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The Picture Memory Interference Test with Iranian Americans: Does first language impact performance?

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THE PICTURE MEMORY INTERFERENCE TEST WITH IRANIAN AMERICANS: DOES FIRST LANGUAGE IMPACT PERFORMANCE?

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ABSTRACT

The purpose of this study was to examine the impact of first language on one's performance on the Picture Memory Interference Test (PMIT). This casual-comparative study examined if Iranian American students whose 1st language is Farsi performed differently from 1st language English-speaking Iranian American and monolingual English-speaking Caucasian students, after controlling for age and gender. To conduct this investigation, 103 Iranian American students who endorsed Farsi as their 1st language and English as their 2nd language were compared to a matched group of 103 monolingual English-speaking Caucasian students. Forty-four Iranian American students who endorsed 1st and 2nd language as English were also compared to a matched group of 44 monolingual English-speaking Caucasian students. The results of the 2 ANOVA conducted indicated that 1st language does significantly influence participants' scores on True Positive responses on the PMIT. Participants who self-identified Farsi as their 1st language recalled fewer pictures correctly on the PMIT when compared to their monolingual English-speaking counterparts. This study revealed the relevance of considering 1st language and cultural differences among ethnic minorities when administering nonverbal assessment measures of visual memory.

Introduction

Clinical neuropsychology is devoted to the understanding of brain-behavior relationships, and its role in identifying, and treating brain injury or dysfunction. Neuropsychological tests are used to determine how various parts of the brain are functioning. The measurement of higher order dimensions of cognition, including attention and concentration, learning and memory, language and communication, and spatial cognition are essential in a comprehensive evaluation (Wasserman & Lawhorn, 2003). However, a lack of empirically based guidelines for the application of neuropsychological tests among ethnic minorities poses a significant challenge for neuropsychologists today (Manly & Echemendia, 2007).

Rationale for Culturally Responsive Services

United States (U.S.) demographic and sociopolitical changes have resulted in an expanding need for culturally responsive neuropsychological services. Specifically, a remarkable increase in individuals speaking languages other than English that have immigrated to the U.S. has been noted (Artiola i Fortuny & Mullaney, 1998). According to the U.S. Census Bureau (2007), the U.S. ethnic minority population has reached 100.7 million, approximately 34% of the nation's population. It is estimated that by 2050, 50% of U.S. residents will belong to an ethnic minority group (Mindt, Byrd, Saez, & Manly, 2010). The rapid growth in population of individuals other than European American descent calls for culturally responsive neuropsychological services among growing ethnocultural communities.

Cross-cultural neuropsychology identifies the role of culture and minority status in understanding brain function (Puente & Perez-Garcia, 2000). Historically, a

universalist perspective within neuropsychology of cognitive processes argued a “direct, unencumbered link between the neurobiological brain, cognitive processes, and behavior” (Perez-Arce, 1999, p. 582). This view discusses cognitive processes as being stable across cultural groups, where differences between performances across ethnic groups on a given measure can be attributed to genetic factors rather than culture or environment (Mindt et al., 2010). In contrast, radical environmentalism argues that cognition is the result of an interaction between biological, socioeconomic, and cultural determinants (Nell, 2000). However, the interplay between cultural or social factors on cognitive processes has not been studied in full (Perez-Arce, 1999). Nevertheless, competent neuropsychological evaluations require a well-equipped clinician to attend to the unique challenges of examining an individual of an ethnic minority status.

Despite the increase in numbers of minorities requiring mental health and neuropsychological services, there has been a slow response in providing culturally responsive clinical services to ethnic minority clients. The American Psychological Association (APA, 2002) has delineated professional mandates for clinicians to provide culturally responsive neuropsychological services in response to the rapid changes in U.S. demographics. The Ethical Principles of Psychologists and Code of Conduct (APA, 2002) provides guidelines for culturally responsive neuropsychological services. Ethical Standard 9.06 (Interpreting Assessment Results) explains how the interpretation of assessment results must take various factors of the examinee into consideration, including “situational, personal, linguistic, and cultural differences, which might affect psychologists’ judgments or reduce the accuracy of their interpretations” (APA, 2002, p. 14). Given the various factors that may play a role in neuropsychological assessment, the

culturally responsive neuropsychologist must be alert when examining low test scores as results are potentially impacted by socioeconomic status, sociocultural, culturally derived behavioral, or organic brain dysfunction variables (Perez-Arce, 1999).

Additionally, Ethical Standard 9.02b states, “Psychologists use assessment instruments whose validity and reliability have been established for use with members of the population tested” (APA, 2002, p. 13). For example, detection of brain dysfunction is largely contingent upon psychometric properties of a test, such as its validity, reliability, sensitivity, and specificity (Brickman, Cabo, & Manly, 2006). It has been shown that ethnic minorities perform more poorly on neuropsychological tests. Specifically, larger than expected false positive results on neuropsychological tests may result from the use of psychometric instruments that have been standardized on culturally dissimilar samples (Puente & Perez-Garcia, 2000). According to Manly and Echemendia (2007), performance on a neuropsychological measure falling below a race-independent mean has not been shown to be generalized across race, ethnicity, or geographic region. As a result, the use of culturally appropriate measures is essential for the assessment of ethnic minorities, as the construct being measured by a neuropsychological test in one culture may not accurately or equally measure the same construct within another culture (Mindt et al., 2010). For example, performance on a timed measure (i.e., a task where completion time is incorporated in the score) may be resultant of the participant’s cultural appraisal towards speediness. Due to the growing need for culturally responsive services, it is imperative for psychologists to also consider the validity of the instrument used in a neuropsychological evaluation with a patient of the nondominant culture (APA, 2003).

While there is limited research on neuropsychological assessment with individuals of ethnic minority status, the author aims to explore the issue as it relates to Farsi-speaking individuals. Due to the paucity of literature on neuropsychological assessment with Iranian Americans and Farsi-speaking individuals, an initial understanding of neuropsychology with Iranian Americans is warranted. The target population discussed in this study will be interchangeably referred to as Iranian American and Farsi-speaking. The terms refer to: (a) participants who identified their country of origin as Iran and currently reside in the U.S., (b) second-generation Iranian immigrant participants who identified their country of origin as U.S., and (c) participants who self-identified or identified parents speaking Farsi.

Characteristics of the Population

Historical background. The Islamic Republic of Iran is the nineteenth most populous nation in the world, with nearly 50 million people in the late 1980s and nearly half of the population considered ethnically non-Arab and direct descendents of Aryan invaders of the 2nd century B.C. E. (Gillis, 2000). The Persian Empire was established in 550 A.D. under the rule of the Achamenid Dynasty. By the 7th century, Arab invaders spread the teachings of Muhammad throughout the region. Although once initially welcoming of the Arabs and their new religion, Persians' contempt for the oppression of their culture led to centuries of struggle for preservation of their pre-Islamic, indistinctly Arab traditions (Johnson, 2001).

The modern era began with Reza Shah (1878-1944) seizing power through establishing the Pahlavi monarchy in the 1920s. Ruled as a constitutional monarchy, the second ruler of the Pahlavi family Shah Mohammad Reza Pahlavi changed the country's

name from Persia to Iran in 1935, to reflect the birthplace of the Aryan race (Gillis, 2000). Pahlavi attempted to educate, Westernize, and modernize Iran, where political, socioeconomic, and cultural changes, along with democratization and secularization of education and introduction of mass media of communication were transformed under his rule (Nassehi-Behnam, 1985; Mobed, 1996).

However, political oppression, income inequality, religious subjugation, and an inopportune relationship with the West, led widespread religious and political protest to the Shah and inevitably to his exile in 1979 (Mostofi, 2003). Following the revolution and overthrowing of the Pahlavi monarchy in 1979, four decades of the Shah's once Western-backed government was dismantled, and Iran officially became an Islamic republic governed by the laws of the Koran and the traditions of the Shi'i religion as construed by Ayatollah Ruhollah Khomeini (Gillis, 2000). Authoritarianism and restoration of traditional Islamic laws, as well as rejection of all Western and American doctrine were advocated by the new regime (Johnson, 2001). Upon the Shah's exile, 1 million Iranians against the ban on Western influences were among the pro-West elite seeking religious freedom, political asylum, or educational opportunities by immigrating to the United States (Mostofi, 2003).

Current demographics. Iranian immigration to the U.S. can be divided into two chronological phases: (a) following World War II until the Iranian revolution (1950-1977), and (b) during and after the Iranian revolution (1978-1980) (Sabagh & Bozorgmehr, 1987). Between 1950-1977, the first wave of immigration was noted as relatively insignificant in terms of numbers of immigrants, with approximately 17,000 Iranians arrived in the U.S. The vast majority of Iran's immigrants left their homeland

just prior to or as a result of the 1979 revolution. The average number of Iranians entering the U.S. annually increased to more than 112,000 between 1978-1980, where the majority of immigrants who left Iran during that time were considered to be exiles and refugees (Sabagh & Bozorgmehr, 1987). While data for Iranian Americans have not been tabulated yet, it is anticipated that the results of the 2010 U.S. Census will highlight significant increases in the population size of Iranians currently living in the U.S. today.

Constituting a range of political backgrounds, Iranian immigrants included working-class traditional families, Westernized bourgeoisie, persecuted elite classes of intellectuals and professionals, as well as oppressed minorities and educated workers (Mostofi, 2003). Immigrants residing in the West today are for the most part, products of the Pahlavi era, and are a highly educated, professional, and entrepreneurial group that reflects the social, cultural, and economic changes that have taken place in Iran during the 20th century (Amanat, 1993; Gillis, 2000). Despite non-Muslims forming a small minority of the Iranian population, the largest concentration of non-Muslim religious minorities of Iranians reside in Los Angeles (Gillis, 2000; Mobed, 1996).

Language. Iran is one of the few countries whose native tongue is Farsi, despite Arabic being the dominant language of most Middle Eastern countries. One of the oldest languages, Farsi dates back to the 6th century B.C. (Johnson, 2001). Known as Persian to the West, it combines ancient Farsi language with many Arabic words and is written in Arabic script (Gillis, 2000). In addition to being a highly educated immigrant group, the use of foreign languages such as French and English are of common practice in Iran, and allows for the majority of Iranian Americans to have a strong command and high level of proficiency in English (Gillis, 2000).

Memory

One major component of neuropsychological assessment entails the evaluation of memory. Memory assessment, in relation to Iranian American and Farsi-speaking individuals, will be the primary focus this study. The definition of memory can be understood as the processes involved in the brain's ability to acquire new information, including encoding, storing, and retrieving (Strauss, Sherman, & Spreen, 2006a). Although memory has been a substantial area of interest within research in neuropsychological literature, memory has not been easily understood. This is in part due to complex neural activities that have contributed to the intricacies in understanding the brain in relation to memory. Historically, different models regarding memory functioning have emerged from cognitive psychologists and neuropsychologists.

The earliest conceptualizations of memory began in the 1960s, following innovative development in computer technology (Sander, Nakase-Richardson, Constantinidou, Wertheimer, & Paul, 2007). Atkinson and Shiffrin (1968) proposed memory functioning as a single system consisting of several stages or processes, acknowledging memory as functioning in a straightforward and sequential manner, similar to the information-processing operation of a computer (Atkinson & Shiffrin, 1968). This stage model of memory discusses encoding, storage, and retrieval processes as the manner in which new information is processed. Encoding refers to the initial processing that occurs following the acquisition of new information that is to be learned (Sander et al., 2007). Storage is when information is held in one's memory for future reference, and retrieval is when information is recovered from storage, most often from long-term memory (Sander et al., 2007). The stage model acknowledges an interchange

between encoding, storing, and retrieval processes, as the quality of the encoding process impacts storage of information and shapes retrieval processes (Sander et al., 2007).

It was later found that the stage model was overly simplistic and could not sufficiently explain the true complexity of memory. For example, the stage model could not explain how impairment in one area of the memory process can occur while other components remain intact (i.e., unimpaired short-term storage does not appear to be essential for learning to occur; Sander et al., 2007). As a result, new memory theories have emerged over the last two decades that have helped guide the understanding of memory as a function of interconnected systems and subsystems. Baddeley and Hitch (1974) proposed a working memory model, where two subsystems temporarily store information and perform operations, and leads to the maintenance and transference of information into long-term memory. These subsystems include the visuospatial sketchpad and phonological loop, which contribute to the processing of visual and auditory information, respectively. The visuospatial sketchpad is responsible for holding visual-based information, and the phonological loop performs a similar function for speech-based information (Baddeley, 2000).

The central executive is responsible for directing attention to different memory processes by inhibiting competing information (Sander et al., 2007; Strauss et al., 2006a). The central executive can be compared to an attentional control system, where aided by the phonological loop and visuospatial sketchpad, works to combine information from sensory input (Baddeley, 2000). As an attentional controller, the central executive is largely implicated in the brain's ability to mediate interfering information, thus significantly impacting one's ability to encode and subsequently recall information. The

brain's ability to draw information from the visuospatial sketchpad, the phonological loop, and long-term memory is greatly dependent on the central executive, as it allows for the integration of information from a range of independent sensory channels to occur (Baddeley, 2000). While it is less well understood, frontal lobe areas appear to be strongly associated with the central executive (Baddeley, 2000).

In addition, Baddeley (2000) described another component of working memory called the episodic buffer. As the central executive lacks large storage capacity, the episodic buffer works to provide an additional storage system used for combining verbal and visual information to form integrated episodes, as well as for storing information that exceeds the capabilities of the phonological loop and visuospatial sketchpad (Strauss et al., 2006a). Long-term information is thought to be mediated by the episodic buffer, which allows the information to be combined with the other subsystems for problem solving, forming new memories, and directing behavior (Baddeley, 2000).

In regards to long-term memory, Tulving (1985) discussed declarative or explicit memory as an intentional recall of previous experience, and consisting of two subsystems: semantic and episodic memory. Semantic memory refers to one's fundamental factual knowledge of the world that has been crystallized over time (Sanders et al., 2006; Strauss et al., 2006a). Episodic memory consists of knowledge of personal experience that requires conscious recollection of the specific event (Strauss et al., 2006a). As in working memory, semantic and episodic appear to be interrelated in function, and interact with other factors such as attention and motivation that work to impact memory (Sander et al., 2007). Further, the term declarative was coined to reflect that a memory can be conjured to mind, and its content can be declared (Squire, 1992).

Interestingly, studies of amnesic patients who fail conventional tests of memory and learning (including recall and recognition tasks that rely heavily on declarative memory processes) are able to succeed at other memory measures and evidence preserved learning (i.e., priming, skill learning; Haist, Shimamura, & Squire, 1992; Squire, 1992). This discovery led to the more recent development of nondeclarative, or implicit memory. Squire (1992) proposed this additional model of long-term memory that contributed to the developments in the understanding of long-term memory functioning. Nondeclarative or implicit memory is distinguished from declarative memory as the latter recognizes conscious learning and recall of information, whereas nondeclarative memory does not. Nondeclarative memory is referred to as "a collection of nonconscious memory abilities" (Squire, 1992, p. 233), where the acquisition of information in the absence of explicit recall of the learning episode is found to occur. Implicit memory is demonstrated by phenomena such as priming, skill learning, procedural memory, and habit formation. Being able to retain learned connections between a stimuli and the response in skill-based learning (procedural memory), as well as the effects of priming (benefiting from previous exposure) were evidenced in amnesic patients, and further elucidate the nature of nondeclarative memory (Sander et al., 2006; Strauss et al., 2006a; Squire, 1992; Tulving, 1985). Declarative memory relies on a specific brain system, whereas nondeclarative memory utilizes multiple aspects of the brain's memory functioning (Squire, 1992).

Visual memory. The neural system responsible for vision starts with the retinas, which contain typical brain cells as well as specialized light-sensitive detectors (Gregory, 1997). The visual region of the brain is known as the area striata, where if a small part is stimulated, a flash of light is observed (Gregory, 1997). Changes in the position of the

stimulating electrodes will result in flashes seen in other parts of the visual field, indicating a spatial representation of the retinas upon the visual cortex (Gregory, 1997). The superior colliculus is a second projection area that is responsible for providing command signals to move the eyes, and is understood to have developed through the evolution (Gregory, 1997).

A broad view of visual memory states that a memory is a visual memory if the information was initially acquired by the visual system. A more specific understanding of a visual memory identifies that the perceptual state originally used in generating the memory is retained after encoding the information (Hollingworth & Luck, 2008). Visual memory can further be understood between short and long-term memory. Visual short-term memory's functional feature is how visual representations can be maintained for several seconds, and are implemented by neural firing in the lateral occipital complex and prefrontal cortex (Hollingworth & Luck, 2008). Furthermore, the capacity of visual short-term memory is limited to maintaining three or four simple stimuli, and one to two more complex stimuli (Hollingworth & Luck, 2008). Visual long-term memory has a larger storage capacity, and retains information regarding specific objects and scenes (Hollingworth & Luck, 2008). Given its large storage capacity, visual long-term memory can incorporate thousands of visual stimuli of objects and scenes (Hollingworth & Luck, 2008). Representations are maintained by pattern and strength changes between neuronal connections, and changes in the structure of synaptic connections are thought to be instrumental in maintaining visual long-term information (Hollingworth & Luck, 2008).

Baddeley and Hitch's (1974) influential working memory model identified that information may reach long-term memory without needing to go through short-term

memory. In regards to visual memory, one hypothesis posits that a visual long-term memory representation indeed does not require passage through visual short-term memory, as the information can be directly generated by the perceptual processes (Hollingworth & Luck, 2008).

Importance of memory assessment. Memory has been one of the most common cognitive functions being measured by neuropsychologists (Sander et al., 2007). Assessment of memory has been known to aid in the diagnosis or identification of cognitive disorders. Along with the assessment of other cognitive functioning, assessment of memory can provide the examiner valuable information regarding the examinee's level of intellectual functioning, premorbid functioning, the nature of the cognitive deficit, and whether it is found extensively or in an acute area of the brain (Wilson, 2002).

Memory impairment in learning and recall is frequently detected as a major cognitive sequelae among many neurological disorders, including traumatic brain injury, stroke, multiple sclerosis, and cerebral tumors (Sander et al., 2007). Memory deficits are considered to be one of the most frequently occurring and disabling problems following brain injury. In addition, medical conditions such as HIV infection, Alzheimer's disease, mental illness, malnutrition, as well as cognitive decline in aging are also related to disturbances in memory functioning (Hannay, Howieson, Loring, Fischer, & Lezak, 2004; Luo & Craik, 2008; Maj et al., 1991). Failures in memory storage of visual information can result from multiple factors, including failure to encode, interference from new memories (and decay of memory), and failures in retrieval (Palmeri & Tarr, 2008). Specifically, failure to retrieve visual details can be due to insufficient cues to aid

in retrieval, and is possibly one of the most common reasons for memory failure (Palmeri & Tarr, 2008).

Given the devastating consequences that may result from memory dysfunction, a comprehensive neuropsychological assessment of an individual's memory is essential for thorough diagnosis and treatment. In addition, memory assessment can aid in the development and implementation of the treatment goals in cognitive rehabilitation, as well as provide a means for communicating to the patient and his or her family challenges resulting from impairment (Sander et al., 2007). Thus, the assessment of memory is fundamental for a comprehensive neuropsychological examination, and visual memory can elucidate a component of an individual's memory functioning.

Nonverbal assessment. Two common domains exist in the neuropsychological evaluation of memory assessment, which include visual and verbal memory, also referred to as nonverbal and verbal abilities. Memory tests have been developed to assess both of these areas. Some tests are designed to assess both verbal and nonverbal memory. Perhaps two of the most commonly used memory tests that solely assess nonverbal abilities are the Rey-Osterrieth Complex Figure and the Brief Visuospatial Memory Test. As nonverbal assessment measures of recognition and recall, these tests aim to present the examinee with a design that must be remembered following exposure.

For individuals with speech and language impairment, or from a different cultural background, a nonverbal measure could be more appropriate (McCallum, 2003). Nonverbal tests are best described as language-reduced instruments, despite some reliance on verbal directions (McCallum, 2003). Nonverbal tests often include minimal expressive or receptive language from the examinee, and usually not more than several

sentences are needed to ensure comprehension of spoken instructions (McCallum, 2003). Historically, certain measures have been adapted for nonverbal assessment in order to assess specific cognitive abilities, such as presenting a maze task to assess prefrontal lobe planning (McCallum, 2003). Because neuropsychologists hypothesize that certain cognitive functions are controlled by different elements of the central nervous system, nonverbal assessment has been helpful in understanding learning difficulty related to such abilities (McCallum, 2003). Currently, nonverbal neuropsychological assessments of cognitive abilities is still in the early stages of development, and there is no single model that fully explains the dynamics of memory, nor is there a single source that describes the best nonverbal neuropsychological assessment (McCallum, 2003).

Validity

As the importance for memory assessment is well understood, utilizing a valid neuropsychological instrument is imperative for obtaining an accurate evaluation (APA, 2003). The lack of empirically based guidelines for use of neuropsychological tests among ethnic minorities is a current and significant challenge for neuropsychologists in the U.S. (Manly & Echemendia, 2007). The effectiveness of neuropsychological assessment for the identification and classification of brain dysfunction is contingent on the psychometric properties of the particular tests of the battery, such as their validity, reliability, sensitivity, and specificity (Brickman et al., 2006). A neuropsychological memory test must be selected based on its utility in a clinical setting, the proficiency of normative data, and sensitivity to memory impairment effects observed in the patient (Harker & Connolly, 2007). Individual test scores obtained through examination are compared to a normative population as it provides the clinician with a reference to

compare the patient's performance in determining their cognitive ability, which is a fundamental tenet in determining a patient's cognitive status (Brickman et al., 2006).

Examining the validity of a neuropsychological instrument is important for adhering to culturally responsive guidelines set forth by the APA. Validation strategies are used to aid in the understanding and implications of test scores. An instrument's construct validity determines how well an observable behavior can be assessed by the test that is representing the theoretical construct in question (i.e., memory functioning; Mitrushina, Boone, Razani, & D'Elia, 2005). Construct validity describes the degree to which a given theoretical construct is accurately examined by the proposed test (Mitrushina, Boone, Razani, & D'Elia, 2005). What is now simply referred to in the literature as "validity," can be established in multiple ways (Strauss, Sherman, & Spreen, 2006b). Some methods include, (a) establishing correlations with other similar tests that measure the same construct, (b) low correlation between another test that measures a different construct, and (c) demonstration of high internal consistency, and (d) comparing test performance across different groups (Mitrushina et al., 2005; Strauss et al., 2006b).

Many neuropsychological instruments have been developed to assess visual memory functioning in English-speaking individuals. *Culture-fair* tests are thought to have risen from the universalist perspective of cognition, which have been considered most valid and reliable for culturally responsive assessment (Perez-Arce, 1999). However, researchers now argue that cognitive tests are inevitably culturally driven, where construct validity must be examined if the test is applied outside the culture used for its development (Cole, 1996). Literature on the nonverbal visual memory assessment of non-native English speakers is lacking, especially for Farsi-speaking individuals.

Cross-linguistic construct validity in a sample of English- and Farsi-speaking adults will contribute to the scant literature for the Iranian population.

Statement of Purpose and Significance of Study

This study explored the use of a neuropsychological instrument in an ethnic minority cohort. Specifically, the PMIT for use with Farsi-speaking individuals in memory assessment was examined. Given that Iranian Americans have a strong command and high level of proficiency in English, a comparison between English-speaking groups will provide useful information on the adaptability of the PMIT for this minority group. As an academic search yields zero results on memory assessment with Iranian Americans or Farsi-speaking individuals, this study aimed to explore the PMIT as a *culture-fair* nonverbal assessment measure of visual memory for use with this population. In hopes of contributing to the absence of neuropsychological literature of Farsi-speaking individuals on memory assessment, this study aimed to examine how well the PMIT assesses this population's memory and learning functioning.

An increase in understanding and awareness of the neuropsychological sequelae in Iranian Americans can contribute to a more culturally responsive course of psychological treatment through measures that adequately assess memory impairment within this population. Furthermore, this dissertation may serve as groundwork for future study with this vastly growing minority population in the U.S. The impact of first language on one's performance was examined regarding the PMIT. The study sought to answer the following question: Are there differences in participants' performance on PMIT True Positive scores between monolingual English-speaking Caucasian students,

monolingual English-speaking Iranian American students, and bilingual Farsi- and English-speaking Iranian American students?

Hypothesis: There will be no differences between: (a) monolingual English-speaking Caucasian students and bilingual Farsi- and English-speaking Iranian Americans, and (b) monolingual English-speaking Caucasian students and monolingual English-speaking Iranian American students.

Methods

This chapter describes the characteristics of the participants, the instrument used (the PMIT), and data analysis procedures.

Participants

Undergraduate students enrolled in the Life Sciences Core Laboratories (LS2) at UCLA were participants for the project entitled: "Undergraduate Research Initiative (URI) for Life Sciences 2 Students about Cognitive Processing," conducted by Dr. Gaston Pfluegl, Ph.D. Approximately 1,800 students enroll in LS2 each year, which includes an undergraduate physiology class with a laboratory component. These students are asked to participate anonymously and to voluntarily partake in the study. The aims of the URI are to provide undergraduate students with a database through which they can understand research design.

For the purpose of this study, a subset of data from three groups of participants was analyzed. Participants were selected based on self-report of first and second language. The four groups included: (a) 103 Iranian American students who endorsed first language Farsi and second language English ("1FI"); (b) matched group of 103 monolingual English-speaking Caucasian students ("MFI"); (c) 44 Iranian American students who endorsed first and second language English and mother and father language as Farsi ("1EI"); and (d) matched group of 44 monolingual English-speaking Caucasian students ("MEI"). To equalize the size between the Caucasian group and the two Iranian groups, age and gender were used as matching variables, generating four groups for the final sample for this study. Students' age and gender information is described in Table 1.

Table 1.

Means and Standard Deviations of Students' Age and Gender

	Age		Gender	
Group	*M*	*SD*	*Male*	*Female*
1FI	19.82	1.57	57	46
MFI	19.82	1.57	57	46
1EI	19.36	1.33	24	20
MEI	19.36	1.33	24	20

Note. 1FI = Iranian American students who endorsed first language Farsi and second language English. MFI = matched group of monolingual English-speaking Caucasian students. 1EI = Iranian American students who endorsed first and second language English, as well as mother and father language Farsi. MEI = matched group of Caucasian monolingual English-speaking Caucasian students.

Instrument

The Picture Memory Interference Test-Computerized version (PMIT), developed by the World Health Organization (WHO) and the University of California, Los Angeles (UCLA), is a short and easily administered memory test that measures visual long-term memory (Maj et al., 1991). The PMIT can be considered a direct memory test, where the examinee is required to select between two previously visually presented stimuli (i.e., pictures). Recognition memory tasks are the presentation of previously presented items (i.e., pictures) that are combined with distracter items not initially presented to the patient (Sander et al., 2007). The number of correctly identified target items represents the patient's ability to recognize items that were previously presented. Of note, long-term episodic store is required for recognition performance, as well as the episodic buffer and central executive (Sander et al., 2007).

The original version of the PMIT was administered manually using 3 inch by 5-inch cards presented with verbal instructions. A large series of standardized line drawings adapted from Snodgrass and Vanderwart (1980) were utilized in the development of this test to assess visual memory (Appendix B). Currently, administration of the test has been modified into a computerized version, where the original line drawings are presented with millisecond timing through the Flash Payer 5.0 Macromedia program for a PC Windows interface.

Development of the PMIT. The PMIT was originally developed for visual learning and memory for a cross-cultural WHO study. In an attempt to understand the neurological, psychiatric, and neuropsychological repercussions of human immunodeficiency virus 1 (HIV-1), the WHO conducted a multi-center study using a battery of neuropsychological tests deemed suitable for cross-cultural use (Maj et al., 1991). The tests included in the neuropsychological battery were selected by an international committee of experts on the basis of: (a) ability to tap the functional domains affected by HIV-1 infection, (b) sensitivity to mild degrees of cognitive or motor dysfunction, (c) suitability for large-scale administration, and (d) suitability for cross-cultural use (Maj et al., 1994). Researchers strived to develop an assessment measure sensitive to detecting neuropsychological abnormalities in individuals suffering from HIV-1, regardless of cultural, socioeconomic, educational, or linguistic differences (Maj et al., 1991). It was determined that no available test fulfilled all of the aforementioned criteria, therefore it was decided that new tests would be developed and validated, including the PMIT (Maj et al., 1994).

Among the battery was the PMIT, where its development incorporated a large set of *culture-fair* monochromatic line drawings that were developed and standardized at New York University in the 1980s (Snodgrass & Vanderwart, 1980). The line drawings, representing a variety of objects, were standardized for use in investigating differences and similarities in the processing of pictures and words (Snodgrass & Vanderwart, 1980). Additionally, researchers developed normative data on pictorial representations of concrete nouns used in studies of semantic and episodic memory.

Some of the images include an apple, an airplane, an insect, and other images familiar to most cultures (Appendix B). The 260 pictures that were developed to be easily identifiable were selected based on three criteria: (a) that they be unambiguously picturable, (b) that they include exemplars from widely used category norms, and (c) that they represent concepts at the basic level of categorization (Snodgrass & Vanderwart, 1980). Once the images were selected, researchers utilized guidelines for how each picture should be drawn, such as the drawing needed to be realistic in its details, the most typical representation, and the amount of detail needed to be consistent with the complexity of the real-life object (Snodgrass & Vanderwart, 1980). For example, animals are shown in sideways view, objects whose up-down orientation may vary (e.g., fork) were drawn with the functional end down, and long, thin objects are oriented at a 45-degree angle (Snodgrass & Vanderwart, 1980). In their study, Snodgrass and Vanderwart (1980) had subjects name the 260 picture concepts to determine the picture's most common name, and the degree to which subjects agreed on the name. Subjects then rated the degree of agreement between their mental image of a concept and its name, and rated the visual complexity of each picture (Snodgrass & Vanderwart, 1980).

Recognition or recall of pictorial material has been documented as being better to remember than verbal material (Snodgrass & Vanderwart, 1980). Snodgrass and Vanderwart (1980) present three reasons why picture memory is maintained better than verbal memory. It is hypothesized that the greater likelihood of "dual coding" (registering as both visual and verbal memory in the brain), the greater intricacy of a picture as a sensory code than a word, and the unique meaning of a picture, all contribute to the superiority of pictures over words and the higher likelihood of a picture being better recalled and recognized in episodic memory (Snodgrass & Vanderwart, 1980). In order for the PMIT to be adapted for cross-cultural use, it was imperative that pictures used be familiar and easily identifiable cross-culturally. The images developed by Snodgrass and Vanderwart (1980) were piloted and administered by researchers to several different countries, including Brazil, Germany, Kenya, Thailand, and the U.S. (Maj et al., 1991).

More recently, the PMIT was used to assess nonverbal memory in a study examining the effects of HIV-1 serostatus and cocaine on neuropsychological performance in a sample of gay and bisexual urban-dwelling African-American men (Durvasula et al., 2000). The PMIT was also used to assess nonverbal memory in a study examining alexithymia, emotional stimuli processing, and performance on neuropsychological tests exploring fronto-temporo-limbic circuit activity in patients with panic disorder (Galderisi et al., 2008).

Administration. The computerized PMIT takes approximately 15 minutes to complete, and 5 minutes to complete a computerized demographic questionnaire (Appendix C). Verbal instructions are presented on the screen prior to administration (Appendix D). The PMIT consists of four trials of memory tests (Books 1-4) as well as a

reaction time test. The PMIT assesses participants' ability to sequentially recognize three sets (Books 1, 2, and 3) of pictures while exposed to interference lists. Books 1-3 present a target list of 20 drawings, and are followed with a recognition test of 50 drawings (Pfluegl, 2008). During each recognition test, 20 drawings are from the target list from the most recently presented Book, and 30 items are dispersed randomly as distracter items (Pfluegl, 2008). Books 1, 2, and 3 require the participant to respond to each stimulus by pressing a keyboard button labeled *yes* or *no* (left and right arrow keys) to identify if a drawing was presented in the preceding Book. Book 4 involves a presentation of 60 line drawings, where 10 target items from Books 1, 2, and 3 are presented with 30 distracter items. The recognition trial of Book 4 requires the subject to press the numerical key (1, 2, 3, or 4) corresponding to the Book number the subject believes the item was originally presented in (Pfluegl, 2008).

While the PMIT is a nonverbal assessment measure that requires no expressive and minimal receptive language, participants will likely mentally verbalize the name of each image that is presented throughout the trials. Thus, an underlying verbal component can be assumed to be present during the PMIT. This test is unique as a participant's processing speed may be assisted by mentally verbalizing the pictures, but can also impede their performance if there is no linguistic equivalence between the participants' native language and the presented pictures.

Throughout Books 1-4, subsequent stimuli are presented only after the subject responds to each item. Reaction time is measured, which indicates how fast a participant responded to the correct items. Additionally, a test of reaction time is administered on the fifth and final trial of the PMIT. Independent of any memory effects, the subject is

presented with 50 items of 20 squares and 30 circles, and is asked to identify the shape of each item (Pfluegl, 2008). In addition to recording correct and incorrect responses, the amount of time the subject takes to respond to each item is measured for all trials. To date, UCLA investigators have not yet published literature on the PMIT.

Procedures

A secondary analysis of a subset of preexisting data collected at UCLA for the URI was conducted to examine if Iranian American students whose first language is Farsi and Iranian American students' whose first and second language is English performed differently from monolingual English-speaking Caucasian students. Participants were provided informed consent for research purposes and voluntarily opted to participate in the study at UCLA (Appendix E). Upon a student's completion of the PMIT, responses are automatically sent to an electronically aggregated database. Confidentiality is strictly enforced and specific scores and background data is not available to anyone outside approved panel members. In addition, students' anonymity is further assured with demographic information accessible only if there are more than 50 participants within each group.

Test performance is measured by True Positive scores. The score represents the number of correct responses, which measures how accurately the participant remembered the items. Correct responses range from 0 to 20, with 20 being the highest number of correctly remembered items. Participants' level of effort and motivation while administering the PMIT was taken into consideration in order to ensure accurate scores. The secondary analysis conducted in this study was comprised of data from participants who demonstrated intact motivation during the reaction time trial of Book 5. This was

determined by the examining the mean for True Positive scores on Book 5 across all participants (M = 18.94). Due to the PMIT being a relatively new measure, no formal data analysis has been conducted to date. Therefore, no reliability or validity information for True Positive scores on the PMIT is available at this time. For this study, approval from the principal investigator, Dr. Pfluegl, was obtained (Appendix F).

Results

Two one-way analysis of variance (ANOVA) were conducted to examine if there were differences in students' performance on PMIT True Positive scores between (a) Iranian American students whose first language is Farsi and second language is English (1FI) and monolingual English-speaking Caucasian students (MFI); and (b) Iranian American students whose first and second language are English (1EI) and monolingual English-speaking Caucasian students (MEI). Matching sampling strategy was adapted to control the age and gender, and to arrive at a more equivalent sample size between the Farsi-first language students and monolingual English-speaking students.

The Statistical Package for the Social Science (SPSS) Version 17.0 was used for all data analysis. Descriptive statistics was used to summarize the data set, sample, and the subset of scores analyzed. The variance for the set of sample means was computed to describe any observable differences. Overall scores on a subset of True Positive scores from Books 1, 2, 3, and 4 were analyzed. Results indicated significant differences in True Positive scores between groups 1FI and MFI, (F [1, 204] = 10.49, p = .004; F [1, 204] = 6.92, p = .009; F [1, 204] = 9.82, p = .009; F [1, 204] = 17.34, p = .000) for Books 1, 2, 3, and 4, respectively. More specifically, Monolingual English-speaking Caucasian students scored significantly higher on True Positive responses on the PMIT across Books 1, 2, 3, and 4 than those Iranian American students whose first language is Farsi (Mean difference = 0.80, 0.87, 1.28, and 2.29, respectively). No significant differences were found between groups 1EI and MEI (F [1, 86] = 1.97, p = .164; F [1, 86] = 2.46, p = .119; F [1, 86] = .05, p = .831; F [1, 86] = 2.29, p = .134), for Books 1, 2, 3, and 4, respectively. Average reaction time across all participants was .92 seconds (SD = .14).

Table 2.

Means and Standard Deviations of True Positive Scores for 1FI and MFI

	TP1		TP2		TP3		TP4	
Group	*M*	SD	*M*	SD	*M*	SD	*M*	SD
1FI	18.71*	2.36	17.12*	2.63	16.32*	3.52	15.67*	4.00
MFI	19.51	0.81	17.99	2.05	17.60	2.19	17.96	3.86

Note. TP1 = True Positive scores from Book 1, TP2 = True Positive scores from Book 2, TP3 = True Positive scores from Book 3, TP4 = True Positive scores form Book 4.
*Significant at the $p<0.05$ level.

Table 3.

Means and Standard Deviations of True Positive Scores for 1EI and MEI

	TP1		TP2		TP3		TP4	
Group	*M*	SD	*M*	SD	*M*	SD	*M*	SD
1FI	18.93	1.13	16.57	2.93	16.93	3.19	16.31	4.46
MFI	19.25	0.99	17.50	2.62	17.07	2.77	17.73	4.28

Note. TP1 = True Positive scores from Book 1, TP2 = True Positive scores from Book 2, TP3 = True Positive scores from Book 3, TP4 = True Positive scores form Book 4.

Discussion

The purpose of this casual-comparative study was to examine if the PMIT is a *culture-fair* nonverbal assessment measure of visual memory for Iranian Americans. The results of the two ANOVAs indicate the following:

1. When controlling for age and gender, Iranian American students who self-identified Farsi as their first language recognized fewer correct pictures when compared to monolingual English-speaking Caucasian students.
2. When controlling for age and gender, no difference in recognition was noted between Iranian American students who self-identified English as their first language and monolingual English-speaking Caucasian students.

Interpretation of Findings

In comparing Iranian American students whose first language is Farsi to monolingual English-speaking Caucasian students, Iranian Americans appeared to recognize fewer pictures correctly on the PMIT, as evidenced by lower incidence of True Positive scores across Books 1-4. No significant difference were found in comparing Iranian American students who identified English as their first and second language and monolingual English-speaking Caucasian students, where equal correct recognition was indicated. While the means and standard deviations between the groups were similar, significant differences were found between 1FI and MFI, but not between groups 1EI and MEI. This may be due to the sample size of the groups, where 1FI and MFI each had over 100 students, while the sample sizes of 1EI and MEI were fewer than 50.

The results of this study indicate that the PMIT may not accurately identify nonverbal visual memory skills equally between Iranian American whose first language

is Farsi and Caucasian individuals. Given that Iranian American students whose first language is Farsi did more poorly when compared to monolingual English-speaking Caucasian students, and no significant differences were found between English-speaking Iranian American and monolingual English-speaking Caucasian students, it appears that one's first language may impact recognition performance on this measure. While differences were found between bilingual Farsi- and English-speaking Iranian American participants and monolingual English-speaking Caucasian participants, the results of this study provide normative data for Iranian American populations which can be used as comparative data for future administration of the PMIT.

As a result of the poorer performance on recognition tasks of the PMIT by Farsi-speaking Iranian American participants, the author proposes that the PMIT is inevitably culturally driven. Although the PMIT was constructed as a *culture-fair* assessment measure, the results of this study do not indicate equal performance across Iranian American and Caucasian students. More specifically, results of this study support the perspective of radical environmentalism, arguing that cognition is the result of an interaction between biological, socioeconomic, and cultural determinants (Nell, 2000). In this study, language can be construed as a cultural factor, where PMIT participants self-identified their preference for first and second language. Because English-speaking Iranian Americans performed equally to monolingual English-speaking Caucasians, it can be interpreted that first language influences one's performance on the PMIT.

Although research has indicated nonverbal tests could be more appropriate for individuals from a different cultural background, the results of this study do not support this notion (McCallum, 2003). Specifically, the literature describing nonverbal tests often

include minimal use of expressive or receptive language skills (McCallum, 2003). It is hypothesized however, that nonverbal tests of visual memory such as the PMIT may continue to be mediated by a verbal component. If pictorial information continues to be mediated by a verbal component, then the performance of bilingual Farsi- and English-speaking individuals will likely be impacted. When compared to a monolingual English-speaking participant, the bilingual Iranian American's processing speed may be negatively affected by the lack of language equivalence between their first language (Farsi) and the language most commonly used for the pictures (English). Thus, a bilingual Iranian American may not be able to encode the PMIT pictures as rapidly as a monolingual Caucasian individual, which may lead to lower scores on True Positive responses during recognition trials.

Additionally, variability was observed between the scores in the 1FI group from examining the means and standard deviations across Books 1-4. It is postulated that some participants' performance appear to have been assisted by the verbal component when taking the PMIT, whereas some may have been hindered. Research has shown a negative linear relationship between speech rate and memory span, where span could be greater in a bilingual's second language if the pronunciation rate is faster than in one's first language (da Costa Pinto, 1991). However, da Costa Pinto (1991) found that digit-reading rates were faster and digit span was greater in the first language of bilinguals, even if the mean number of syllables per digit was higher. Thus, superiority of one's first language can result in a Farsi-English bilingual participant mentally verbalizing the name of the PMIT pictures in Farsi, where the word may include more syllables in Farsi than in

English. As a result, the Farsi-speaking participant's speed of learning the images may be impacted, and affecting their overall performance on the test.

While the PMIT was constructed as a *culture-fair* measure, results between Farsi-speaking Iranian Americans and English-speaking Iranian Americans are not commensurate with the premise of the PMIT. Given that this study controlled for age and gender between a sample of college students, one largely contrasting factor between the groups of participants was one's first language. It was determined that Iranian Americans whose first language was Farsi performed poorer in comparison to monolingual English-speaking Caucasian students. Thus, the results of this study raises concerns regarding the adaptability of the PMIT for non-English-speaking individuals, and more research should be conducted to further validate these findings. Furthermore, results of the PMIT should be interpreted with caution, particularly with individuals from a Farsi-speaking community.

Implications of Findings

The results of this study further validate the growing need for culturally responsive neuropsychological services among minority communities. While there has been a slow response in providing culturally responsive clinical services to ethnic minority clients, this study has provided information related to Iranian Americans where the literature was otherwise insubstantial. This study emphasizes the potential risks of comparing individuals of ethnic minorities to norms that have not been deemed suitable for their group. In order to abide by APA (2002) guidelines for culturally responsive neuropsychological services, clinicians must select assessment instruments that have been indicated to be reliable and valid for the patient. Thus, normative data must be collected

to accurately understand the results of a patient from the nondominant culture of where the test was originally developed.

Results of this study also highlight the importance of interpreting assessment results with caution. The APA (2002) has delineated various factors of the examinee, including linguistic differences, which may affect the accuracy of interpreting test results. The finding that Farsi-speaking participants performed more poorly compared to English-speaking Caucasian students may not necessarily indicate the existence of a weakness in visual memory skills. Rather, language factors between the two groups are hypothesized to account for the difference in True Positive scores. Hence, this study calls attention to the need for culturally responsive neuropsychologists to be alert when examining low test scores and integrating the potential impact of culturally driven variables in their interpretation.

Limitations and Future Directions

Despite the fact that significant results were found between Iranian American students whose first language is Farsi when compared to monolingual English-speaking Caucasian students, results should be viewed with caution as there are several limitations to the present study. First, while a statistically significant difference was found, the effect size of the results may be small. Future research should examine the effect size to further validate the results found in this study. Second, no reliability or validity information is available on the PMIT, which does not allow for a comprehensive understanding of the test's utility. Additionally, this study consisted of a secondary analysis of a subset of preexisting data collected at UCLA, where direct data collection from participants did not occur. Reliability of participants as informants must be interpreted with caution, as

participants self-reported monolingual or bilingual status. As a result of the participants' level of bilingualism not being assessed, the researcher cannot verify participants' true language proficiency, and whether Iranian Americans who self-identified Farsi as their first language are truly in fact bilingual.

Furthermore, participants' true processing speed was not assessed, which does not allow for a clear understanding of their true abilities when being administered the PMIT. Specifically, if a participant mentally verbalizes the presented images in Farsi, the speed required to process the recognition of each subsequent image can be impacted, which will inevitably affect one's overall performance on the measure. It is therefore recommended that future studies assess participants' level of processing speed prior to administering the PMIT in order to accurately assess performance levels based on individuals' baseline processing speed scores.

Lastly, findings in this study may be generalized only to the population used in the present study. These findings only apply to Iranian Americans living in Los Angeles with similar demographic characteristics (i.e., age, gender) and in a college student population. These findings should not be taken as representative of populations with different demographic characteristics other that the ones used in this study. Given the aforementioned limitations to the present study, the findings suggest that there are some challenges in assuming the PMIT as a culturally fair assessment measure, and further research needs to be done to identify differences that may exists across cultural groups.

As previously discussed, memory impairment is a major cognitive sequelae among neurological disorders and is considered to be the most frequently occurring disabling problem following a brain injury. Thus, appropriate assessment tools are

needed for the Iranian American population to provide culturally responsive services. It is the hope of this author that results from this study will provide a framework for future research in the areas of neuropsychology and neuropsychological assessment with Iranian Americans. As a result of the differences in sample sizes between 1EI and MEI, and 1FI and MFI, it is recommended for future research to have larger and comparable sample sizes for comparison. Additionally, identifying and controlling for participants' processing speed will provide a more equivalent sample for comparison.

Future research that includes a closer examination of the PMIT images developed by Snodgrass and Vanderwart (1980) will provide meaningful information for the adaptability of the PMIT with Iranian Americans. An analysis of the images from an Iranian American perspective will provide important information regarding linguistic and cultural differences pertinent to this ethnic minority community as it relates to neuropsychological assessment. Research that examines the use of abstract designs versus pictures will also provide relevant information regarding the potential impact of a verbal component during a nonverbal visual memory measure. Lastly, examination of language processes in bilingual Iranian individuals and its interplay between verbal and nonverbal memory will be useful in understanding whether nonverbal instruments can be used with this population.

REFERENCES

Amanat, M. (1993). Nationalism and social change in contemporary Iran. In R. Kelley (Ed.), *Irangeles: Iranians living in Los Angeles* (pp. 5–28). Los Angeles, CA: University of California Press.

American Psychological Association. (2002). Ethical principles of psychologists and code of conduct. *American Psychologist, 57,* 1060–1073. doi:10.1037/0003-066X.57.12.1060

American Psychological Association. (2003). Guidelines on multicultural education, training, research, practice, and organizational change for psychologists. *American Psychologist, 58,* 377–402. doi:10.1037/0003-066X.58.5.377

Artiola i Fortuny, L., & Mullaney, H. (1998). Assessing patients whose language you don't know: Can the absurd be ethical? *The Clinical Neuropsychologist,* 12, 113–126. doi:10.1076/clin.12.1.113.1727

Atkinson, R. C., & Shiffrin, R. M. (1968). Human memory: A proposed system and its control processes. In K. M. Spence (Ed.), *The psychology of learning and motivation: Advances in research and theory* (Vol. 2; pp. 89–195). New York, NY: Academic Press.

Baddeley, A. D. (2000). The episodic buffer: A new component of working memory? *Trends in Cognitive Sciences, 4,* 417-423. Retrieved from http://www.cell.com /trends/cognitive-sciences/

Baddeley, A. D., & Hitch, G. (1974). Working memory. In G. A. Bower (Ed.), *The psychology of learning and motivation* (Vol. 8; pp. 47–89). New York, NY: Academic Press.

Brickman, A. M, Cabo, R., & Manly, J. J. (2006). Ethical issues in cross-cultural neuropsychology. *Applied Neuropsychology, 13,* 91–100. Retrieved from http://www.tandf.co.uk/journals/titles/09084282.asp

Cole, M. (1996). *Cultural Psychology.* Cambridge, MA: Harvard University Press.

da Costa Pinto, A. (1991). Reading rates and digit span in bilinguals: The superiority of mother tongue. *International Journal of Psychology, 26,* 471–483.

Durvasula, R. S., Myers, H. F., Satz, P., Miller, E. N., Morgenstern, H., Richardson, M. A.,…Forney, D. (2000). HIV-1, cocaine, and neuropsychological performance in African American men. *Journal of the International Neuropsychological Society, 6,* 322-335. Retrieved from http://journals.cambridge.org/action/display Journal?jid=INS

Galderisi, S., Mancuso F., Mucci, A., Garramone, S., Zamboli, R., & Maj, M. (2008). Alexithymia and cognitive dysfunctions in patients with panic disorder. *Psychotherapy and Psychosomatics, 77,* 182—188. doi:10.1159/000119738

Gillis, M. (2000). Iranian Americans. In *Gale encyclopedia of multicultural America, 2,* 918-928. Retrieved from http://findgalegroup.com/gvrl/infomark.do?&type= retrieve&tabID=T001&prodId=GVRL&docId=CX3405800087&eisbn=0-787677272&source=gale - & userGroupName-pepperdine_main&version=1.0

Gregory, R. L. (1997). *Eye and Brain The Psychology of Seeing*. Princeton, NJ: Princeton University Press.

Haist, F., Shimamura, A. P., & Squire, L. R. (1992). On the relationship between recall and recognition memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 18,* 691–702. Retrieved from http://www.apa.org/pubs /journals/xlm/index.aspx

Hannay, J. H., Howieson, D. B., Loring, D. W., Fischer, J. S., & Lezak, M. D. (2004). Neuropathology for neuropsychologists. In M. D. Lezak, D. B. Howieson, & D. W. Loring (Eds.), *Neuropsychological Assessment* (pp. 157–285). New York, NY: Oxford University Press.

Harker, K. T., & Connolly, J. F. (2007). Assessment of visual working memory using event-related potentials. *Clinical Neurophysiology, 188,* 2479–2488. doi:10.1016 /j.clinph.2007.07.026

Hollingworth, A., & Luck, S. J. (2008). Visual memory systems. In S. J. Luck & A. Hollingworth (Eds.), *Visual memory* (pp. 3–8). New York, NY: Oxford University Press.

Johnson, B. D. (2001). An Iranian-American experience: A narrative of culture and transformation (doctoral dissertation). *Dissertation Abstracts International, 62,* 3945B. (UMI No. 3031984)

Luo, L. & Craik, F. I. M. (2008). Aging and memory: A cognitive approach. *The Canadian Journal of Psychiatry, 53,* 346-353. Retrieved from http://publications .ccpa-apc.org/browse/documents/3

Maj, M., Janssen, R., Satz, P., Zaudig, M., Starace, F., Boor, D.,…Sartorius, N. (1991). The World Health Organizations' cross-cultural study on neuropsychiatric aspects of infection with the Human Immunodeficiency Virus (HIV-1). *British Journal of Psychiatry, 159,* 351–356. Retrieved from http://bjp.rcpsych.org/

Maj, M., Satz, P., Janssen, R., Zaudig, M., Starace, F., D'Elia, L.,…Sartorius, N. (1994). WHO neuropsychiatric AIDS study, cross-sectional phase II. *Archives of General Psychiatry, 51,* 51–61. Retrieved from http://archpsyc.ama-assn.org/

Manly, J. J., & Echemendia, R. J. (2007). Race-specific norms: Using the model of hypertension to understand issues of race, culture, and education in neuropsychology. *Archives of Clinical Neuropsychology, 22,* 319–325. doi:10.1016/j.acn.2007.01.006

McCallum, R.S. (2003). Context for nonverbal assessment of intelligence and related abilities. In R.S. McCallum (Ed.), *Handbook of nonverbal assessment* (pp. 3–21). New York, NY: Kluwer Academic/Plenum Publishers.

Mindt, M. R., Byrd, D., Saez, P., & Manly, J. (2010). Increasing culturally competent neuropsychological services for ethnic minority populations: A call to action. *The Clinical Neuropsychologist, 24,* 429–453. doi:10.1080/13854040903058960

Mitrushina, M., Boone, K. B., Razani, J., & D'Elia, L. F. (2005). Statistical and psychometric issues. In M. Mitrushina, K. B. Boone, J. Razani, & L. F. D'Elia (Eds.), *Handbook of normative data for neuropsychological assessment* (2nd ed.; pp. 33–56). New York, NY: Oxford University Press.

Mobed, S. (1996). Psychosocial review of Iranian culture and Iranian Americans (doctoral dissertation). *Dissertation Abstracts International 57*(10), 6654B. (UMI No. 9708799)

Mostofi, N. (2003). Who are we: The perplexity of Iranian-American identity. *Sociological Quarterly, 44,* 681–703. Retrieved from http://www.wiley.com/bw/journal.asp?ref=0038-0253

Nassehi-Behnam, V. (1985). Change and the Iranian family. *Current Anthropology, 26,* 557–562. Retrieved from http://www.jstor.org/page/journal/curranth/about.html

Nell, V. (2000). *Cross-cultural neuropsychological assessment: Theory and practice*. Mahwah, NJ: Lawrence Erlbaum Associates.

Palmeri, T. J., & Tarr, M.J . (2008). Visual object perception and long-term memory. In S. J. Luck & A. Hollingworth (Eds.), *Visual memory* (pp. 163207). New York, NY: Oxford University Press.

Perez-Arce, P. (1999). The influence of culture on cognition. *Archives of clinical neuropsychology, 14,* 581–592. Retrieved from http:/acn.oxfordjournals.org/content/by/year

Pfleugl, G. M. U (2008). Introduction to scientific methodology. In G. M. U. Pfluegl (Ed.), *Life sciences 2 laboratory manual* (7th ed.; pp. 1–16). Plymouth, MI: Hayden-McNeil.

Puente, A. E., & Perez-Garcia, M. (2000). Neuropsychological assessment of ethnic minorities: Clinical issues. In I. Cuellar & F. A. Paniagua (Eds.), *Handbook of multicultural mental health, assessment and treatment of diverse populations* (pp. 419–435). San Diego, CA: Academic Press.

Sabagh, G., & Bozorgmehr, M. (1987). Are the characteristics of exiles different from immigrants? The case of Iranians in Los Angeles. *SSR, 71,* 77–84.

Sander, A. M., Nakase-Richardson, R., Constantinidou, F., Wertheimer, J., & Paul, D. R. (2007). Memory assessment on an interdisciplinary rehabilitation team: A theoretically based framework. *American Journal of Speech-Language Pathology, 16,* 316–330. doi:1058-0360/07/1604-0316

Snodgrass, J. G., & Vanderwart, M. (1980). A standardized set of 260 pictures: Norms for name agreement, image agreement, familiarity, and visual complexity. *Journal of Experimental Psychology, 6,* 174–215.

Squire, L. R. (1992). Declarative and nondeclarative memory: Multiple brain systems supporting learning and memory. *Journal of Cognitive Neuroscience, 4,* 232–243. Retrieved from http://www.mitpressjournals.org/loi/jocn

Strauss, E., Sherman, E. M. S., & Spreen, O. (2006a). Memory. In E. Strauss, E. M. S. Sherman, & O. Spreen (Eds.), *A compendium of neuropsychological tests: Assessment, norms, and commentary* (3rd ed.; pp. 678–890). New York, NY: Oxford University Press.

Strauss, E., Sherman, E. M. S., & Spreen, O. (2006b). Psychometrics in neuropsychological assessment. In E. Strauss, E. M. S. Sherman, & O. Spreen (Eds.), *A compendium of neuropsychological tests: Assessment, norms, and commentary* (3rd ed.; pp. 3–43). New York, NY: Oxford University Press.

Tulving, E. (1985). How many memory systems are there? *American Psychologist, 40,* 385–398. Retrieved from http://www.apa.org/pubs/journals/amp/index.aspx

U.S. Census Bureau. (2007). *Minority population tops 100 million.* Press release CB07-70 issued May 17, 2007.

Wasserman, J. D., & Lawhorn, R. M. (2003). Nonverbal neuropsychological assessment. In R.S. McCallum (Ed.), *Handbook of nonverbal assessment*. NewYork, NY: Kluwer Academic/Plenum.

Wilson, B. A. (2002). Memory rehabilitation. In L. R. Squire & D. L. Schacter (Eds.), *Neuropsychology of memory* (pp. 263–272). New York, NY: The Guilford Press.

APPENDIX A

Summary of Literature Review

Rationale for Culturally Responsive Services

Author/ Year	Research Questions/ Objectives	Sample	Variables/ Instruments	Research Approach/Design	Major Findings
American Psychological Association (2002).	Ethical standards set forth by the American Psychological Association (APA) for psychologists.	N/A	N/A	Theoretical Discussion	Ethics Code describes the code of conduct psychologists are obligated to adhere to as it relates to scientific, educational, or professional roles. Ethics Code consists of an Introduction, a Preamble, five General Principles (A-E), and specific Ethical Standards. Areas covered include but are not limited to the clinical, counseling, and school practice of psychology; research; teaching; supervision of trainees; public service; policy development; social intervention; development of assessment instruments; conducting assessments; educational counseling; organizational consulting; forensic activities; program design and evaluation; and administration. Additionally, standards of APA Ethics Code apply to all members of the APA, as well as rules and procedures used.

American Psychological Association (2003).	Guidelines for psychologists set forth by the APA related to culturally responsiveness.	N/A	N/A	Theoretical Discussion	Guidelines provide psychologists with the rationale and needs for addressing multiculturalism and diversity in education (psychological education of students in all areas of psychology), training (the application of education and development of research skills), research (with human participants), practice (interventions with children, adolescents, adults, families, etc.), and organizational change (the work of psychologists as administrators, consultants, and other management roles to promote organizational change and policy development). Guidelines are supported by empirical research from psychology, related disciplines, and other data, for its relevance and importance. Further, guidelines provide additional literature in continuing culturally responsive methodologies, and offer a broadened view of professional psychology.
Artiola i Fortuny, L. & Mullaney, H. (1998).	Article discussing potential dilemmas of neuropsychological assessment of non-English speakers by English speaking examiners.	N/A	N/A	Theoretical Discussion	Possible underlying causes of neuropsychological evaluations of non-English speakers being conducted who do not know, or have limited knowledge of, the language of the examinee are discussed. Examples

					of the risks as well as a review of the Ethics Code are provided to assist clinicians to avoid unethical or illegal practices.
Brickman, A. M, Cabo, R., & Manly, J. J. (2006).	Article highlighting clinical and ethical challenges in neuropsychological assessment with patients from diverse cultural and linguistic backgrounds.	N/A	N/A	Theoretical Discussion	Potential and unique ethical challenges faced by clinical neuropsychologists assessing patients from diverse cultural and linguistic backgrounds are explored. Authors review four key dilemmas related to cross-cultural neuropsychology, including: (a) consideration of culture or race in neuropsychological testing, (b) use of race- and ethnicity-specific normative data in neuropsychological assessment, (c) competency in designing and translating tests for ethnic minority groups and non-English speakers, (d) competency in administration and interpretation of tests developed for ethnic minority groups, (e) adequacy of neuropsychological training programs in preparing clinicians for competency in cross-cultural assessment.
Cole, M. (1996).	Book discussing field of cultural psychology and the study of the role of culture in the mental life of human beings.	N/A	N/A	Book	Overview of the prehistory of psychology as a discipline, and ways in which culture's relation to thinking was dealt with before psychology was developed. Author

					discusses attempts to apply strategy of standardized cross-cultural research, and on improvement of standard methodologies for multidisciplinary research on cognitive development. Author also examines the role of culture in human origins and historical change.
da Costa Pinto, A. (1991).	Study examining the effects of digit syllable length on speech rate in five different bilingual groups, and the correspondence between speech rate and digit span with Portuguese-English bilinguals.	60 postgraduate students and scholars, whose first language was French, German, Italian, Portuguese, Spanish, and English. Subjects' age range was between 23 and 31 years old.	Digit syllable length and speech rate.	Causal-Comparative	Results showed that digit-reading rates were faster and digit span larger in the first language even if the mean number of syllables per digit were higher. The superiority of the first language was discussed according to the view that digits are subject to massive practice in one's first language with a strong tendency to be abbreviated, thus reducing its spoken duration.
Manly, J. J. & Echemendia, R. J. (2007).	Article reporting on issues in understanding race, culture, and education when using norm reference groups for neuropsychological assessment.	N/A	N/A	Theoretical Discussion	Article discussing controversy over using race/ethnicity-specific norms in neuropsychological testing. With recent research on hypertension used to understand issues in construct validity in neuropsychological testing, the authors aim to reveal other possible underlying causes of poor cognitive test

					performance for which race serves as a proxy. While it is currently understood that using race/ethnicity-specific norms will improve the sensitivity and specificity of neuropsychological instruments that aim to detect cognitive impairment, the authors review recently surfaced arguments. The implications of using race/ethnicity-specific norms can lead to ignoring underlying cultural and educational factors for which race serves as a proxy. Additionally, setting more lenient cutoffs for impairment among ethnic minorities may lead to an increase in failing to provide these groups needed services. - Norms are defined as a standard against which a person's performance can be evaluated and then interpreted. - Descriptive norms are defined as when an individual's performance is compared to a single reference group. - When norms are being used for diagnostic purposes, background variables are likely to be crucial determinants of premorbid ability. - It has not been demonstrated that performance below a

					common, race-independent cutoff means the same thing across race, ethnicity, and geographic region. It is not clear whether measures of any particular cognitive domain have equivalent construct validity across racial groups. Future investigation is needed further to understand implications of race and ethnicity on definitions of brain function and cognitive impairment, and selection of a norm reference group.
Mindt, M. R., Byrd, D., Saez, P., & Manly, J. (2010).	Article discussing the increasing need for culturally responsive neuropsychological services for ethnic minority populations.	N/A	N/A	Theoretical Discussion	Historical overview of universalism as a limitation in neuropsychology is discussed. Universalism theorizes that cognitive processes are stable across humankind, and are not impacted by cultural milieu. Within the U.S., a universalist view has predominantly been held within the field of neuropsychology. Holding a universalist perspective frees the neuropsychologist from examining construct validity and related issues, and assessment instruments may be considered universally applicable. However, a universalist perspective is limited, as cognitive processes are now

					understood as being different among ethnic groups. Neuropsychological test performance is impacted by culture and environment, which are not recognized with a universalist perspective. Ethical/professional guidelines related to neuropsychological practice are discussed, including cultural considerations. Authors provide a call to action for neuropsychologists to further multiculturalism and diversity within the field by increasing culturally responsive awareness and knowledge in education, training, research, and assessment.
Nell, V. (2000).	Book discussing cross-cultural neuropsychological assessment.	N/A	N/A	Theoretical Discussion	Book for neuropsychologists who assess individuals of different cultures. Provides understanding for neuropsychological assessment methods that accommodates to cultural difference and the lack of appropriate □norms. Author comments on lack of norm until construct validity for the population in question has been demonstrated. Demonstrating construct validity requires a large body of scores for a representative sample of that population,

					which is a costly and time-consuming process. Author argues that migration patterns and increases in ethnic minorities have also increased assessment and test validity concerns. Radical environmentalism is described, stating that cognition is the result of an interaction between biological, socioeconomic, and cultural determinants. Specifically, until language proficiency, quality of education, test-sensitivity, cognitive style, and the other components of acculturation have been proved be equivalent for the groups whose scores are being compared, score differences cannot be attributed to genetic differences.
Perez-Arce, P. (1999).	Author proposes that cultural factors have a determining influence on an individual's behavior, regardless of their neurophysiological status of the brain. A differentiation is made between the effects of culture/language and socioeconomic level on cognitive testing results for Latino	N/A	N/A	Theoretical Discussion	- Theoretical framework to understand the relationship between cognition and behavior within the context of the individual's ecological brain, that is, biological endowment, unique psychological development and structure, and sociocultural environment. - Neuropsychology has been an atheoretical and decontextualized neuroscience that has treated the brain as an organ whose processes are

	patients.				independent of fundamental socioenvironmental variables. Author presents “socially shared cognition” perspective to understand the role of culture and social variables in cognition. - An individual’s ecological context, which includes language, culture, education, and social class must be injected into the traditional formula of neuropsychological test interpretation in order to arrive at the “functional residual capacity of the individual.” - When, to whom, and what an individual says in specific circumstances, the vocabulary he or she uses, and the mode of expression, are influenced by cultural determinants in addition to neurophysiological processes and socioeducational experience. - Those who have not had the opportunity to go through formal schooling are considerably restricted in their knowledge base and linguistically mediated problem-solving capacity. These limitations confound NP results and make interpretation of test data more difficult. - Those with poor

					quality education have lower SES status. The effects of SES on cognition and behavior are frequently confused with cultural effects. - Neuropsychologists must be aware enough to question whether low test scores are the result of SES-related variables, sociocultural stress, cultural determinants of behavior, and/or brain damage.
Puente, A. E. & Perez-Garcia, M. (2000).	Book chapter discussing clinical issues related to neuropsychological assessment of ethnic minorities.	N/A	N/A	Theoretical Discussion	Culturally sensitive clinical neuropsychology is discussed. Neuropsychological evaluation of a culturally dissimilar person is also reported, including potential dilemmas that may arise. The roles of cultural adaptation and educational attainment and the controlling of these variables in neuropsychological evaluations are discussed.
U.S. Census Bureau (2007).	Data regarding U.S. minority population rates.	N/A	N/A	Survey	U.S. Census Bureau's data for the nation's minority populations as estimated by race. Population estimates for Hispanic, Black, Asian, American Indian and Alaskan Native, Native Hawaiian and Other Pacific Islander, and Non-Hispanic White is provided. Data reports population increases among minority groups.

Characteristics of the Population

Amanat, M. (1993).	Book chapter depicting Iranians living in Los Angeles. Includes background, historical, and interview data with Jewish, Muslim, Armenian, Bahai, Assyrian, Zoroastrian, and Kurd populations.	N/A	N/A	Theoretical Discussion	Historical overview of religious, political, governmental, and immigration trends in Iran are provided. Book chapter also incorporates photographs of Iranians living in Los Angeles in the 1980s, depicting Iranian's adaptation to mainstream culture, as well as adherence to Iranian cultural values and norms.
Gillis, M. (2000).	Iranian culture overview	N/A	N/A	Theoretical Discussion	Overview of Iran's history including: - Geographic information - History of invasion and settlement - Modern era - Religion - Immigration to United States - Interactions with settled Americans - Acculturation and assimilation - Misconceptions and stereotypes - Language - Tradition (holidays, clothing, etc.) - Family and community dynamics - Courtship and weddings - The role of women - Employment and economic traditions - Politics and government
Johnson, B. D. (2001).	Cross-cultural study of the impact of American life and culture on individual Iranian's adjustment to	4 Iranian couples (4 male and 4 female)	One-to-One Interview	Qualitative-Phenomenological	Examination and analysis of the dynamics of interplay between Iranian culture and culture in the U.S. as it relates to the lives of individual Iranian

	life in the U.S.				immigrants who entered the U.S. following the 1979 Iranian Revolution. Author provides one-one-one elicitation of life stories and experiences of Iranian immigrants regarding their personal views on adjustment and adaptation to American life, culture, and values. Issues also discussed include: - Iranians' reaction to Americans' reception patterns - Dynamics of oil politics and American imperialism - Decolonization of pre-revolutionary Iran and forces leading to 1979 Revolution. - Events leading to the overthrow of the Shah and mass emigration of millions of Iranians. - Groups of Iranian immigrants are differentiated, including royalist or aristocratic families that fled the country immediately following the revolution who were targeted for execution by the new regime, and Western-educated individuals. - Distinction between Iranian immigrants and other immigrants groups is provided by the author, who stated Iranians' unique culture did not lead directly to assimilation to

					WASP culture in the U.S. - Iranians' social and economical adaptation in the U.S., while maintaining values and beliefs.
Mobed, S. (1996).	Psychosocial review of Iranian culture and of Iranian Americans.	133 Iranians (65 females, 66 males) ranging from 19 to 70 years of age were surveyed. Mean education level was 12.3 years. Sample consisted of 5 different religious backgrounds.	Iranian Cultural Cohesion Scale, adapted from the Asian Indian Cultural Cohesion Scale	Correlational	An investigation of the level of acculturation of Iranians living in the U.S. Review of Iranian culture and Iran is provided. - Based on participants surveyed, 13% were identified as Traditional, 73% as Moderators, and 14% Assimilators. - Moderators were able to maintain values and beliefs while adjusting to host culture. - Assimilators were identified as having an easier time integrating to host culture. - The younger the participants, the more acculturated they were found to be. - The longer the participants live in the U.S., the more acculturated they became. Iranians with more education are more acculturated. This may be due to being more aware about learning a new culture, and possibly due to having an easier time learning a new language. Acculturation may be an easier process by learning a new language, as the immigrant has more access to books,

					magazines, and general communication with the new culture.
Mostofi, N. (2003).	An article conveying the Iranian experience in the United States by analyzing the formation of an Iranian identity in the United States.	N/A	N/A	Theoretical Discussion	- Diaspora paradigm of William Safran (1999) is utilized, which refers to the mass migration of peoples to various locations around the world. Throughout this migration, immigrants maintain a longing for their homeland and a desire to either return or preserve their nostalgia as a form of identification. Dual identity is characterized, and the Iranian-American culture is interpreted. A relationship between the American civic society and its immigrants is also discussed. - This essay describes Iranian-American identity as a combination of (a) American notions of freedom and liberty and (b) Iranian cultural traditions and concepts of the family. - History of Iranian Diaspora is discussed.

Nassehi-Behnam, V. (1985).	Article discussing the traditional Iranian family, the impact of modernization on the family, the importance of the kinship network, and a typology of the Iranian family.	N/A	N/A	Theoretical Discussion	- The traditional family: depicted by poet and philosopher Ghazali, states the male is the master and head of the household. Women should have chastity, temperance, beauty, a modest dowry, fertility, virginity, and a respectable ancestry. Men should have stature, generosity, and peace of mind. - Impact of modernization: Family Protection Law promulgated in 1967 granted women the right to divorce by inserting an "irrevocable clause" in the contract of marriage. Traditional values have persisted, but new cultural models have arisen that express the aspirations of a new generation. Spouse choice, role and status of family members, and family disintegration have all been affected by modernization.

Sabagh, G. & Bozorgmehr, M. (1987).	Article examining the demographic, religious, and socioeconomic differences between immigrants and political refugees or exiles from Iran.	N/A	N/A	Theoretical Discussion	- Iranian immigration to the U.S. can be divided into two chronological phases: (a) after World War II until the Iranian revolution (1950-1977) and (b) during and after the Iranian revolution until the census year (1978-1980). - Between the first and second phase, the average annual number of Iranian immigrants increased about fivefold, and nonimmigrants nearly sevenfold. - Those who arrived after the revolution may be considered to be exiles. - A higher proportion of religious minorities that is more balanced with respect to age and sex distribution than the pre-1975 cohort. - Iranian exiles have a lower educational attainment than immigrants. - The lower occupational and income levels of Iranian exiles than immigrants may reflect both their social class origin and the downward mobility of exiles immediately after arrival.

Memory and Assessment

Atkinson, R. C. & Shiffrin, R. M. (1968).	Book chapter discussing multi-store model of memory.	N/A	N/A	Theoretical Discussion	The structure of memory is proposed as consisting of a sequence of three stages, as first described by the

					authors. Sequence of memory incorporates sensory memory, short-term memory, and long-term memory. This model proposes memory functioning in a straightforward and sequential manner, similar to the information-processing operation of a computer - Sensory memory: sensory organs are able to briefly store information. The visual system processes visual stimuli, and hearing system processes auditory stimuli. - Short-term memory: Acoustically or visually information is retained. Short-term memory can retain sound and visuospatial information. Without rehearsing, the information typically lasts between 15-30 seconds. Chunking of information can assist in retaining short-tem memory information. - Long-term memory: Lasting retention of information. Long-term memory encoding usually occurs at a semantic level (meaning). Procedural skills and imagery are also retained in long-term memory. Trace decay can occur if information in long-term memory is not rehearsed.
Baddeley, A. D. (2000).	Article discussing the fourth	N/A	N/A	Theoretical Discussion	The episodic buffer is described as the fourth component to

	component to Baddeley and Hitch's (1974) original model of working memory.				Baddeley and Hitch's working memory model. The episodic buffer provides a limited capacity for temporary storage of information that is held in a multimodal code. The episodic buffer is able to bind information from subsidiary systems and from long-term memory. The representation is then a unitary episodic memory. Author proposes that conscious awareness is likely to be the primary method of retrieval from the episodic buffer. This updated model encompasses information integration processes. As a result of not isolating the different subsystems, this model provides a better understanding for the complex aspects of executive control and working memory. The episodic buffer provides a means for modeling the environment, as well as for creating new cognitive representations to aid in problem solving. Author discusses the phonological loop playing a vital part in long-term phonological learning, as well as to short-term storage.
Baddeley, A. D. & Hitch, G. (1974).	Book chapter discussing Baddeley and Hitch's original three-	N/A	N/A	Theoretical Discussion	The three-component model of working memory originally proposed by Baddeley and Hitch

	component model of working memory.				(1974) is operated by an attentional agent, the central executive. Working memory is also facilitated by two subsidiary systems, the phonological loop and the visuospatial sketchpad. The phonological loop is involved in the storage and manipulation of auditory-verbal imagery, and the visuospatial sketchpad is involved in the storage and manipulation of visual images. These two subsidiary systems combine information from sensory input and from the central executive. Frontal lobe areas appear to be involved in the functioning of the central executive.
Durvasula, R. S., Myers, H. F., Satz, P., Miller, E. N., Morgenstern, H., Richardson, M. A., Evans, G., & Forney, D. (2000).	Study examining the independent and interactive effects of HIV-1 serostatus and cocaine on neuropsychological performance.	237 gay and bisexual urban-dwelling African American men.	The UCLA-WHO Neuropsychological Battery assessing verbal memory, psychomotor speed, reaction time, nonverbal memory, motor speed, and verbal fluency.	Causal-Comparative	Multivariate analyses controlling for age and alcohol use yielded significantly poorer psychomotor speed in symptomatic seropositive subjects than seronegative subjects, and slower reaction time and poorer nonverbal memory than the asymptomatic seropositive subjects. No interaction of serostatus and cocaine was noted for any neuropsychological domain.
Galderisi, S., Mancuso F., Mucci, A., Garramone, S., Zamboli,	Study examining the hypothesis that patients with panic disorder	32 subjects diagnosed with panic	Alexithymia, general cognitive abilities, attention,	Causal-Comparative	Alexithymia was more frequent in patients with panic disorder when compared to healthy

R., & Maj, M. (2008).	show higher prevalence of alexithymia, greater difficulty in emotional stimuli processing, and poorer performance on neuropsychological tests exploring the activity of fronto-temporo-limbic circuits.	disorder, and 32 healthy subjects.	working memory, secondary memory, and ability to recognize facial emotional expressions were assessed.		subjects. Patients with panic disorder had lower verbal cognitive abilities and more difficulty to inhibit interference from nonverbal stimuli and from panic-related words. Findings were consistent with a dysfunction of frontolimbic circuits, in particular orbitofrontal and cingulated circuits. The observation of reduced abstraction and symbolization in patients with panic disorder might be related to a reduction in verbal cognitive abilities.
Gregory, R. L. (1997).	Book discussing visual perception.	N/A	N/A	Theoretical Discussion	Discusses how humans see brightness, movement, color, and objects, and explores the phenomena of visual illusions to establish principles about how perception normally works as well as hypotheses for why perception fails.
Haist, F., Shimamura, A. P., & Squire, L. R. (1992).	Study examining the relationship between recall and recognition for the study of memory.	12 amnesic patients (6 had alcoholic Korsakoff's syndrome, 2 patients had hippocampal lesions, 2 patients had diencep	18 lists of 20 words randomly assembled from 360 unrelated one-syllable and two-syllable nouns.	Causal-Comparative	Results of this study support the view that recall and recognition are related functions of declarative memory. Amnesia is defined as damage that has occurred to a brain system that is vital for declarative memory (conscious memory). In amnesic patients, skill learning, priming, and other forms of nonconscious memory continue to be intact. According to the study's results,

		halic lesions) were compared to 19 subjects in control group (10 abstaining alcoholic patients, 9 healthy patients).			recall and recognition can be best understood as equally dependent in amnesic brains. No evidence for impaired recall performance in amnesic patients was found when compared to control subjects and matched on recognition performance. Recall and recognition were found to be impaired in amnesic patients. Results of this study align with the view that recognition memory is not supported by nonconscious memory.
Hannay, J. H., Howieson, D. B., Loring, D. W., Fischer, J. S., & Lezak, M. D. (2004).	Book chapter discussing the neuropsychological presentation of various neurological disorders in order to better understand and interpret assessment results.	N/A	N/A	Theoretical Discussion	Authors argue that a diagnostic frame of reference helps the neuropsychologist integrate meaningful contextual information with observations, scores, family reports, and medical history that often comprises each case. Chapter offers a broad overview of behavioral outlines of neurological disorders, in order to enhance the neuropsychologist's understanding of a patient's clinical presentation. Disorders reviewed include: - Traumatic Brain Injury - Vascular disorders (strokes, dementia, multi-infarct dementia, hypertension, migraine) - Degenerative disorders

					- Cortical dementias (Alzheimer's Disease, frontal lobe dementias, cortical atrophies) - Subcortical dementias (movement disorders, Parkinson's Disease, Huntington's Disease, Progressive Supranuclear Palsy) - Toxic conditions (alcohol-related disorders, street drugs, social drugs, environmental and industrial neurotoxins) - Infectious processes (HIV infection and AIDS, Lyme Disease, Chronic Fatigue Syndrome) - Brain tumors - Oxygen deprivation (acute/chronic oxygen deprivation, carbon monoxide poisoning) - Metabolic and endocrine disorders (Diabetes, hypothyroidism, liver disease, uremia) - Nutritional deficiencies
Hollingworth, A. & Luck, S. J. (2008).	Book chapter discussing visual memory systems in the brain.	N/A	N/A	Theoretical Discussion	Authors describe what a visual memory entails, and the importance in studying visual memory. The various visual memory systems are also summarized in this chapter. Authors state that a memory must retain properties of the original perceptual state used to generate the memory during encoding, in order to qualify as a visual

					memory. Further, a visual memory must represent the topographic and metric properties from the original state of perception. Therefore, a visual memory incorporates memory representations that include information about the perceptual properties of the viewed stimulus. Visual memory is important to focus on as the field of vision science has provided great insight into this aspect of memory study. - Visual short-term memory retains visual information from a small number of objects, and is limited to three or four objects for simple stimuli, and one to two objects for complex stimuli. - Visual long-term memory has a large storage capacity. Memories retain information about the specific form of objects and scenes, and plays a pivotal role in memory for visual features in categorization. Representations in visual long-term memory are retained by changes in the pattern and strength of neuronal connections.
Luo, L. & Craik, F. I. M. (2008).	Article describing changes in memory functioning related to	N/A	N/A	Theoretical Discussion	Articles report on current research in cognitive psychology showing that age-related changes in memory vary

	normal aging processes as understood by cognitive psychology.				significantly depending on the specific memory system being assessed. Memory difficulties are not consistent across all aspects of memory. Due to the greater need for self-initiated processing, certain memory systems such as working memory and episodic memory, decline most with age. One could then expect to see an effect on performance dependent on self-initiated processing (such as free recall tests or paired association tests). According to the authors, normal aging should have less of an effect on test performance that taps into generic ideas (such as recalling a story's thematic content). Normal aging should also have less of an effect on test performance that utilizes a higher level of environmental support (such as recognition tests). Article discusses appropriate methods of assessing memory impairment, which includes being cognizant of the mental operation involved. Some methods include: - Healthy elderly adults fair well on quick attentional and memory ability tests (such as digit span), but a more sensitive

					test to tap into working memory functioning as it relates to aging would require manipulation of items. - Assessment of Alzheimer's Disease (AD) should incorporate monitoring of other cognitive domains that do not present at impaired yet. Given that memory deficits are first to be recognized in the early stages of the disease, the clinician can distinguish a pattern of memory loss associated with normal aging, and those in AD. Memory functioning in healthy elderly adults can be improved over an extended period of time through training and support. However, gains are limited by the specific training task implemented. Some methods include: - Creating supportive conditions that minimize the demand for controlled processing (using cues). - Utilizing intact processes (semantic processing). - Directly train efficiency in strategic and controlled processing (training recollection).
Maj, M., Janssen, R., Satz, P., Zaudig, M., Starace, F.,	Multi-center study conducted by the World Health Organization	175 (127 men and 48 women)	Domains assessed included: motor speed, sustained	Causal-Comparative	Study aimed to provide information for the need for comprehensive evaluation

Boor, D., Sughondhabirom, B., Bing, E. G., Luabeya, M. K, Ndetei, D., Riedel, R., Schulte, G., & Sartorius, N. (1991).	(WHO) to explore the nature and prevalence of HIV-1 associated neurological, psychiatric, and neuropsychological abnormalities in persons living in different geographical and sociocultural contexts.	were recruited from Brazil, Germany, Kenya, Thailand, United States, and Zaire. 62 HIV-1 asymptomatic seropositive individuals, 53 HIV-1 symptomatic seropositive, and 60 HIV-1 seronegative individuals were studied.	attention, selective attention, cognitive flexibility, perceptual/motor analysis, verbal memory, visual memory (WHO/UCLA Picture Memory Interference Test), and verbal fluency.		instruments, especially for the assessment of HIV-1-associated neuropsychiatric abnormalities in diverse cultural and SES settings, irrespective of education and linguistic background. - Information on neuropsychological tests administered was provided: WHO/UCLA Picture Memory and Interference Test: - Large series of line drawings representing a variety of objects, presented visually with verbal instructions. - Test consists of 4 "books," where the examinee is shown a series of 20 drawings and is instructed to remember these target drawings. Next, examinee is immediately presented with 50 more drawings and is asked to say "yes" or "no" whether he/she saw each of the cards in the target group. -Books 2, 3, and 4 continue with new target items while integrating items from previous books as distracters. - This test has been deemed suitable for cross-cultural use. - Study found that a cross-cultural research on the neuropsychiatric aspects of HIV-1 infection is possible.
Maj, M.,	Multi-site study	Asympt	The	Cross-sectional	Prevalence of

Satz, P., Janssen, R., Zaudig, M., Starace, F., D'Elia, L., Sughondhabirom, B., Mussa, M., Naber, D., Ndetei, D., Schulte, G., & Sartorius, N. (1994).	using neuropsychological test battery validated for cross-cultural use examining neurological effects of HIV-1 infection and AIDS.	omatic HIV-1 seropositive and symptomatic HIV-1 seropositive subjects compared with HIV-1 seronegative controls	WHO/UCLA Auditory Verbal Learning Test, Color Trails 1 and 2, The WHO/UCLA Picture Memory Interference Test, a rating scale of functioning daily living activities, a neurological module, and a structured interview for the diagnosis of dementia		neurological impairment was significantly higher in symptomatic HIV-1 seropositive individuals, compared with seronegative controls. Data suggests that the risk of subtle cognitive deficits may be increased in asymptomatic stages of HIV-1 infection, but that these deficits are not associated with neurological changes. Additionally, deficits do not seem to affect the subjects' social functioning.
McCallum, R. S. (2003).	Book chapter discussing nonverbal assessment of intelligence and related abilities.	N/A	N/A	Theoretical Discussion	Historical and sociopolitical context of assessment was explained in relation to operationally defining nonverbal intellectual assessment. The reliance on nonverbal strategies as part of a neuropsychological evaluation assessing general verbal and nonverbal functioning has led to the use of nonverbal tests to assess functions of the central nervous system (which are primarily nonverbal). Information on new developments in nonverbal assessment is also provided. Author describes language as a confounding variable in the assessment of individuals with speech and language impairments, hearing deficits, culturally different

					backgrounds, neurological trauma, or emotional problems (such as selective mutism). Nonverbal assessment may provide more rigorous and less biased assessment for such individuals. True nonverbal tests should not require receptive or expressive abilities of the examinee. However, many nonverbal tests will be administered with verbal instructions. Author describes the best definition for a nonverbal test as one that involves language-reduced demands with verbal directions.
Palmeri, T. J. & Tarr, M. J. (2008).	Book Chapter discussing visual long-term memory.	N/A	N/A	Theoretical Discussion	Authors discuss how objects are perceived and represented over experience. The perceptual nature of information stored in long-term memory that allows us to recognize, identify, categorize, and perform perceptual skills on visual objects is also discussed. Failures in memory storage of visual information can result form multiple factors. Some include: - Failure to encode - Interference from new memories - Decay of memory - Failures in retrieval Failures to retrieve visual details can be due to insufficient cues to aid in retrieval. Authors

					argue that insufficient cueing may possibly be one of the most common reasons for memory failure.
Sander, A. M., Nakase-Richardson, R., Constantinidou, F., Wertheimer, J., & Paul, D. R. (2007).	Article describing a cognitive neuroscience model of memory to aid in neuropsychological assessment and to contribute to consistent terminology within interdisciplinary rehabilitation teams.	N/A	N/A	Theoretical Discussion	Authors provide a theoretically based model of memory in order to assist interdisciplinary team members in understanding the various processes related to underlying memory performance. Authors discuss early conceptualizations of memory as developed by Atkinson and Shiffrin (1968). Authors report on original model being replaced by newer models, and the terminology that has been retained for understanding memory performance. Encoding, storage, and retrieval are described as the stage model of memory is explained. Authors progress into describing advanced models of memory functioning, including the systems model of memory, which incorporates Baddeley and Hitch's (1974) working memory model and Baddeley's (2000) episodic buffer for additional storage that combines visual and verbal information. Authors describe ways in which episodic buffer exceeds the capacity of the original phonological loop

					and visuospatial sketchpad (individuals with long-term memory impairment continue to display average performance on immediate recall of information that is more complex than typical verbal and visual memory span). - Long-term memory is described as composing of declarative (explicit) memory, which is comprised of semantic and episodic memory. - Nondeclarative (implicit) memory is described as being comprised of priming and procedural learning/skills and habits.
Snodgrass, J. G. & Vanderwart, M. (1980).	Article presenting set of 260 pictures for use in experiments investigating differences and similarities in picture and word processing.	219 native English speaking volunteer subjects from introductory psychology courses participated. Sample size was approximately equal in number of males and females, and were run in small	Name agreement familiarity, visual complexity, and image agreement	Correlational	Pictures are black and white line drawings that have been standardized on four variables of central relevance to memory and cognitive processing: name agreement, image agreement, familiarity, and visual complexity. Researchers hoped to have the line drawings used in future research to help answer theoretical questions about differences in processing between pictures and words.

		groups of from 5 to 15.			
Squire, L. R. (1992).	Article discussing biological viewpoint of multiple forms of memory.	N/A	N/A	Theoretical Discussion	Declarative (explicit) memory is compared and contrasted to nondeclarative (implicit) memory. The latter is described as a collection of nonconscious memory abilities, which includes priming, skills, habits, and simple conditioning. Author reports on evidence discussing declarative and nondeclarative memory systems having different operating characteristics, and are dependent on separate brain systems. Author discusses lesion studies that have provided insight into understanding memory phenomena and a framework of brain systems. Author also discusses how positron emission tomography, studies of rats, monkeys, humans (amnesic and healthy humans), and the technique of dividing the visual field have contributed to findings in separate brain systems. However, multiple forms of memory are supported by various brain systems with different characteristics, and an interaction between systems continues to be understood.

Strauss, E., Sherman, E. M. S., & Spreen, O. (2006a).	Book chapter discussing the memory system.	N/A	N/A	Theoretical Discussion	The complex processes of encoding, storing, and retrieving information is discussed in this chapter. Authors discuss research that explains memory is not a unitary construct, but consists of multiple forms that are each moderated by various components. Authors describe working memory, long-term memory, episodic memory, semantic memory, and neural correlates. Resources for conducting interviews with patients with retrograde amnesia is provided. Additionally, select neuropsychological tests used for memory assessment are disseminated, including information related to the test's purpose, age-range for administration, administration protocol, scoring, normative data, reliability, validity, and interpretation.
Tulving, E. (1985).	Article discussing the interrelated systems that comprise memory.	N/A	N/A	Theoretical Discussion	Author describes the interrelated organized structures of operating components, which are comprised of neuronal substrates and behavioral and cognitive associations. Author argues for the existence of multiple memory systems. Author describes a ternary classification of memory to

					describe memory as functioning consisting of three major systems: - Procedural: enables retention of learning between stimuli and response. - Semantic: enables states of internal representation of the world that are not perceptually present. - Episodic: enables the acquisition and retention of knowledge about personal experiences, and the temporal relations in subjective time. Three systems are referred to as monohierarchical arrangement, where procedural memory contains semantic memory as its single specialized subsystem, and semantic memory contains episodic memory as its single specialized subsystem. Author states the three memory systems are characterized by different forms of consciousness. Procedural, semantic, and episodic memory are governed by anoetic (nonknowing), noetic (knowing), and autonoetic (self-knowing) forms of consciousness, respectively. - Anoetic consciousness: ability to sense and react to external and internal stimuli

					- Noetic consciousness: ability for introspective awareness of the internal and external world - Autonoetic consciousness: ability for subjective awareness of one's own identity and existence.
Wasserman, J. D. & Lawhorn, R. M. (2003).	Book chapter discussing nonverbal neuropsychological assessment.	N/A	N/A	Theoretical Discussion	Operational definition of nonverbal is provided. Authors report on nonverbal tests that rely on objective, observable, and overt performance requirements and no expressive or receptive language skills from the examinee. Nonverbal tests across neuropsychological domains are reported, including attention and executive functions, spatial cognition, and memory and new learning.
Wilson, B. A. (2002).	Book chapter discussing rehabilitation of memory.	N/A	N/A	Theoretical Discussion	Author differentiates rehabilitation of memory as separate from recovery of restitution of lost functioning. Organic memory deficits make recovery or restitution of functioning impossible. Rehabilitation can go beyond attempts for restoration. Rehabilitation also consists of aiding people in the understanding and processing of their developing memory difficulties. Often

					resulting from brain injury, memory difficulties are the most common cognitive problems that is devoted to by cognitive rehabilitation. Efforts to reduce or avoid everyday problems is the aim of cognitive rehabilitation. Author discusses methods for individuals with memory deficits to be assisted in living independently and as adequately as possible within their own most appropriate environment. Goals for treatment can include: - A goal-oriented approach that is developed by the memory-impaired individual, family members and caretakers, and the rehabilitation staff and medical professionals. - Goals should be reasonable with deadlines. - Patient's behavior when goal is obtained should be clearly explained. - Goals should be broken down into smaller short-term goals and attempted to be achieved over time. - Reduce emotional problems associated with memory impairment. - Compensate for and improve learning in people with memory deficits. - Provide environmental

					adaptations for memory-impaired individuals. This may include reducing or avoiding the need for memory (i.e., rely on cueing instead).
Maj, M., Satz, P., Janssen, R., Zaudig, M., Starace, F., D'Elia, L., Sughondhabirom, B., Mussa, M., Naber, D., Ndetei, D., Schulte, G., & Sartorius, N. (1994).	Multi-site study using neuropsychological test battery validated for cross-cultural use examining neurological effects of HIV-1 infection and AIDS.	Asymptomatic HIV-1 seropositive and symptomatic HIV-1 seropositive subjects compared with HIV-1 seronegative controls	The WHO/UCLA Auditory Verbal Learning Test, Color Trails 1 and 2, The WHO/UCLA Picture Memory Interference Test, a rating scale of functioning daily living activities, a neurological module, and a structured interview for the diagnosis of dementia	Cross-sectional	Prevalence of neurological impairment was significantly higher in symptomatic HIV-1 seropositive individuals, compared with seronegative controls. Data suggests that the risk of subtle cognitive deficits may be increased in asymptomatic stages of HIV-1 infection, but that these deficits are not associated with neurological changes. Additionally, deficits do not seem to affect the subjects' social functioning.

Validity

Brickman, A. M, Cabo, R., & Manly, J. J. (2006).	See Rationale for Culturally Responsive Services.				
Harker, K. T. & Connolly, J. F. (2007).	Study conducted to determine if recognition/familiarity memory can be measured through direct observation of brain activity by recording event-related potentials during administration of a neuropsychological test (ERP).	18 healthy participants (11 females, 7 males) with no history of epilepsy, neurotrauma, psychiatric disorders, languag	Differences in ERP in relation to new and old CVMT items.	Correlational	Authors aimed to understand the neurophysiology of recognition memory, and assess whether using cognitive assessment battery for patients whose nonverbal and/or verbal communication is impaired would be helpful. The Continuous Visual Memory Test (CVMT) is a computer-version instrument that

		e-related disorders, or audiological problems) from a university campus community.			allows for behavioral and ERP responses to be recorded simultaneously. Recognition memory was also examined offline, and behavioral performance was compared with performance from an alternate test using standardized procedures. Authors discovered the computerized ERP version of the CVMT allows for direct assessment of cognitive processes related to recognition memory, using neurophysiological responses. Results from this study corroborate with information provided by experimental neuroimaging research within traditional clinical neuropsychological assessment, delineating a link between functional and neurophysiological aspects of memory. Electrophysiological results from this study were able to discriminate memory performance for new and old stimuli of the CVMT.
Manly, J. J. & Echemendia, R. J. (2007).	See Rationale for Culturally Responsive Services.				
Mitrushina, M., Boone, K. B., Razani, J., & D'Elia, L. F. (2005).	Issues related to statistics and psychometrics in neuropsychological assessment is discussed.	N/A	N/A	Theoretical Discussion	Administration, scoring, and interpretation of results from neuropsychological assessment that are utilized in clinical

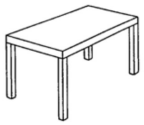
					practice must undergo critical evaluation prior to being used for decisions about a patient's cognitive status, diagnosis, prognosis, and treatment. This chapter reviews basic statistical concepts and its relevance to neuropsychologists. Accurate decisions based on test results must incorporate a clear understanding of the psychological phenomena and statistical properties of the test being used. Authors discuss standardization of raw scores, standard scores and normal distribution, as well as interpretation of infrequently scores or scores that are not normally distributed. A review of psychometrics is also provided, including reliability and validity information as it pertains to test selection and interpretation of results.
Perez-Arce, P. (1999).	See Rationale for Culturally Responsive Services.				

Strauss, E., Sherman, E. M. S., & Spreen, O. (2006b).	Psychometrics in neuropsychological assessment is reviewed.	N/A	N/A	Theoretical Discussion	Authors report on reliability and validity issues in relation to the process of neuropsychological assessment. A broad overview of important psychometric concepts in neuropsychological assessment and the important issues needed for consideration are reviewed to assist clinicians in critical evaluation of a test for clinical use. The psychometric properties of a test determine the test's quality. This may include reliability, measurement error, temporal stability, sensitivity, specificity, and predictive validity. Additionally, methodology for obtaining normative data is extremely important for determine a test's psychometric properties. Statistical information is also reviewed, including frequency distributions of physical, biological, and psychological phenomena that occur across all individuals.

APPENDIX B

PMIT Images (Snodgrass & Vanderwart, 1980)

SHOW PICTURE LIST A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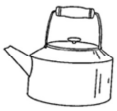
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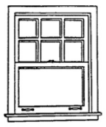
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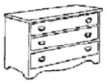
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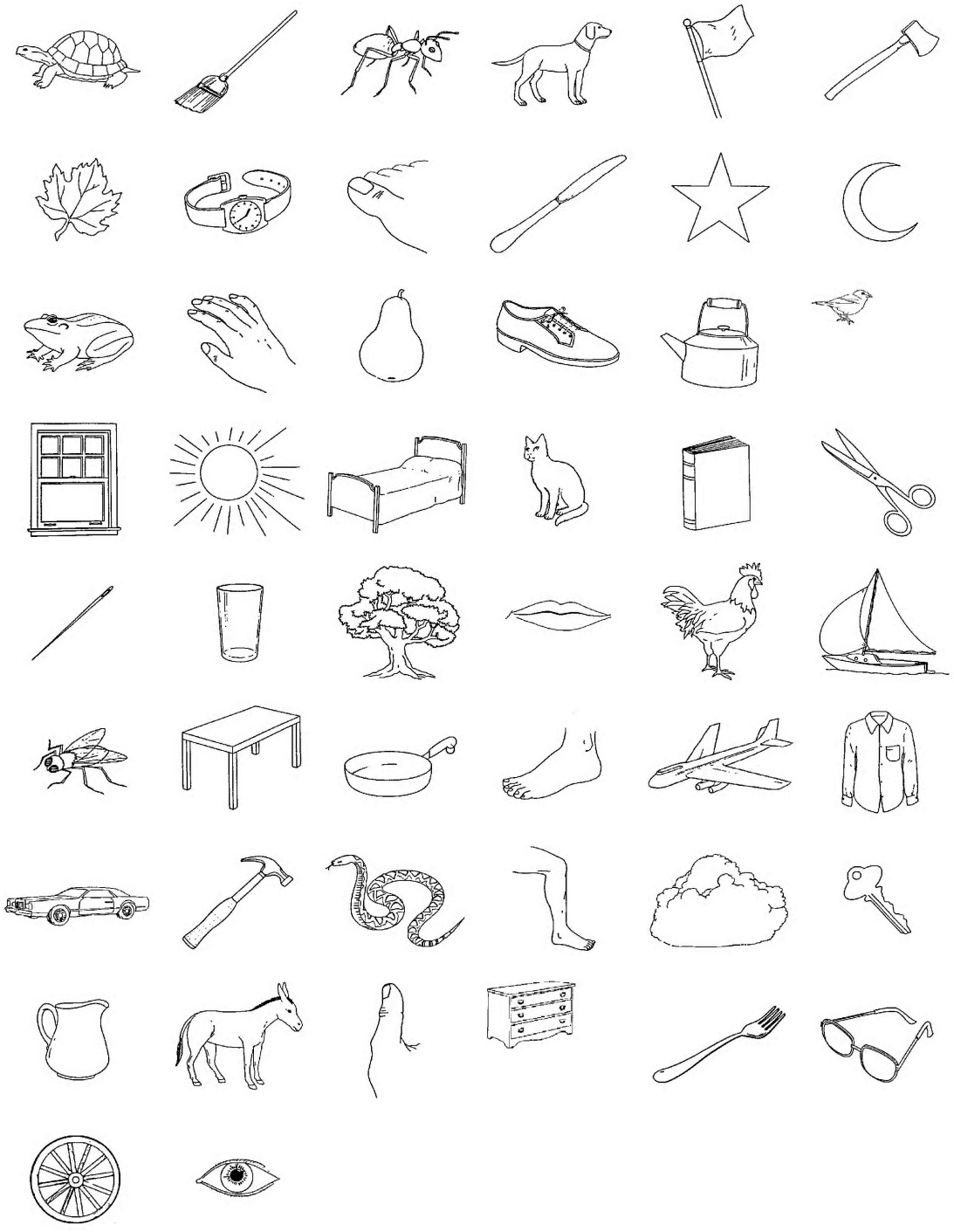

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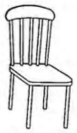

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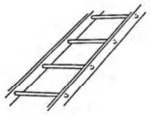

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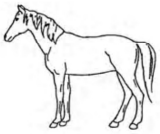

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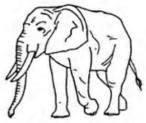

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ALL PICTURE LIST B

SHOW PICTURE LIST C

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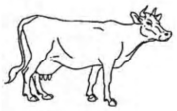

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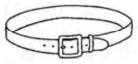

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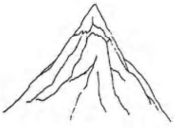

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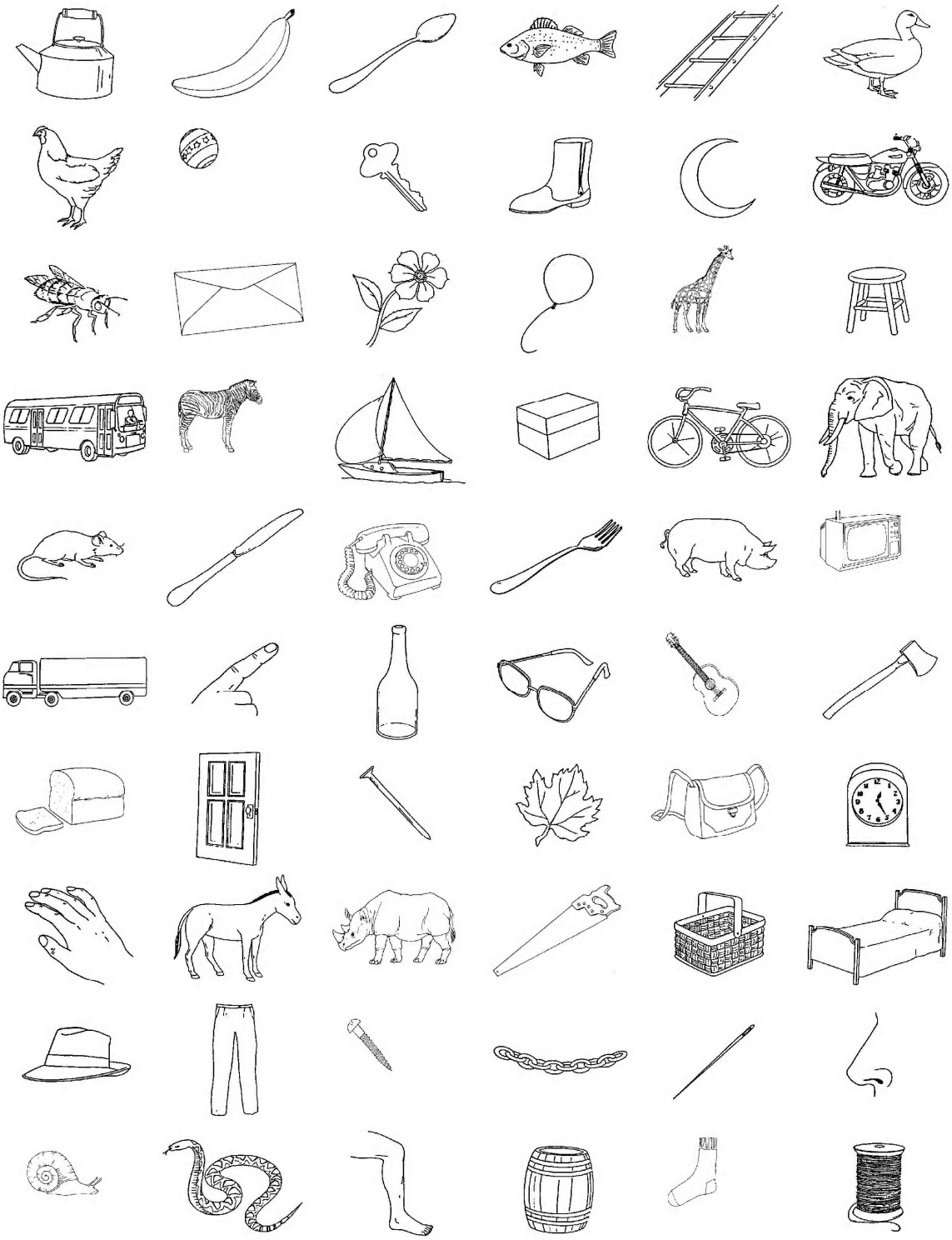
ALL PICTURE LIST C

ALL PICTURE LIST D



APPENDIX C

PMIT Demographic Questionnaire

Is this your first time performing the URI-UCLA Memory Interference Test? ☐ Y ☐ N

If not, please indicate what trial this is: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ >5

Last time performed this task (date and time): MMDDYY
HH:MM

Age: ☐ 18 ☐19 ☐20 ☐ 21 ☐22 ☐23 ☐24 ☐25 ☐26 ☐28 ☐>28

Gender: male☐ female ☐

Education COMPLETED: ☐High School ☐First Year ☐ Sophomore ☐ Junior ☐ Senior

☐ B.S. ☐ M.S. ☐ Ph.D./M.D. ☐ Post-Doc/Residency

Have you been in special education: ☐Yes ☐No

Race Ethnicity: ☐African American ☐Asian ☐Caucasian ☐ Latino
☐ Pacific Islander ☐ Interracial ☐ other

Country of Birth:

First Language:

Primary Language Use:

Language Spoken by Mother: by Father:

Handeness: ☐Right ☐Left ☐Ambidextrous
If left, family history of left handedness: ☐Yes ☐No

Hand used for test ☐dominant ☐Non-Dominant

Ever had loss of consciousness: ☐No ☐Yes, if yes duration:

Loss of consciousness incident: ☐head injury ☐intoxication ☐exhaustion ☐other ☐ N/A

Current Alcohol Use: ☐No ☐Yes, if yes frequency:

Current Tobacco Use: ☐No ☐Yes, if yes frequency:

Current Caffeine Use: ☐No ☐Yes, if yes frequency:

How many hours ago did you have coffee: ☐0 ☐ 1 ☐2 ☐3 ☐ 4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐>9 ☐ N/A

How many hours ago did you have nicotine: ☐0 ☐ 1 ☐2 ☐3 ☐ 4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐>9 ☐ N/A

How many hours ago did you eat last: ☐0 ☐ 1 ☐2 ☐3 ☐ 4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐ >9

How many hours did you sleep last night: ☐0 ☐ 1 ☐2 ☐3 ☐ 4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐ >9

How do you feel mentally right now: ☐very good ☐ good ☐o.k. ☐ bad ☐ very bad

How do you feel physically right now: ☐very good ☐ good ☐o.k. ☐ bad ☐ very bad

How do you feel emotionally right now: ☐very good ☐ good ☐o.k. ☐ bad ☐ very bad

APPENDIX D

PMIT Computer Instructions

INSTRUCTIONS FOR THE URI UCLA PICTURE MEMORY AND INTERFERENCE TEST

Introduction to Picture Memory Interference Test:

· You are going to see images that you need to remember. You will be shown these images one at a time. The words are things that exist in the real world.

· Please click the line below when you are ready to see and remember the images.

After Presentation of Images:

· Those were the images that you needed to remember. Now we are going to show you some more images. Some of the words will be the ones you just saw, other images will be new. You are to identify which set of images you just saw.

· Press the right arrow key if the image is one you just read or press the left arrow key if the image is new. Make sure you work as quickly as possible. Click on the line below when you are ready to see the images and make your decisions.

End:

· The test has ended. Thank you for your participation. You can return to the home page by clicking on the line below.

Choice Reaction Time Test Instructions:

· You are going to see the image of a “square” or the image of a “circle.” Press the right arrow key (yes) if the image was a “square” or press the left key (no) if the image was not a “square.” Make sure you work as quickly as possible.

· Put your index finger next to both of the arrow keys (right and left). Make sure that you

are an equal distance to both arrows (next to the arrow that points down on your keyboard).

· Please click the line below when you are ready to begin.

APPENDIX E

UCLA Informed Consent

University of California, Los Angeles

RESEARCH INFORMATION SHEET

Undergraduate Research Initiative (URI) for Life Sciences 2 Students about Cognitive Processing

You are asked to participate in a research study conducted by Gaston Pfluegl, Ph.D., Director of the Life Sciences Laboratories at UCLA and Enrique López, Psy.D., Clinical Assistant Professor from the Semel Institute for Neuroscience & Human Behavior in the Department of Psychiatry and Biobehavioral Sciences at the University of California at Los Angeles. You were selected as a possible participant in this study because you are enrolled in Life Sciences. Your participation in this research study is voluntary.

PURPOSE OF THE STUDY

The primary purpose of the study is to provide undergraduate students with a database on which they could understand research design. The study will cognitively assess undergraduate students through computerized measures in order to create a research database.

PROCEDURES

If you volunteer to participate in this study, we would ask you to do the following: In one of the Life Sciences 2 labs, you will have the option to perform a variety of computerized measures that involves cognition.

If you wish to participate, you will only complete one of the computerized tests. Each test takes approximately 15 minutes to complete. In addition, you will fill out a computerized questionnaire at the beginning of the test. You will have the right to not answer any of the questions that you may choose not to answer. This questionnaire will also take approximately 15 minutes to complete. No identifiable information will be asked of you.

Your responses will be sent automatically and electronically to an aggregated database. Your specific scores will not be available to you or anyone. This will provide you and others with the opportunity to conduct research and generate hypothesis.

While you are conducting research hypothesis, we will only provide you with demographic information about a subgroup if that group is larger than 50. This assure

your and other's anonymity. In addition, it will assist in conducting good research design with an adequate group size.

POTENTIAL RISKS AND DISCOMFORTS

I understand that the study described above may involve the following risks and/or discomforts: I may get a bit tired or anxious, but I will be encouraged to make breaks to rest should I so desire; however, there are no known physical risks.

POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

There may be specific benefits which will accrue to you as a result of participation in this study, including knowledge about how research is conducted at all phases of the design. Additionally, this study will provide you and others with the opportunity to conduct research with an available database. The possible benefits to humanity include better ways of evaluating individuals cognitively.

PAYMENT FOR PARTICIPATION

You will not receive monetary compensation for participation in this study.

CONFIDENTIALITY

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law.
Confidentiality will be maintained by means of sending your responses automatically and electronically to an aggregated database. No identifiable information will be asked of you (e.g., names, date of birth, identification numbers). Additionally, no untrained individuals will have direct access to the database.

PARTICIPATION AND WITHDRAWAL

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You are not required to participate in the assessment portion of the study in order to use the database for your lab assignment.

IDENTIFICATION OF INVESTIGATORS

If you have any questions or concerns about the research, please feel free to contact: Gaston Pfluegl, Ph.D., who can be reached at (310) 794-4113; Director of the Life Sciences Core Laboratories, UCLA, 2305 Life Sciences Building, Los Angeles, CA 90095-1606 and/or Enrique Lopez Psy.D. who can be reached at (310) 206-8100 and/or (310) 892-3351; 7600 Westwood Plaza, Suite C8-735, Los Angeles, CA 90024-1759.

RIGHTS OF RESEARCH SUBJECTS

You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal rights because of your participation in this research study. If you have questions regarding your rights as a research subject, contact the Office for Protection of Research Subjects, 2107 Ueberroth Building, UCLA, Box 951694, Los Angeles, CA 90095-1694, (310) 825-8714.

APPENDIX F

Permission from Dr. Gaston Pfluegl, Ph.D.

UNIVERSITY OF CALIFORNIA, LOS ANGELES **UCLA**

Gaston M.U. Pfluegl, Ph.D.
Academic Coordinator / Lecturer
Program Director
Undergraduate Research Initiative
Life Science Core Laboratories

LIFE SCIENCES CORE CURRICULUM
Box 951606
LOS ANGELES CA 90095-1606
Office: (310) 794-4113
email: gaston@lifesci.ucla.edu

November 6, 2010

Re: PMIT

To Whom It May Concern:

I, Dr. Gaston Pfluegl, Ph.D., hereby give Shereen Kianmahd, M.A. full permission to use Picture Memory Interference Test data from the Undergraduate Research Initiative at the University of California, Los Angeles. I understand Shereen will be using the data for clinical dissertation purposes as part of the requirement for the Doctor of Psychology (Psy.D.) program at Pepperdine University. I also give Shereen permission for possible publication purposes at a later date.

Sincerely Yours,

Gaston M.U. Pfluegl, Ph.D.