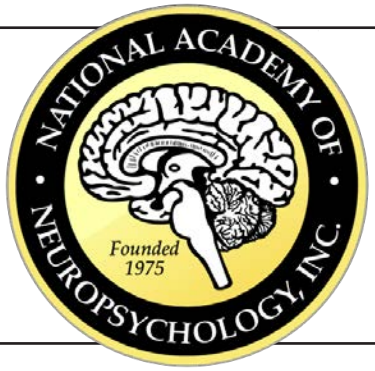

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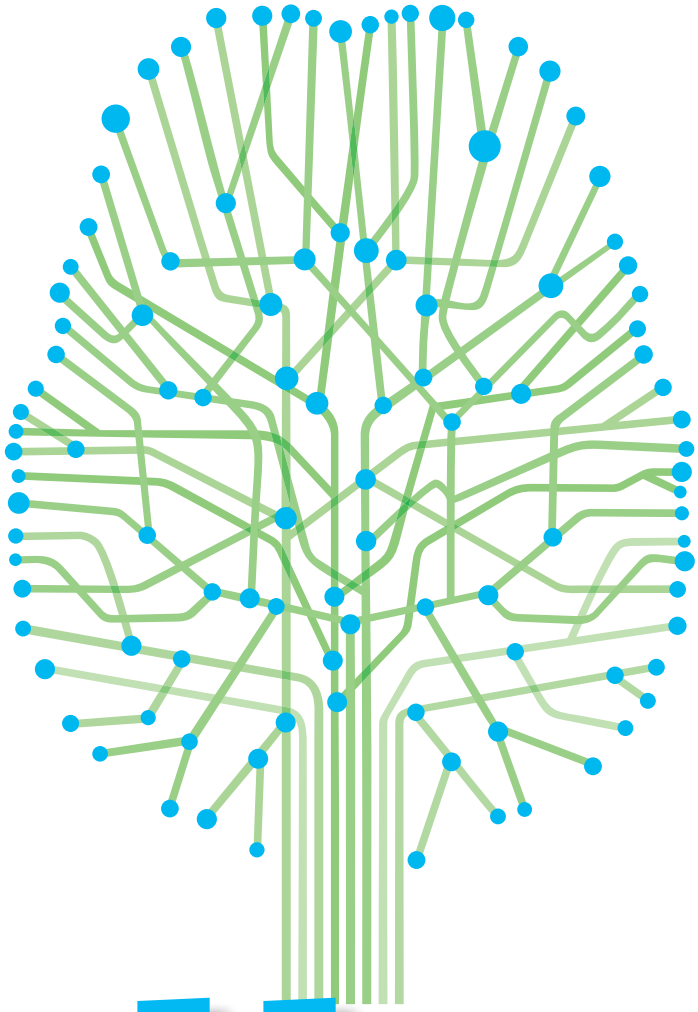

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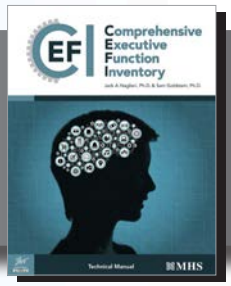
Comprehensive Executive Function Inventory

Jack A. Naglieri, Ph.D. & Sam Goldstein, Ph.D.



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Editor's Corner

Peter Arnett, Ph.D.,
NAN Bulletin Editor

As the Editor of the *NAN Bulletin*, I am pleased to present to you our latest issue, with a focus on diversity issues as they relate to clinical neuropsychology. Diversity issues have been studied for many years in clinical neuropsychology, though much still needs to be learned. In the Professional Issues section of this *NAN Bulletin*, three experts address core issues of interest in the area of diversity issues in clinical neuropsychology that are relevant to practitioners. Morlett-Paredes and Arango-Lasprilla review the myriad factors that practitioners need to take into account when assessing Hispanic clients. Another piece by Kumar and Sadasivan explores the complexities involved in conducting neuropsychological assessments in India. Finally, Rabin and colleagues' contribution presents the results of a survey that they conducted on practitioners about diversity issues in neuropsychology. Each of these fascinating pieces provides important clinical recommendations and should help to enlighten readers about diversity issues in clinical neuropsychology.

The Student Corner section of the *Bulletin* includes a discussion by a current Latina doctoral student, Cristina Roman, about her experience as a doctoral student in clinical neuropsychology. She shares some of her experiences growing up as an under-represented minority in the U.S., and how she has come to appreciate the importance of diversity issues as she has proceeded through her training. She also has a number of recommendations that students will find interesting in terms of opportunities to get more involved in organizations and initiatives that address diversity issues in clinical neuropsychology. In the Journal Section, a recent article published in the *Journal of the International Neuropsychological Society* is reviewed that focuses on possible differences in cognitive trajectories of older Latinos and non-Latinos over approximately a six-year period using a comprehensive neuropsychological battery to resolve some inconsistencies in past research. This interesting study will provide readers with insight into how they approach their clinical work when important decisions need to be made regarding the likelihood of cognitive decline in their elderly patients.

Of note, Dr. John Randolph has continued to serve as Associate Editor of the *Bulletin*, and was instrumental in working with me on completing this issue. We also appreciate the continued help from the members of the NAN Publications Committee, especially the chair of this committee, Dr. Lee Ashendorf, who provided valuable input on the contributions to this issue.

Peter Arnett, Ph.D.,
Professor & Director of the Neuropsychology of Sports Concussion and MS Programs at Penn State University
NAN Bulletin Editor

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- Neuroimaging for Neuropsychologists
- Neuropsychological Assessment of Hispanics Residing in the US: Ingles, Español o dos? (English, Spanish or both?)
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- Introduction to Sports Neuropsychology

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Student Corner

My Experience as a Latina Graduate Student in Clinical Neuropsychology

Cristina A. F. Roman, M.S.
Penn State University

Aprovecha y trabaja duro para que salgas adelante – work hard and take advantage of opportunities to succeed – my grandmother would tell me after each academic milestone. Despite being two of the most intelligent, well-read people I have ever met, opportunity was not something that was easily available to my grandparents. My grandfather, a 6th grade graduate, came to the United States in the 60s with little money but a strong work ethic. Unable to afford a place to stay or even a watch, he would sleep in a car, and without a way to tell the time, he would arrive at WC Disposal Co. hours before it opened to try to secure work for the day. He worked hard so that we could have what he did not; he worked hard so that we, his family, could have a chance; he worked hard so that we could have opportunities. Being privy to this struggle and the struggles faced by my family members who were never given the opportunity to pursue an education has instilled in me a deep respect and dedication to higher education. So I dreamed and worked, and in 2012 my work paid off – I, the girl who slept with a brain model on her nightstand, was accepted to Penn State's clinical psychology program and was one step closer to her goal of becoming a clinical neuropsychologist. The road was not easy, however. As a first-generation Mexican American, it was difficult to balance familial obligations with my academic and professional development, and the juxtaposition between the two often left me struggling to maintain an identity affirmed by both worlds. Yet, through these difficulties I learned and grew, both personally and academically, and as a result, I was able to achieve equilibrium between my roots and academic ambitions.

After matriculating to Penn State and becoming more privy to the disparities of Latinas in psychology and neuropsychology, however, that equilibrium I had fought so hard to achieve began to waver. According to the National Center for Education Statistics,[1] of all doctoral degrees in psychology awarded to women in 2014-2015, only 8% were to Latinas, a stark contrast to the 68% awarded to White women over the same time period. What's more, Latinas have, time and time again, been shown to be significantly underrepresented in STEM fields, including neuropsychology, as a whole.[2] This chronic imbalance was befittingly summed up in a 2015 Monitor On Psychology issue,[3] noting: "Ethnic minorities in particular are horrendously underrepresented in neuropsychology."

These disparities also cross over into the training of students and the care we provide for Latina/o populations. To date, neuropsychology has largely been anchored toward non-minority populations (e.g., normative data, WEIRD research populations), and while some steps have been taken to try rectify this issue, the field has continued to fall short in providing equitable care for culturally and linguistically diverse patients, largely due to insufficient neuropsychological training.[4] In fact, in a comprehensive survey of neuropsychologists residing in the United States, most indicated that they felt like they needed additional clinical training in working with Hispanic populations, and overall, did not feel competent to work with Hispanic patients, despite having reported conducting large numbers of assessments with this group.[5] A lack of emphasis on 'cultural competence' in training can even be seen in the Houston Guidelines, where out of 2,035 total words, only 11 (0.5%) were found to be culturally relevant.[6]

Inequalities in the training and treatment of Latina/o individuals clearly exist in the field, but I have found solace in the work of programs, committees, and organizations aimed at increasing diversity, cultural awareness, and competence. The National Academy of Neuropsychology (NAN), for example, has a Culture and Diversity Committee aimed at "increasing knowledge of diversity issues and promoting the inclusion and affirmation of diversity."[7] The Association of Neuropsychology Students in Training (ANST),[8] in conjunction with the Society for Clinical Neuropsychology (Division 40), has also worked to improve the training of neuropsychology students by increasing knowledge, community, and leadership. Lastly, the Hispanic Neuropsychological Society (HNS)[9] was established to promote competent practice of neuropsychology with Spanish-speaking populations through networking, collaboration, training, mentorship, and facilitating the dissemination of valuable clinical and research information regarding neuropsychological practice with Hispanic populations.

I attended HNS's 2015 conference in Austin, Texas, which was largely focused on discussions around enhancing the Houston Guidelines to increase cultural competency in neuropsychology, both in terms of treating Hispanic patients and training future and current neuropsychologists. It was suggested that in order to start making strides to further increase cultural competence in neuropsychology, we as a field would need to "develop and implement comprehensive multicultural neuropsychological training standards" using an empirical approach.[10] A suggested framework would include awareness (i.e., assumptions, values, biases), knowledge and understanding (i.e., the impact of world view, sociopolitical influences), acquisition (i.e., appropriate assessment, intervention, and communication skills), and individuals and organizations.[6,10,11] What I personally took from this meeting is the importance of acknowledgement, open discussion, and action. That is, acknowledging that there *are* problematic discrepancies in the treatment and training of Latina/o individuals

and having a willingness to openly discuss these issues, despite the difficulty or discomfort that may accompany them. I feel that by making these issues a part of our everyday training and practice, cultural competence and humility will continue to grow.

In the end, I still sometimes struggle to maintain a balance between my cultural and academic worlds, but with organizations like those described above and continued advancement in the field for Latina/o trainees, I am able to maintain a stance of "resistance with accommodation," which allows me to hold onto my cultural roots, while at the same time actively working to make a positive impact on the field of neuropsychology, both academically and clinically.[12] However, I cannot do it alone, so I also urge you to work toward a more culturally diverse and competent field, because *juntos podemos*.

- Saludos,
Cristina Almeida Flores Roman

Cristina A. F. Roman is currently a 5th year doctoral student in The Pennsylvania State University's clinical psychology program (focus on neuropsychology). She is interested in identifying neural substrates of cognitive and affective dysfunction in multiple sclerosis using structural and functional MRI. She hopes to eventually translate multimodal neuroimaging findings into interventions and treatment for individuals suffering from neurological disorders.

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Review by Peter Arnett, Ph.D., Penn State University

Rationale for the Study:

Explore possible differences in cognitive trajectories of older Latinos and non-Latinos over approximately a six-year period using a comprehensive neuropsychological battery to resolve some inconsistencies in past research. A few prior studies have explored this issue, with two studies finding no differences, and a few other studies finding differences on some measures but no differences on others. However, most studies have used global measures of cognitive functioning. Additionally, possible moderating factors between groups, including SES, health differences, and possible group differences in susceptibility to learning effects have not been explored.

Overarching Goal:

Compare trajectories of change in cognitive abilities in older Latino and non-Latino individuals. Individuals were selected from three longitudinal cohort studies if they did not have dementia at enrollment.

Methods:

Participants: The three longitudinal cohort studies from which participants were drawn were diverse. One was The Religious Orders Study which began in 1994 and included Catholic priests, monks, and nuns from across the United States. The second study was The Rush Memory and Aging Project that began in 1997 and included lay persons from the Chicago metropolitan area. Finally, The Minority Aging Research Study began in 2004 and included individuals from the Chicago metropolitan area.

The study sample was derived from 3336 persons without dementia at baseline who had completed at least one annual follow-up assessment. This included mostly non-Latinos (3207) and a few Latinos (129). From this sample, the authors formed two groups consisting of 104 participants each who were matched at baseline on education, race, and number of cognitive evaluations. The groups were also similar in gender distribution, baseline Mini-Mental Sate Examination (MMSE) scores, and depression. Additionally, both groups had a mean age in their mid-70's at baseline.

Procedures: All participants were administered a battery of 18 cognitive tests yearly, with the sessions taking about an hour. Tests included the MMSE, and 17 other tests that were then used to create composite scores measuring the domains of Episodic Memory (e.g., Logical Memory), Semantic Memory (e.g., Boston Naming Test), Working Memory (e.g., Digit Span), Perceptual Speed (e.g., SDMT), and Visuospatial Ability (e.g., JLO). A global composite cognitive score was also calculated that included all of the individual tests.

Results:

Analyses took into consideration a number of interactions between Latino group and things like age and sex, but the core of the analyses involved using linear mixed-effects models adjusted for age at baseline, sex, and education.

There was a main effect for a decline in each cognitive domain during the study period; however, there was no interaction with group and time, with the groups declining at a statistically equivalent rate. Of note, the groups did not differ significantly on baseline cognitive function in any core domain. Interestingly, the rate of cognitive decline was faster in older compared with younger participants but, again, there was no significant interaction with Latino group.

The authors also conducted some sophisticated follow-up analyses to determine whether there were any differences in learning effects from repeated testing between groups. Both groups did show an initial learning effect, but it was statistically equivalent and, when this effect was controlled for, both groups showed an overall decline over time. The authors also examined potential confounds involving diabetes, smoking, and early household SES. All of these factors have been found to be related to cognitive health in prior studies, and the authors of this study also found that their Latino and non-Latino groups differed significantly on each of these variables. They controlled for these potential confounds in subsequent analyses, but again, there was no difference found between groups in terms of rate of cognitive decline over time.

To sum up, then, this study showed that older Latino and non-Latino groups showed comparable initial practice effects and then decline over time on a typical clinical neuropsychological battery surveying five different core cognitive domains often affected by aging. This was true even after controlling for group differences in childhood SES, diabetes, and smoking. Thus, compared to older non-Latinos, Latinos appear to show similar rates of cognitive decline with age.

One important limitation of this study is that the authors focused exclusively on group level analyses. As shown in their Figure 1, there appeared to be marked individual differences in patterns of decline over time. Although no mean differences in decline between groups were found, it would have been interesting to explore decline at an individual level using reliable change scores.

This would have allowed the authors to identify the number of participants in each group who showed reliable decline from, say, baseline to the last time point tested (i.e., year six). They also could have examined reliable change from the point after the practice effect had dissipated to the last time point tested. The authors could then have determined whether there were group differences in the proportion of participants who showed reliable decline. Furthermore, these authors could have compared individuals showing reliable decline versus those who did not within each group to see if different factors were associated with such decline across groups.

So what is the clinical meaning of these interesting results? The main take home point is that older Latinos do not differ from older non-Latinos in rates of decline with age, at least over a six-year period. This was true despite the fact that the Latino group had significantly more individuals with diabetes, and their SES in childhood was lower overall. More research is clearly necessary to explore this important cross-cultural issue, but this was a carefully designed and methodologically sound study that can help to guide clinicians' expectations about cognitive decline in Latinos in clinical care.

Dr. Peter Arnett received his Ph.D. in Psychology (Clinical) from the University of Wisconsin – Madison, and completed a post-doctoral fellowship in Clinical Neuropsychology at the Medical College of Wisconsin under the direction of Drs. Stephen Rao and Thomas Hammeke. He is currently a Psychology Professor and Director of the Neuropsychology of Sports Concussion and multiple sclerosis (MS) Programs at Penn State University. Dr. Arnett's research has focused on clinical neuropsychology, with an emphasis on studying secondary influences on cognitive functioning in persons with MS and sports-related mild traumatic brain injury (concussion). He is a fellow of the NAN, past winner of NAN's Nelson Butters Award for Research Contributions to Clinical Neuropsychology, and past winner of the Herndon Award for the Outstanding *International Journal of MS Care* for the 2013 year. Dr. Arnett was the Program Co-Chair for the 2010 Mid-Year Meeting of the International Neuropsychological Society (INS), and is a past board member of the INS. Dr. Arnett is the author of over 130 research articles and book chapters, and has edited a book entitled, *Secondary Influences on Neuropsychological Test Performance*. Dr. Arnett is also currently working on an edited book entitled, *Neuropsychological Perspectives on Sports-Related Concussion* that will be published by the American Psychological Association in early 2018. He is an editorial board member of several journals, and has received grant funding from the National MS Society, NIH, and NIMH.

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Factors to Take Into Account When Assessing a Hispanic Client

Alejandra Morlett Paredes, M.S.
Virginia Commonwealth University

Juan Carlos Arango Lasprilla, Ph.D.
BioCruces Health Research Institute, Cruces University Hospital

Hispanics in the United States

The term "Hispanic" has been used to identify a number of cultural or ethnic groups. According to the Merriam Webster dictionary, being Hispanic relates to being a person of Latin American descent (Mexico, Central and South America) living in the United States (U.S.).[1] Most individuals of Hispanic origin living in the U.S. are from Mexico (63.4%), followed by Puerto Rico (9.5%), El Salvador (3.8%), Cuba (3.7%), the Dominican Republic (3.3%), and Guatemala (2.4%). Although Hispanics are generally a heterogeneous group, many do share some common characteristics including language, socioeconomic status, religion, and educational attainment.

According to the most recent U.S Census, the Hispanic population in the U.S is the nation's largest ethnic minority, constituting 17.6% of the nation's total population with 56.6 million inhabitants.[2] This number is projected to increase to 119 million by the year 2060. Research has shown the risk of certain types of chronic serious illnesses (e.g., diabetes, heart disease, cancer) and injuries (e.g., TBI) that involve cognitive deficits are disproportionately higher in Hispanics.[3] This phenomenon may be influenced by factors associated with ethnic minority status such as poverty, limited educational opportunities, dangerous environments, limited access to health care, discrimination experiences, and/or culture-specific health behaviors.[4]

An important aspect of a neuropsychological assessment consists of the use of batteries of psychometric tests aimed at measuring the cognitive performance of individuals on different tasks and comparing these performances with a normative group. The majority of psychological research has been conducted on individuals from Western, Educated, Industrial, Rich and Democratic (WEIRD) backgrounds that are unrepresentative of the global human population. This phenomenon has been described as the "WEIRD problem."[5] Studies have revealed that normative data for the general population are not appropriate for individuals who are members of ethnic minority groups. For instance, it has been reported that some minority groups in the U.S., especially Hispanics and African Americans, perform well below that of their Caucasian counterparts on a wide range of neuropsychological tasks.[6] Research has demonstrated that neuropsychological test performance in Hispanics could be influenced by multiple factors, such as age, gender, education, socioeconomic status, language, and race/ethnicity.[7]

Given the growing Hispanic population in the U.S. and the high risk of presenting diseases or injuries that lead to cognitive impairment, it is imperative that neuropsychologists understand why Hispanics could perform worse on cognitive tests as compared to their Caucasian counterparts. This article offers an overview of some variables that may influence neuropsychological performance in Hispanics living in the U.S. A brief description of some of the potential factors associated with cognitive performance in Hispanics will be presented, and recommendations for more appropriately evaluating this population will be discussed.

Education

The effects of education on neuropsychological test performance have been well established in the literature. Previous studies have shown that higher levels of education predict sustained cognitive function in old age and reduce the rate of cognitive decline.[8] In addition, more years of education are associated with higher test performance.[9] According to the 2015 U.S Census, Hispanics reported the lowest percentage of education at every level, from high school graduate or more (67%) to advanced degrees (5%).2 This could be due in part to many Hispanic individuals coming to the U.S. to work in order to help their families back home, thus limiting the number of Hispanics receiving an education in the U.S. Also, most Hispanics in the U.S are native born. However, of the 56.6 million people who identify themselves as Hispanic,[10] approximately 35% (19.4 million) are immigrants.[11] As immigrants, the majority of these individuals received their education in their native countries, not the U.S., which has been found to be an important factor when evaluating cognitive performance in Hispanics.[12,13]

Further, quality of education is critical because most neuropsychological tests used with Hispanics use normative data that have been stratified according to years of education, without attention to quality of education. Many Hispanic immigrants have levels of education below the available normative groups for many neuropsychological tests. Studies have shown educational levels to influence cerebral organization such that differential processing styles and skills emerge among Hispanic individuals with higher levels of education correlating with better performances and vice versa.[13] This has been well documented on verbal neuropsychological tests.[14] However, less attention has been paid to the effects of education on non-verbal test performance. Quality of education is also an important consideration in the context of those who immigrated as adults to the U.S. from rural or disadvantaged backgrounds and who have received academic training in a poor educational system. For example, a Hispanic's

educational level may indicate the same number of years of education as individuals from the U.S., but even having attended the same number of years, Hispanic individuals could have experienced a lower quality of education.[15] In addition, grades may be repeated more frequently in Latin America than in the U.S., reading achievement in Spanish may surpass equivalent grade level reading achievement in English, and developmental norms and adaptive behavior expectations may differ.[16]

Many of the tests used with Hispanics do not have normative data that takes into consideration education and/or education quality (e.g., adults that emigrated to the U.S. from rural and/or disadvantaged settings with poor educational systems). Perhaps even more important is the fact that the majority of these tests have been developed and standardized with "WEIRD" populations. In the context of neuropsychological assessment with Hispanics, education has to be carefully measured. It is of great importance to take into consideration the effects education has on neuropsychological testing in order to reduce the possibility of misinterpreting test results as showing cognitive impairment in individuals with lower education levels when there is none. However, it is important to point out that individuals with higher levels of education do not necessarily have more abilities than individuals with less years of education and vice versa. Cognitive performance is evaluated by the abilities that individuals with more education were trained in, and is not surprising that those individuals would outperform those with less education. Therefore, it is preferable to develop and adapt neuropsychological tests that take into account the effect of education and education quality.

Acculturation

Many definitions of acculturation exist, all of which generally describe acculturation as the adaptation to or learning of a second culture (e.g., beliefs and values of one culture adopted or acquired by another culture[17]). A multidimensional approach to understanding acculturation is the view that acculturated individuals can identify and affiliate with both their traditional cultural group and the new culture, separate of each other and in different degrees.[18] If a member of a minority group adopts the lifestyle and values of the dominant culture, the individual is said to be "acculturated". However, many individuals from minority groups tend to remain immersed in their own cultural traditions and are referred to as "traditional" or non-acculturated. Some participate in the traditions of their own culture and those of the predominant society. These individuals are described as "bicultural" individuals.[19]

An individual's level of acculturation is an essential factor that needs to be considered when evaluating Hispanic individuals. Studies have shown that over time, patterns of behavior of Hispanics living in the U.S tend to become more aligned with American standards. Further, level of acculturation is associated with test performance.[20,21] While some Hispanic individuals upon arrival to the U.S. exhibit little acculturation to their new society, others acculturate right away. Acculturation may depend on many factors such as age of the individual or the geographic area in which they reside.[22] For example, a newly arrived Mexican immigrant who settles in a Hispanic community in Southern California may be better able to retain Spanish language skills and cultural characteristics of his or her country of origin compared to an immigrant who moves to a rural area in Illinois and is isolated from other Spanish-speaking individuals.

The issue of acculturation is important for neuropsychologists, as it helps clinicians to make important decisions related to the evaluation process.[23] Importantly, there is evidence that suggests repeated experiences such as continuous engagement in cultural practices (e.g., participating in the new culture) influences neural structure and cognition.[24] Many factors commonly associated with acculturation have been found to affect language tasks in Hispanics such as naming, list learning, verbal fluency, repetition, attention, and receptive and expressive vocabulary.[21] Important variables include the amount of time an individual was educated outside the U.S., the amount of English spoken, age of entry to the U.S., and the length of time spent living in the U.S. Acculturation is a very important factor in the assessment of Hispanics and neuropsychologists should take cultural identity and level of acculturation into consideration when assessing this population.

Bilingualism

The majority of Hispanics in the U.S. (40 million) speak Spanish as their primary language; however, linguistic diversity is high with numerous dialects and languages spoken.[25] It is estimated that more than half (59%) are bilingual.[2] It has long been presumed that being bilingual affects the developing brain.[26] In general, research has suggested bilinguals' verbal abilities in both languages to be weaker than monolingual speakers. For example, in comparison to monolinguals, bilingual children and adults have a smaller vocabulary in the second language.[27] On picture-naming tasks (e.g., the BNT), bilingual individuals are slower and less accurate.[28] On verbal fluency tasks (e.g., semantic fluency), serious deficits for bilingual individuals have been found, even if responses can be provided in either language.[29] Moreover, bilinguals have slower responses to comprehension and production of words even when responding in their dominant language.[30] In fact, some research findings suggest that bilingual individuals are at risk for language delay or language disorder, reflecting poor bilingual and cognitive abilities.[31] The extant literature suggests that a bilingual individual who is not dominant in a specific language will perform worse if the test is not in the language of dominance. Nevertheless, it should be highlighted that negative results do not necessarily reflect an individual's true cognitive abilities, as cognitive performance could be higher than observed when assessing this population.

As the Hispanic population increases, the need for appropriate neuropsychological assessments in their language also increases. Testing bilingual individuals can be even more challenging because the degree of fluency in either language varies according the context in which the individual is found. In other words, a person can use Spanish at home to communicate with family and English in school or job settings, such that each language is dominant in a particular setting. So, bilingualism adds variability to the complex task of testing Spanish speakers. It is also of vital importance to develop and adapt neuropsychological tests that not only take into account whether an individual is bilingual, but also consider the country of origin, the specific languages a bilingual individual speaks, age of acquisition of the second language, education levels, and the context in which both languages are used. All of these factors can have a significant impact on neuropsychological assessment.[32]

There is a great demand for neuropsychologists to assess bilingual patients and create working hypotheses about any perceived differences on test performance between bilingual and monolingual individuals. It is of great importance to determine the patient's language proficiency at the beginning of an evaluation through formal and informal approaches in order to establish the most appropriate language for the evaluation.[16]

Test Translations

Cognitive assessment tools are typically developed in a particular culture at a particular time, but the majority of these have been developed with "WEIRD" populations.[5] The use of these tools in

non-WEIRD population (for example, Hispanic individuals living in the U.S.) can lead to inaccurate diagnoses. There are important differences between languages that mean scores and norms do not fully translate from one language to the other. For example, several tests norms that do not fully transfer between English and Spanish include verbal fluency,[33] oral word reading,[34] and Digit Span.[35] A major misconception is that testing Spanish speakers simply involves translating a test into Spanish, assuming language is the only problem needed for proper adaptation. However, there are several literal translations from English to Spanish that do not reflect the original content well. For example the phrase "I feel blue" on a depression inventory does not make sense when translated into Spanish ("Me siento azul").

Other problems that need to be taken into account are related to sub-cultural group differences, as not all vocabulary in Spanish is understood or has the same meaning within Latin American countries.[36] Spanish speakers share Spanish as a universal language, but important differences exist in words, phrases, and expressions depending on an individual's country of origin. Simply translating a neuropsychological test to Spanish does not fully assure it will be applicable to everyone who speaks the language. For instance, in Chile a T-shirt is called "polera" and in Argentina is called "remera." For the most part, Chileans would not be able to understand what "remera" is and vice-versa. As another example, the word "necio" (roughly translated as "fool" in English) has a different meaning in Spain ("stupid"), Colombia ("hyperactive") and México ("obstinate").

Careful translations by people knowledgeable about the culture's tests must be done to identify whether translated tests are measuring what they intend to measure. The process of translation is critical, as the value of the tests does not solely depend on translation, but requires a deep understanding of each factor item and scale of the test.[37] Culturally competent translation requires instrument items to be changed and adapted to create cultural meaningfulness to accurately capture the meaning of the original items.[16]

Conclusions

Overall, this brief report highlighted some of the main issues and challenges of conducting neuropsychological testing with Hispanics and factors that may influence cognitive performance. Research indicates that cognitive test performance in Hispanics can be influenced by multiple factors, such education, bilingualism, and acculturation, among others. Regarding the availability of neuropsychological measures and normative data for use with Hispanic populations, the majority of the instruments used with Hispanics are adaptations of North American tests and standardized with American norms in "WEIRD" populations.[38] Using tests with normative data from other cultures can be problematic, as described by the studies in this review paper.

During the past three decades, a great number of neuropsychological tests used with Hispanic individuals in the U.S. have been translated but not adapted correctly with sufficient normative data.[39] Before 2009, only a limited number of studies that focused on the standardization of neuropsychological tests existed in this population. Despite the fact that the intention of these studies was to develop, validate, and standardize various neuropsychological instruments for use with Hispanics, the majority of studies had small sample sizes, restricted age ranges, or were concentrated to a single geographic area. As a result, neuropsychological diagnoses among this population may be inaccurate and non-generalizable. However, there have been recent multisite efforts to increase normative data for various Hispanic groups,[40,41] including current work with children and clinical populations in Spain and Latin American countries (J.C. Arango-Lasprilla, personal communication, July 15, 2016).

Despite the contributions to date, a number of challenges still exist to further develop Hispanic neuropsychology in the U.S. It is important for neuropsychologists to enhance cultural competency and improve assessment of Hispanics. Neuropsychologists should validate current neuropsychological tests with Hispanic populations taking into account variables such as education, acculturation, bilingualism, and proper language and cultural translations. In addition to creating new and culturally relevant instruments for Hispanic individuals living in the U.S., there is an established need to foster national collaborations with researchers and clinicians with the purpose of increasing multicenter studies dedicated to the standardization of neuropsychological tests in this population.[40]

Recently, the Hispanic Neuropsychology Society and the National Academy of Neuropsychology presented professional guidelines to enhance the quality of neuropsychological services for Spanish speakers living in the U.S.[16] Neuropsychologists were advised to a) carefully select the most appropriate language to conduct the assessment, b) apply caution when performing bilingual evaluation to prevent selected language, c) take into consideration the heterogeneity of the Spanish speaking individual when designing, selecting, administering, scoring and interpreting test scores, and d) integrate cross-cultural issues in testing to understand their effects on behavior.[42]

Clinical Take Home Points:

1. Neuropsychological tests are not culture free.
2. Cognitive test performance in Hispanics is influenced by multiple factors, including, but not limited to, education, gender, socioeconomic status, bilingualism, and acculturation.
3. Simply translating a neuropsychological test into Spanish does not guarantee that it will be understood or answered in the same manner by everyone that speaks that language.
4. Interpreting neuropsychological test results in Hispanic individuals using normative data from other cultures can be problematic and could lead to an incorrect diagnosis.
5. Acculturation is a very important factor in the assessment of Hispanics, and neuropsychologists should take cultural identity and level of acculturation into consideration when interpreting results of neuropsychological tests administered to this population.

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Dr. Juan Carlos Arango Lasprilla is currently a Research Professor at BioCruces Health Research Institute, affiliated with Cruces University Hospital in Bilbao, Spain. A neuropsychologist by training, Dr. Arango's areas of expertise are neuropsychology, traumatic brain injury, and rehabilitation. He has been instrumental in securing over $6 million dollars in grant funds for studies which primarily focus on cross-cultural neuropsychology and traumatic brain injury. In addition, he has received national and international recognition for his work in the area of brain injury and rehabilitation.

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Neuropsychology in India

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India is the largest country in South Asia spanning an area of 3,287,263 square kilometers.[1,2,3] It is the world's largest democracy and the 7th largest nation in the world. The country measures 3,214 kms from North to South and 2,933 kms from East to West. It is the second most populous country in the world with a current population (as of January 2017) estimated to be 1,326,801,576. More than 70% of this population lives in rural areas.[2] There are more than two thousand ethnic groups speaking about 22 official languages.[3] Several languages have different dialects making communication challenging. Although Hindi is the national language, only 41% of the people in India can speak this language. Literacy rates (as reported in 2014) are at 74.4%, but it varies from 63.8 % to 93.9 % across different Indian states.[4]

This vast country with its myriad cultures and religions poses a significant challenge for health professionals. This challenge only increases in magnitude within the mental health sector, as diagnosis, assessment, and intervention are heavily dependent upon language. Another challenge lies in the limited number of practicing psychologists—and especially neuropsychologists—thereby placing a huge demand upon the existing professionals. The content that follows will highlight some of the challenges both patients and neuropsychologists face in this huge country.

Who is a Neuropsychologist

Neuropsychology in India is considered to be a super specialization pursued only after obtaining a two-year supervised course in clinical psychology referred to as M. Phil.[3] Anyone who wishes to practice as a clinical psychologist is required to complete the M. Phil (from Rehabilitation Council of India (RCI) recognized institutes in the country) after a postgraduate degree in psychology.[3,5] As part of their training, all clinical psychologists are trained in neuropsychological assessments of adults, elderly, and children. In addition, they learn various neuropsychological rehabilitation programmes for patients from psychiatry, neurology, and neurosurgery. In order to become a neuropsychologist, one has to obtain a Ph.D. in the field of neuropsychology. After a doctoral degree, some pursue post-doctoral research under their supervisors. The total number of neuropsychologists in the country is about 50,[3] which is not enough to cater to the needs of a vast population. As a result of this shortage, clinical psychologists (with a M.Phil. degree) do double duty as neuropsychologists. Thus, they carry out all the work expected of both clinical psychologists as well as neuropsychologists. There also are no licensing bodies that clarify practice guidelines for neuropsychologists in the country. In addition, finding supervisors to provide guidance for research and clinical practice is very difficult, as there are very few practicing neuropsychologists within the country. Interestingly, many neuropsychologists appear to be in and around the National Institute of Mental Health and Neuroscience (NIMHANS), Bangalore, where neuropsychology began in the year 1975.

History of Neuropsychology in India

Neuropsychology in India is still in its infancy.[3] It was introduced at the Neuropsychology Unit, Department of Clinical Psychology, National Institute of Mental Health and Neurosciences (NIMHANS), as a specialization in 1975.[6,7] Before 1975, research consisted of identifying cognitive deficits in neurological and psychiatric patients. Tests employed included the Wisconsin Card Sorting Test, Bender Gestalt Test,[7] Alexander's Pass Along, and Block Design.[8] As a formal specialization, neuropsychology was introduced by Professor C R Mukundan at the National Institute of Mental Health and Neurosciences (NIMHANS) in 1975.[3] He can thus be referred to as the father of neuropsychology in India. He developed a NIMHANS neuropsychology battery influenced significantly by Luria's work in the field.[6] The thrust of the work focused on localization and lateralization of cognitive deficits using this battery of tests. In addition, electrophysiological research using EEG and event related potentials was initiated around the same time. This effort made it possible for many young students interested in the field of neuropsychology get exposure to and obtain research experience in the field of neuropsychology. Between the 1980s and early 2000s, the thrust of research in the field of neuropsychology expanded to cognitive rehabilitation programmes that attempted to improve cognitive functions in adults and children with acquired brain damage including TBI[9] and epilepsy.[10] Recent trends are consistent with international research where the focus has shifted to imaging techniques. Today students and research scholars in some centers in India (especially at NIMHANS) are exposed to the use of DTI, PET, EEG, and fMRI. Areas of interest span across many different clinical populations including neurological, neurosurgical, psychiatric, child and adolescent, and geriatric populations.

Challenges Faced by Neuropsychologists in India

The primary challenge faced by neuropsychologists is dealing with multiple languages while performing neuropsychological assessments. Most of the neuropsychological tests used in India are Western tests primarily adapted to suit Indian populations with minor modifications and translations in a few Indian languages.[3,9] Neuropsychologists often have to use willing translators who accompany patients to complete the assessments. Hence, assessments could have the bias of the translator as a factor to be considered during interpretation. Another major problem is testing neuropsychological functions with illiterate individuals from rural backgrounds who may be holding a pencil for the first time in their lives. The neuropsychologist may also encounter 'functional illiterates' who are patients with a few years of formal education but who have not gone back to academic activities such as reading and writing since leaving school. They would possibly be able to just write their names. The poor performance by these patients on neuropsychological tests could be due to lack of exposure to both psychological tests as well as psychological

testing situations which may lead to test anxiety.[11] Other challenges include:

- A small number of trained neuropsychologists to provide neuropsychological assessment and rehabilitation to a huge population;
- Lack of licensing bodies to prevent untrained and inadequately trained neuropsychologists from practicing;
- Lack of or limited indigenous neuropsychological tests developed for Indian populations using items that are familiar to both urban and rural populations;
- Lack of funding agencies to develop India-specific neuropsychological tests and normative data in multiple languages.

Despite these challenges, neuropsychology in India has progressed significantly, and several trained neuropsychologists in the country are able to offer services such as diagnosis, assessment, and cognitive rehabilitation services both in the private sector as well as in hospitals. Areas of research have extended to psychiatric, neurologic, neurosurgical, and forensic domains. In addition, several home-grown intervention and assessment batteries have been developed in the last few years. Despite the thrust of work in the field, several frontiers need exploration in the future.

Professor Keshav Kumar J is currently working as Neuropsychology consultant at Department of Clinical Psychology, National Institute of Mental health and Neurosciences (NIMHANS), Bangalore, India. He has completed his M. Phil in Clinical Psychology and Ph.D. in Neuropsychology from Department of Clinical Psychology, NIMHANS. He has worked as Senior Lecturer and Assistant Psychologist at Kasturba Medical College, Manipal, Karnataka India. Here he was teaching M. Phil (Clinical Psychology) and MD, DPM (Psychiatry) students along with participating in-patient care.

Subsequently he has worked a senior neuropsychologist at Brain Injury Rehabilitation Services, Burwood Hospital, New Zealand where he was involved in teaching as well as clinical practice. He is a New Zealand Board of Psychologists registered psychologist, and is also a member of the International Neuropsychological Society (INS) and Indian Association of Clinical Psychology (IACP). He returned to NIMHANS in 2005 and has been working there since. He guides several M.Phil and Ph.D. theses, M.D. (Psychiatry), DM neurology and MCh, Neurosurgery theses and has several funded research projects to his credit. He is invited to several institutes across the country to conduct lectures, seminars, workshops and talks on neuropsychological rehabilitation in different neurological, psychiatric and neuro-surgical conditions. Dr. Kumar has been and continues to be passionate about neuropsychological rehabilitation and has developed indigenous intervention programmes for Parkinson Disease, Alcohol Dependence, Schizophrenia and MCI and dementia. He has also developed the first neuropsychological battery for the elderly in India. He has published chapters and research articles in national and international journals.

Dr. Akila Sadasivan is a consultant child neuropsychologist working with children with specific learning disorder, attention deficit hyperactive disorder and children with autism and spectrum disorder. She has completed her M. Phil from the National Institute of Mental health and Neurosciences NIMHANS, Bangalore, India and has completed her Ph. D. from University of Canterbury, Christchurch, New Zealand. She is the director of Samvidh Psych Services, Bangalore where children are assessed and provided with intervention for academic, behavioural and social-emotional issues. She has developed a unique neuropsychological intervention programme for these diagnostic categories and has many success stories to her credit.

She is New Zealand registered Psychologist and has served as Executive council member of the Indian Association of Clinical Psychologists (IACP). She conducts several training programmes, seminars, and workshops for teachers, counselors, special educators and psychologists working in the field of learning disorders. She is visiting faculty for several training programmes on specific learning disorders and special education. She has published chapters and research articles in national and international journals. She has served as task force member for the IACP and has been instrumental in bringing out the practice guidelines for Clinical psychologists working with specific learning disorders in India.

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Diversity Issues in Neuropsychology: A Survey of Practicing Neuropsychologists

Laura A. Rabin, Ph.D., Donald L. Brodale, Milushka M. Elbulok-Charcape, & William B. Barr, Ph.D.

Study Rationale

Shifts in population trends and immigration patterns, both locally and globally, create challenges and opportunities for clinical neuropsychologists who increasingly must consider issues of race, ethnicity, socioeconomic status, culture, language, and other demographic dimensions in the conduct of culturally sensitive and competent assessments. Over the past decade, multicultural issues have received increased attention in the neuropsychology literature. Summit and call to action papers,[1,2,3] alongside position papers[4] and consensus recommendations,[5,6,7] have addressed the challenges of assessing diverse individuals and offered suggestions for improved neuropsychological training and practice. In addition to expert opinion about diversity issues in neuropsychology, it is important to understand current practice trends. Therefore, in the current study we took a bottom-up approach by surveying clinical neuropsychologists regarding their multicultural assessment practices and perspectives. For the purposes of this study, we refer to individuals with culturally, racially, or ethnically diverse backgrounds as *ethnic minorities*. Also, while various diversity factors impact the neuropsychological assessment process (e.g., gender, age, sexual orientation, disability, class status, religious orientation), in this study we focused on ethnicity.

Overview of Methods

Data were collected as part of a broader survey of neuropsychological assessment and test usage practices conducted in 2011.[8] In brief, potential participants were randomly selected doctorate-level members from the International Neuropsychology Society (INS) or the National Academy of Neuropsychology (NAN) who resided in the United States or Canada. The authors combined the membership lists and eliminated overlap. Questionnaires were sent to 2,178 individuals—approximately one-third of the combined INS and NAN membership. Efforts were made to maximize participation through multiple mailings and the provision of incentives.

Eleven survey items related specifically to multicultural competence and neuropsychologists' assessment of ethnic minorities including: participants' race/ethnicity (1 item); percentage of professional time spent with ethnic minority individuals (1 item); nature and extent of any training received in neuropsychological assessment of ethnic minorities or cross-cultural neuropsychology (3 items); assessments conducted in languages other than English (2 items); approaches to testing individuals not fluent in English (1 item); approaches to interpreting test scores of ethnic minorities (2 items); and perceived challenges associated with assessing ethnic minorities (1 item). A copy of the survey is available upon request.

Select Results and Discussion

We present results related to ethnic designations of respondents and patients, multicultural training, and perceived challenges associated with assessing ethnic minorities (for additional study results and related discussion, the reader is referred to references 9 and 10). Data from 512 respondents were included in the analysis, which reflects a 25.7% usable response rate after accounting for undeliverable and unusable questionnaires. The average survey respondent was close to 50 years of age, had practiced neuropsychology for 15 years, and performed approximately three neuropsychological assessments per week. The overwhelming majority of respondents held Ph.D. degrees (81%), most commonly in clinical psychology (65%). The majority of respondents were female (54%).

Ethnic designations of respondents and patients

Although non-Whites comprised approximately 36% of the U.S. population at the time the current survey was conducted (U.S. Bureau of the Census, 2017), less than 10% of neuropsychologists identified as non-White (Figure 1a).[11] These percentages are similar to those reported in the 2005 and 2012 TCN/AACN Salary Surveys.[12,13] By contrast, neuropsychologists reportedly work with diverse populations, with roughly one-third of their professional time, on average, spent with non-White individuals, most commonly Black or African American and Latino or Hispanic individuals (Figure 1b).

Results confirmed what others have observed previously—that ethnic minorities are seriously underrepresented in neuropsychology.[2,14] Therefore, important goals for the field should include recruitment efforts that target underrepresented individuals for doctoral student and faculty positions. In terms of graduate student retention, a convergence of research suggests the importance of adequate financial support, academic environments supportive of diversity, solid mentoring by faculty and peers, and opportunities for students to work clinically with ethnic minority populations of interest.[15] The integration of neuropsychologists who identify as ethnic minorities into the field, however, does not guarantee culturally competent assessments. Nonetheless, there are compelling reasons to foster an ethnically, culturally, and linguistically diverse body of neuropsychologists. For example, diverse professionals may be committed to serving those within their underserved communities.[16] Also, diverse colleagues can serve as mentors and role models to young professionals and bring new perspectives to theory development, research, and clinical application.[1]

Multicultural training

Although roughly one-third of respondents' professional time, on average, is spent with non-White individuals, more than one-quarter (27.7%) of respondents reported receiving no training in neuropsychological assessment of ethnic minority populations or cross-cultural neuropsychology. For those who did receive such training, it tended to occur at the graduate level or during postdoctoral fellowship or residency (Table 1). Guidelines for practicum training in neuropsychology include essential

competencies that doctoral students must achieve before transitioning to internship and fellowship,[17] including the integration of knowledge of diversity issues in assessment, research, treatment, and consultation. Notably, these are the same basic competencies required for specialty practice in neuropsychology at the professional level.[18] How best to incorporate multicultural training into existing psychology doctoral program curricula, however, is not readily known. Proctor and Simpson (2016) describe an "integration-separate" course model for psychology graduate training, where separate courses develop particular areas of competence, while content covering diversity issues is spread throughout core coursework. As an example, a neuropsychology doctoral program with faculty expertise in aging could offer a course on cross-cultural issues in the neuropsychological assessment of dementia. Simultaneously, multicultural content would be infused into most other courses and diversity issues addressed in practica evaluations, comprehensive examinations, and subsequent licensure and board certification examinations.[2,19] Students and faculty would be encouraged to join professional organizations that target diversity issues (e.g., Hispanic Neuropsychological Society; APA Division 45: Society for the Psychological Study of Culture, Ethnicity and Race). There may even be financial support for research on multicultural issues, externship opportunities to serve ethnic minority clinical populations, and guest speakers or brown-bag talks on diversity topics.

Many respondents also reported obtaining training at the professional practice level through continuing education or self-education, suggesting that existing training within formal neuropsychological education may be insufficient or inconsistently administered. Those who attend conferences offered through major professional organizations (e.g., INS, NAN, APA Division 40-Society for Clinical Neuropsychology) will find continuing education programs, research talks, symposia, keynote speeches, and discussion groups focused on diversity issues. Neuropsychologists can also participate in diversity-focused webinars.[20] As with the design of educational curricula for doctoral and postdoctoral students, however, it is not entirely clear how to establish and monitor multicultural neuropsychological competence for professionals.[21]

Perceived challenges associated with assessing ethnic minorities

Respondents overwhelmingly endorsed a lack of appropriate norms as the greatest challenge associated with neuropsychological assessment of ethnic minorities (Table 2). While the use of norms for separate ethnic, racial, or cultural groups is intuitively appealing and can augment the diagnostic utility of neuropsychological tests, the practice poses problems. For example, race-specific norms do not resolve issues of test bias or cultural equivalence in neuropsychological tests.[22] There is substantial cultural, linguistic, and educational heterogeneity within ethnic minority subgroups, leading to complications when determining whom to include in a normative data set and for which individuals a given dataset is deemed appropriate.[23] Given the vast number of ethnic minority groups and subgroups, it is impossible to create datasets appropriate for each. Brickman and colleagues (2006) suggest using race-specific normative data only when the following specific criteria are met: (1) research has established a significant relation between race/ethnicity and performance on the target test; (2) the norms have adequate cell sizes; (3) the norms are appropriately stratified and capture demographic factors that contribute to test performance such as age, education, and sex; and (4) the patient appropriately matches the normative sample in terms of demographics and educational and cultural experiences (for additional discussion of this complex issue and related topics, e.g., applying demographic corrections in neuropsychological assessment, the reader is referred to references 3, 22, 24, 25).

Other commonly reported challenges were the lack of appropriate tests and difficulties in finding referral sources or colleagues for consultation. With regard to locating appropriate tests, in recent years there has been an increase in empirical research, book chapters, and compendia that provide descriptions of tests with validated translations or evidence for cross-cultural utility.[25-31] While work in this area is encouraging, more is needed, as there is still a lack of sufficiently validated neuropsychological tests and norms for many cultural and linguistic subgroups; moreover, a host of challenges arise in the development and translation of tests.[10] In terms of finding referral sources and/or colleagues with whom to consult, there is an unfortunate shortage of multilingual professionals.[32,33] Additionally, culturally or linguistically appropriate neuropsychological referrals can present financial, logistical, and/or health-related hardships for some patients.[32] For detailed discussion of these and other challenges, the reader is referred to Rabin et al., in press. Also, Fujii (2017) offers an excellent practical guide for constructing neuropsychological batteries appropriate for most individuals who present for care.

Concluding Comments

Overall, our results confirm what others have observed in recent decades—that ethnic minorities remain underrepresented in neuropsychology and that neuropsychologists perceive the lack of appropriate norms, tests, and referral sources as challenges strongly associated with the assessment of ethnic minorities. Additional survey results highlighted the various challenges of conducting neuropsychological assessments in languages other than English and interpreting the cognitive test scores of ethnic minorities.[10] The continued viability of neuropsychology depends on the ability to assess and treat diverse individuals in a sensitive, responsible, and valid manner. Therefore, regardless of demographic background, level of training, or specific area of expertise, all neuropsychologists must strive for cultural competency through education, consultation, or clinical supervision. There is also a need for delineation of the core educational and skills requirements for practicing culturally competent neuropsychology[33] and possible oversight of these requirements by administrative structures.[34]

Several recently published books are devoted to the conduct of culturally informed neuropsychological evaluations and offer opportunities for self-directed study (see references 24,25,35). Of particular relevance are the comprehensive case studies and chapters devoted to working with specific ethnic groups and multicultural patient and diagnostic populations. Additionally, these books provide links to professional organizations, census data on ethnic minorities, data on mental health disparities, and general information to facilitate understanding of specific cultural subgroups.

Note: This article was drawn, in part, from a forthcoming chapter: Rabin, L.A., Brodale, D.L., Elbulok-Charcape, M., & Barr, W.B. (2017, in press). Challenges in the neuropsychological assessment of ethnic minorities. In. O. Pedraza (Ed.), Clinical cultural neuroscience: Foundations and assessment. New York: Oxford University Press.

Figure 1a.
Neuropsychologist's Race/Ethnicity (*n* = 510)

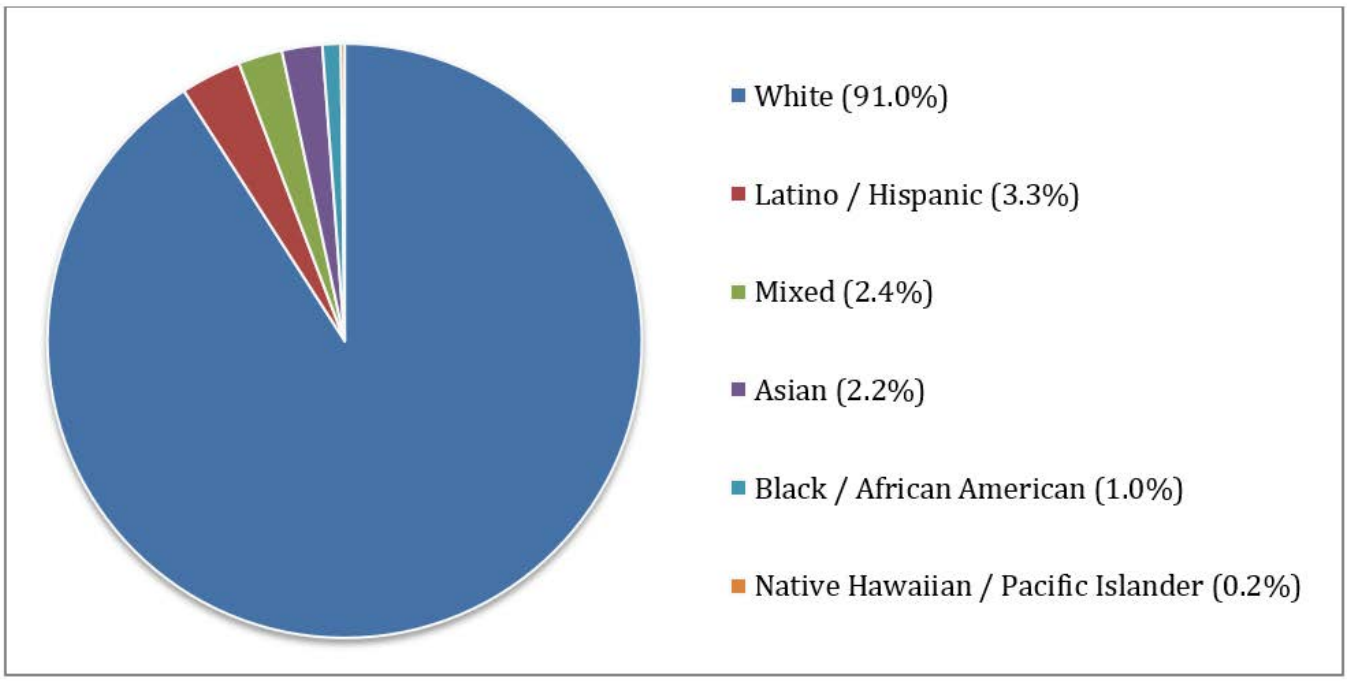

Figure 1b.
Mean Neuropsychological Practice Time by Patient Race/Ethnicity (*n* = 497)

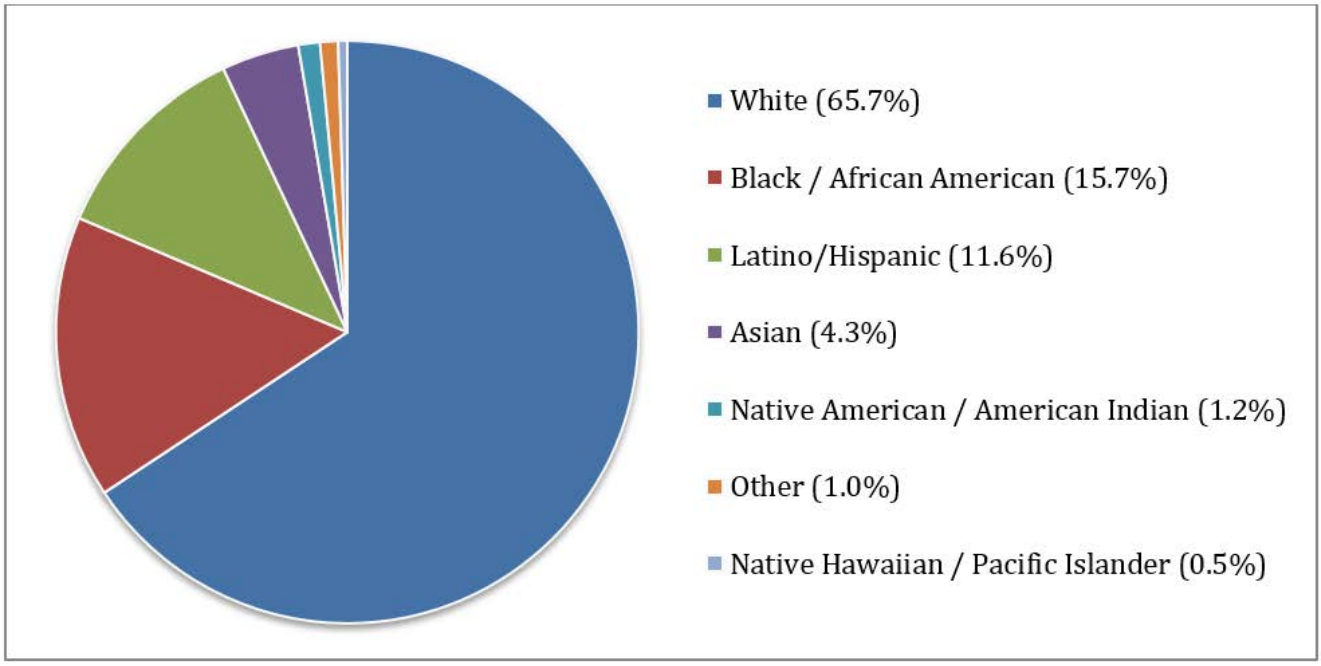

Table 1
Settings for Professional Training in Neuropsychological Assessment of Ethnic Minorities (n = 351)

Setting	*n* of responses	% of respondents
Graduate or doctoral studies	224	63.8
Postdoctoral studies, fellowships, or residencies	199	56.7
Continuing education courses, certifications, or workshops	69	19.7
Internships	45	12.8
Conferences	10	2.8

Note: Sum of respondent percentages exceeds 100% because the survey did not constrain responses.

Table 2
Greatest Perceived Challenges to Neuropsychological Assessment of Ethnic Minorities (n = 499)

Challenge	*n* of responses	% of respondents
Lack of appropriate norms	337	67.5
Lack of appropriate tests	214	42.9
Difficulty locating consulting / referral colleague	177	35.5
Lack of trained neuropsychologists / psychometrists	98	19.6
Lack of training opportunities	43	8.6
Other	16	3.2

Note: Sum of respondent percentages exceeds 100% because respondents could endorse 2 responses.

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HONE-In

Health Outcomes and Neuropsychology Efficacy Initiative

Brought to you by:

National Academy of Neuropsychology

Legislative Action & Advocacy Committee

Neuropsychologists are increasingly being asked to provide evidence of effectiveness to support reimbursement for neuropsychological services, yet this information is not always easily accessible to neuropsychology practitioners. In response to this challenge, the National Academy of Neuropsychology (NAN) authorized its Legislative Action and Advocacy Committee (LAAC) to launch an initiative that would help NAN membership respond to these practice challenges. The result was the Health Outcomes and Neuropsychology Efficacy Initiative (HONE-In).

The primary goal of HONE-In is to assist NAN membership in any effort to demonstrate the value of neuropsychological services through cost effectiveness and/or cost savings.

HONE-In Phase I Sample Article Summary

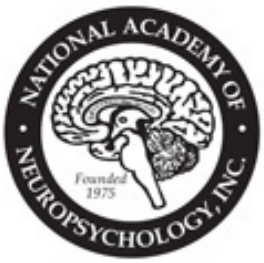
BRAIN INJURY, CONCUSSION, REHABILITATION

The predictive validity of a brief inpatient neuropsychologic battery for persons with traumatic brain injury.

Population: Traumatic brain injury, Inpatient rehabilitation
Categories: Outcome prediction
Authors: Hanks RA, Millis SR, Ricker JH, Giacino JT, Nakase-Richardson R, Frol AB, Novack TA, Kalmar K, Sherer M, Gordon WA.
Date: 2008
Title: The predictive validity of a brief inpatient neuropsychologic battery for persons with traumatic brain injury
Type: Journal article
Citation: Hanks, R. A., Millis, S. R., Ricker, J. H., Giacino, J. T., Nakese-Richardson, R., Frol, A. B., et al. (2008). The predictive validity of a brief inpatient neuropsychologic battery for persons with traumatic brain injury. Archives Of Physical Medicine And Rehabilitation, 89(5), 950-957.

Utility: Prospective study of predictive validity of NP assessment during subacute brain injury rehab, including pts in PTA, within ~ 1 month of injury. Brief NP assessment predicted handicap, functional outcome, supervision needs, employability in adults w/ TBI at 1 year. Adding NP increased predictive power over injury severity and early functional status (with exceptions – SWLS and FIM Motor). Including those w/ PTA did not diminish predictive validity. Findings important given trend toward shorter rehab stays, strengthens argument for role of NP testing during acute rehab.

NAN



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