better than Armenian	Only English

5. In general, what language do you use when talking to a friend?

1	2	3	4	5
Only Armenian	Armenian better than English	Both equally well	English better than Armenian	Only English

6. In general, what language are the programs you watch on television?

1	2	3	4	5
Only Armenian	Armenian better than English	Both equally well	English better than Armenian	Only English

7. In general, what language are the programs you listen to on the radio?

1	2	3	4	5
Only Armenian	Armenian better than English	Both equally well	English better than Armenian	Only English

8. In general, what language do you prefer to see and listen to movies in, and television and radio programs?

1	2	3	4	5
Only Armenian	Armenian better than English	Both equally well	English better than Armenian	Only English

9. Your closest friends are:

1	2	3	4	5
Only Armenian	More Armenian than American	About half and half	More American than Armenian	Only American

10. You prefer to go to social gatherings/parties in which there are:

1	2	3	4	5
Only Armenian	More Armenian than American	About half and half	More American than Armenian	Only American

11. The people you visit or who visits you are:

1	2	3	4	5
Only Armenian	More Armenian than American	About half and half	More American than Armenian	Only American

12. If you could choose your sons'/daughters' or younger siblings' friends, they would be:

1	2	3	4	5
Only Armenian	More Armenian than American	About half and half	More American than Armenian	Only American

13. How would you describe yourself?

1	2	3	4	5
Only Armenian	More Armenian than American	About half and half	More American than Armenian	Only American

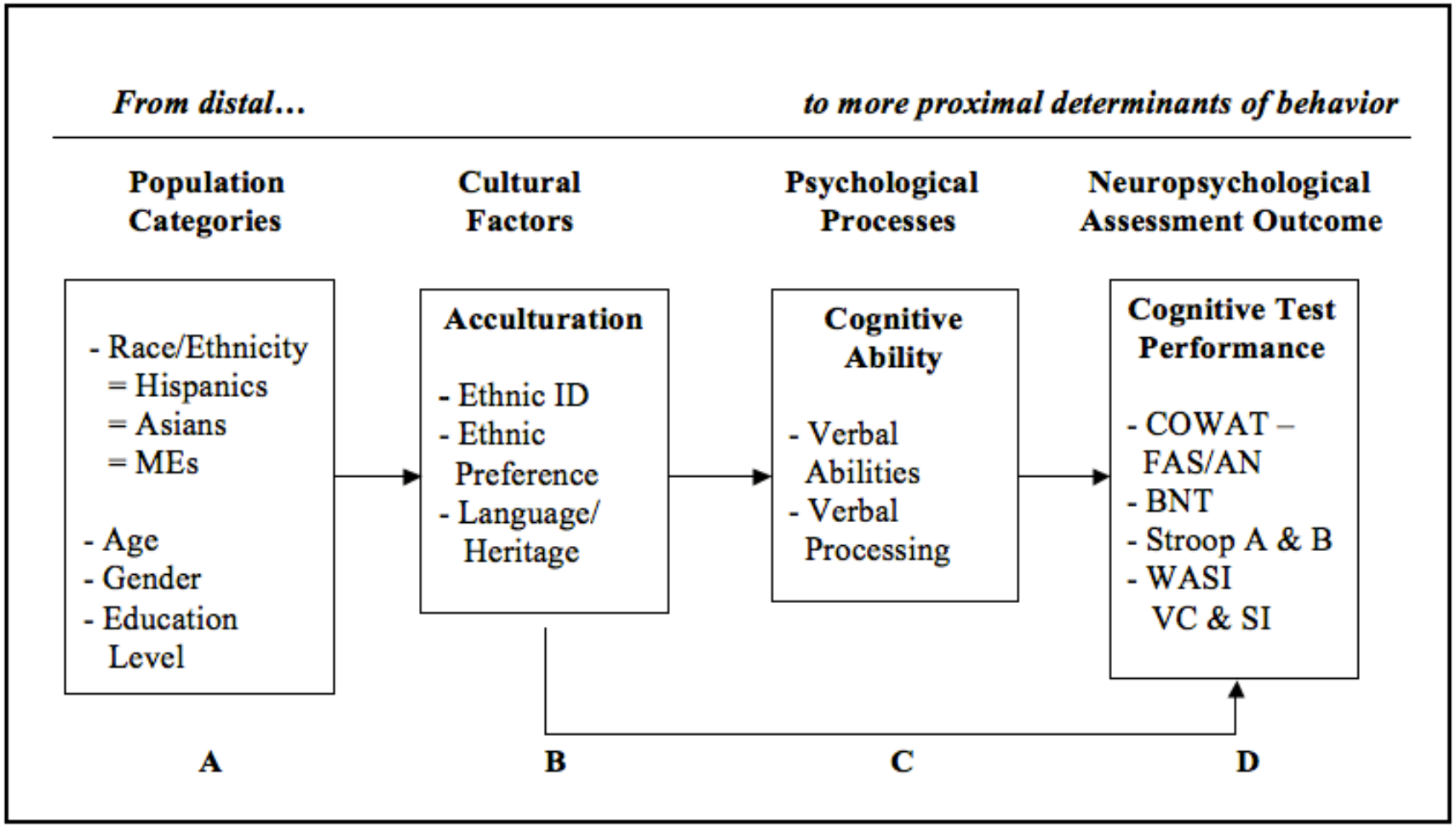

Figure 1. Betancourt's Integrative Model of Culture, Psychology, and Behavior Adapted for the Study of Cultural Influence on Neuropsychological Assessment Outcome