



The Future of Neuropsychology with Hispanic Populations in the United States

Marcel O. Pontón

Harbor-UCLA, Medical Center and Neuropsychiatric Institute, UCLA School of Medicine

Alfredo Ardila

Miami Institute of Psychology

This article discusses neuropsychology within the Spanish-speaking world; it reviews its recent history, existing efforts, and future directions. It also addresses the practice of neuropsychology with Hispanics in the United States and posits that it should take into account the heterogeneity of this population (the largest minority group in the country). Hispanic heterogeneity includes, among other variables, ethnicity, language, acculturation, age and education. Data from current research suggest that these are relevant variables affecting the psychometrics of cognition and therefore, the practice of neuropsychology with this population. Suggestions for future research are also addressed. © 1999 National Academy of Neuropsychology. Published by Elsevier Science Ltd

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In order to address Hispanic neuropsychology, we must begin with definitions. What is meant by the term *Hispanic*? This is an ambiguous term that came into wide acceptance, as it was used by the U.S. Census Bureau in the 1940s to refer to people who emigrated from Mexico and South America. Webster defines Hispanic as “. . . of or relating to the people, speech, or culture of Spain, Portugal, or Latin America (McKechnie, 1983, p. 862).” The *Diccionario de la Lengua Española, Vigésima Edición* edited by the Real Academia Española (1984) defines *Hispano* as “Pertaining to or relative to Hispania, Spain or the nations of Hispanic America” (p. 738). Consequently, Hispanics are those people who have direct ties to the cultural heritage of Spain, and who speak Spanish. *Latino* is

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Address correspondence to: Marcel O. Pontón, PhD, Harbor-UCLA Medical Center, Building F-9, 1000 West Carson Street, Torrance, CA 90509. E-mail: moponton@ucla.edu

also commonly used in the United States to refer to people who are born in Latin America. However, second-generation Latin Americans would no longer be Latinos under this definition, unless the United States is considered (at least, partially) a Latin American country. Latin America includes not only the Spanish-speaking countries, but also Portuguese and French-speaking countries. Culturally, Brazil and Haiti are Latin American nations or states. Of course, Spain is not a part of Latin America, even though it is an European Latin country, as are France, Italy, Portugal, and Rumania. For the purposes of our discussion, the terms *Hispanic* and/or *Latino* will be used here as labels of convenience to refer to those individuals who reside in the United States and who were born in or trace their family background to one of the Spanish-speaking Latin American nations or Spain (G. Marín & B. V. Marín, 1991).

HISPANICS IN THE UNITED STATES

The United States is the fifth largest Spanish-speaking country in the world, behind Mexico, Spain, Argentina, and Colombia. This would make the United States part of Latin America to some degree. Census statistics indicate that the Latino/Hispanic presence in the United States comprised 10.9% of the total population, or 29.2 million people, as of June 1997. The Hispanic population will number 38.8 million by the year 2005. By 2050 there will be 96.5 million Hispanics, equaling one fourth of the total population (U.S. Census Bureau, 1997).

It could be argued that the United States is, partially, a Latin American country, given the historical influence of Spain and Mexico upon its culture and geography as well as the large and distinct Hispanic presence in its midst. Neuropsychology with Latinos or Hispanics in the United States, has been practiced differently from, and, to some degree, blinded to the practice of neuropsychology in other Latin American countries and Spain. In order to understand neuropsychology in the Spanish-speaking world, a brief overview of the same is presented below.

NEUROPSYCHOLOGY IN LATIN AMERICA¹

Neuropsychology in Latin America has a marked European influence. Its roots date back to the 1950s, when Carlos Mendilaharsu and Selika de Mendilaharsu created a division devoted to the analysis of the higher cortical functions at the Montevideo Neurological Institute (Uruguay). The Mendilaharsus had been trained in Hécaen's laboratory, and they used his approach to neuropsychology in their clinical and research activities.

During the 1960s and 1970s, a growing interest in neuropsychology was observed in Latin America. Particularly in Peru and Mexico (for a review on the history of neuropsychology in Latin America, see Ardila, 1990). In Peru, Cáceres developed an influential group in neuropsychology. Cáceres also received his training from Hécaen. The Mexican group, while European in its background, was relatively more eclectic, and actively involved in academic and clinical interchange of ideas with the United States. The International Congress of Neuropsychology held in Bogota (August, 1981), and attended by

¹More is known about neuropsychology in academic circles than the private practice of neuropsychology within this continent.

over 700 people from 14 countries, represented a decisive milestone in the development of neuropsychology in Latin America.

This was a historical meeting because it allowed its participants to become aware of each other's work, it facilitated the interchange of ideas at several levels, and it provided the germinal groundwork for the development of formal organization of Latin American neuropsychologists. The Argentinean, Uruguayan, Chilean, Peruvian, Mexican, Brazilian, and Colombian groups had all been actively involved in research and clinical work. In each country, however, just a handful of people could develop neuropsychology as a formal discipline. Research reports were presented mainly in local journals and at national professional meetings. Discussion at the Bogota meeting centered around the development of formal training programs in neuropsychology, the need to create a Spanish language journal entirely devoted to neuropsychology, and the necessity to coordinate efforts among different countries. During the following years, a *Boletín* of the emerging Latin American Society of Neuropsychology was published. The Sociedad Latinoamericana de Neuropsicología (SLAN) was formally founded in 1989. Of note, at least 30 to 40% of clinicians who belong to SLAN and who practice neuropsychology in Latin America are neurologists.

During the 1983 Meeting of the International Neuropsychological Society (INS) held in Mexico City, a group of Latin American representatives proposed the creation of a Latin American Branch of the INS. It was further proposed during that meeting that a joint new journal in neuropsychology be developed, however, it never materialized. At present, there is an active Latin American Society of Neuropsychology (SLAN), which holds meetings biannually, attended by over 500 participants.

During the 1980s, neuropsychology experienced remarkable growth as a profession in the United States, while achieving a strong professional and scientific profile. In fact, in the past 15 years, over 30 training programs have been developed in neuropsychology across the United States and Canada (Cripe, 1991). New journals in the field emerge every year, and the number of professional neuropsychologists has grown in a significant way. In Latin America, however, only half a dozen graduate programs exist (e.g., Mexico, Colombia, and Argentina) in neuropsychology, and it was not until 1995 that the first issue of *Neuropsychologia Latina* was published jointly by the Sociedad Latinoamericana de Neuropsicología, Sociedad Catalana de Neuropsicología, Sociedade Brasileira de Neuropsicología, and Associação Portuguesa de Neuropsicología (Editorial MCR, S.A., Barcelona).

One obvious question lingers: Why did neuropsychology develop at a significantly faster pace in the United States than in Latin America? Multiple answers may be proposed:

1. The Latin American continent is not a country, but a mosaic of nations, with widely different levels of scientific and economic development. As a result, access to academic/professional resources varies significantly.
2. General communication among and between Latin American countries has been historically very difficult. Mail in many countries is slow, inefficient, and unreliable. This has directly impacted scientific communication. While more recently, the internet and e-mail have been changing the face of the academic communications in the continent, not everyone has access to these resources.
3. The economics of education and private practice for neuropsychologists is markedly different in Latin America from the United States. While university professors may earn in most countries less than the equivalent of US\$1,000 a month, they may have to purchase their own journals, given the lack of institutional resources for highly specialized publications.

4. The amount of neuropsychological literature available in Spanish (or Portuguese) has been limited due to the above. However, this has changed during the past 5 years, as a growing number of neuropsychology books have been published in Spanish (e.g., Brailowsky, Stein, & Will, 1992; León-Carrión, 1995; Mangone, Allegri, Arizaga, & Ollari, 1997; Ostrosky, Ardila, & Chayo, 1996, etc.).

HISPANIC NEUROPSYCHOLOGY IN THE UNITED STATES

Since the advent of neuropsychology and behavioral neurology as professional activities in the United States, Hispanics have been actively participating in the field. Joaquín Fuster, Ismael Mena, Alberto Galaburda, Antonio Puente, and Mario Mendez are examples of this involvement of Hispanics in the behavioral neurosciences.

At an organizational level, Patricia Pérez-Arce and Antonio Puente helped found the group "Neuropsychologist of the Spanish-Speaker" (NOSS), which Dr. Pérez-Arce led in the early 1990s. Simultaneously and independently, another group of neuropsychologists (led by the first author) gathered in Galveston during the 1993 INS meeting, with the intention of forming a society that had virtually identical goals. Antonio Puente served as the synergistic element between the two groups, and in 1994 they joined forces in Los Angeles to form the Hispanic Neuropsychological Society (HNS; DeAngelis, 1994), which currently has over 160 members, and publishes a regular *Boletín*. Eventually, HNS and SLAN could join forces to advance neuropsychology in the Spanish-speaking world, which includes the United States. This was initiated with the participation of several HNS leaders and members at the VII Congress of the SLAN in Guadalajara, Mexico (October 1997). HNS has also begun a formal research consortium to address issues of test development with large test publishers in the United States.

THE FUTURE OF HISPANIC NEUROPSYCHOLOGY IN THE UNITED STATES

Having surveyed briefly the historical background of Hispanic neuropsychology, future directions are now addressed. How should Hispanic neuropsychology in the United States be defined? Of course, neuropsychology has some fundamental purposes (i.e., to study the normal and abnormal relations between brain, cognition, and behavior) beyond any cultural context. But, what should be the focus of Hispanic neuropsychology? Should it be cognitive, experimental, psychometric (i.e., test development), or should it be primarily clinical? There are as many answers as there are Hispanic neuropsychologists. However, most would agree that Hispanic neuropsychology in the United States must devote an appreciable amount of its efforts to the development of tests and norms as a building block to nurture ongoing research.

The current ethos would appear to suggest that having the right translations of known tests into Spanish would facilitate the study of Hispanics in relation to other ethnic groups in the United States. There are many assumptions accompanying this approach. One assumption is that the existing tests are the best expressions of the domain to be measured, regardless of the context in which they are measured. Another assumption is that if the test reflects the exact content and the precise word in another language (i.e., Spanish), it can be an equivalent measure of the same domain in the original language (English). A third assumption is that the psychometric properties of the test in the original language will translate as well as the items into the new language. Teng (1996) has ar-

gued convincingly that appropriate translations and back translations methods may be both insufficient and unnecessary. Insufficient, in the sense that translated tests can be equivalent in content but not necessarily in meaning. Unnecessary, because brain-behavior relationships do not transcend the cognition-context paradigm. The exact translation of a word in a test may be devoid of cultural relevance. The brain functions in predictable ways across cultures, but it is the cultural context that validates and modulates the expression of certain cognitive abilities. As Ardila (1995) has posited, culture dictates what is and what is not situationally relevant. Therefore, the emphasis should be in the *development* of culturally appropriate measures rather than in translations.

A neuropsychology of Hispanic populations or a Hispanic neuropsychology in the diverse U.S. context, should fit within the zeitgeist of mainstream neuropsychology while remaining true to the complexity of the theoretical and psychometric issues involved in assessing this population. It should also assimilate, at least in part, its heritage from the Spanish-speaking world at large. This can best be accomplished by incorporating some of the following areas in test development.

Heterogeneity of the Latino Population in the United States

Latinos in the United States are not a monolithic population capable of being classified under a single rubric. Even the U.S. Census Bureau (1997) notes that “Hispanics may be of any race” (p. 1). Diversity of ethnicity, language ability, educational background, country of origin, migrational forces (see Llorente, Pontón, Taussig, & Satz, 1999, in this issue) and regional differences within countries are some of the variables that comprise such diversity. Argentineans, Cubans, and Mexicans for instance, will fall under the rubric of Hispanic in the United States, however, they could hardly be considered ethnically, culturally, or linguistically uniform. Is country of origin a variable of interest in test performance after educational attainment has been partialled out? Or do the effects of this variable disappear once education is controlled for? There are only intuitive answers thus far, therefore, empirical verification is necessary.

What variables can and should be coded for research purposes? In addition to the obvious variables of age and education (Heaton, Grant, & Matthews, 1986; Pontón et al., 1996), Taussig and Pontón (1996) have described at least three other dimensions on which to characterize Hispanic heterogeneity. These include ethnicity, language, and degree of acculturation. These are discussed in detail below.

Ethnicity. Latin Americans are the product of *mestizaje* (the ethnic mixture of the Spaniards with the indigenous peoples at the time of the Conquista) and *mulataje* (the ethnic mixture of the Spaniards with African peoples). Uslar-Pietri (1986) has argued cogently that Columbus may have discovered the New World, but he did not recognize it (he thought he had reached India, hence he called its inhabitants Indians) while Amerigo Vespucci did not discover the new continent, but he recognized it. Hence, the New World was named in his honor. In the *Conquista* of this America or New World, Spain found what it searched for: an extension of the Crown to become the superpower of the time. Eventually, Spain entered the slave trade ambitiously to expedite the exploits for the Crown. The social experiment resulted in a great mixture of races. Since the indigenous peoples were also ethnically diverse, the resulting fabric of this emerging society was multicultural and multi-ethnic from the start. There were indigenous peoples, White, Black, and multiple mixtures of these races. The rich racial heritage of Latin America is an even greater reality today, due to the migrational forces from Europe, Asia and the Middle East to Latin America from the 1940s through the 1970s. The immi-

grants from Latin America to the United States reflect this rich ethnic diversity, which also includes people from Spain.

Thus, when characterizing Hispanics there is not one single form of ethnicity that could be identified. Due to the marked class differences in Latin America, ethnicity in many countries was confounded with educational attainment and hence with socioeconomic status. A case in point are the “Indians” of the Andean countries. However, this may also be true of ethnic groups from other countries who migrate to the United States.

Coding ethnicity accurately may prove to be quite a challenge, as it is a dynamic, evolving, and amorphous entity that eludes classification in a society of *mestizaje* and *mulataje*. Anthropological tools may be useful when researching this question, by looking at distinct people groups by region (Ardila, 1993). It is, however, an important variable, as there are illnesses that affect cognition (e.g., diabetes, stroke, etc.), which will have a significantly greater incidence among Hispanics of Mexican descent in the Southwestern United States, for instance, than in other ethnic subgroups (Bassford, 1995; Baxter et al., 1993; Berkowitz, Lapinski, Wein, & Lee, 1992; Carter, Wiggins, Becker, Key, & Samet, 1993; Cowie, 1993; Kamboh, Aston, & Hamman, 1995; Kargman, Gu, & Zamanillo, 1995; Kelly & Rothrock, 1995; Shetterly, Rewers, Hamman, & Marshal, 1994; Sorlie, Backlund, Johnson, & Rogot, 1993).

How should ethnicity be appropriately coded/used in research with this population? Given the complexity of this issue as discussed above, the following guidelines are suggested:

- Use homogeneous regional groups inasmuch as possible (i.e., sample groups from New Mexico, El Paso, etc.). There are some areas in which people groups have migrated in networks. Targeting region of origin (vs. country) in the sampling process can also be of interest in controlling for this variable.
- Sample large groups of Hispanic subjects and use country of origin instead of ethnicity as a variable.
- Ignore ethnicity altogether and use education as a variable of interest if access to population is not large.

Language spoken. While monolingualism (English or Spanish) facilitates assessment of cognition, bilingualism does not. What is bilingualism? How does it impact test performance? How can we quantify it in a meaningful way so as to partial out its effects from test performance?

A bilingual person can be a Spanish-speaker with fair speaking but poor writing/reading ability in the English language. Such a person can also have equal mastery of both languages (a condition that needs much research and empirical verification) and thus be considered a balanced bilingual individual (Albert & Obler, 1978), or he or she may be an English-speaker with some mastery of Spanish. However, there are gradations in between these anchors. Thus, there are people who would consider themselves bilingual, but whose dominance of English is relatively poor. Similarly, some subjects will have a poor mastery of the Spanish language, despite self-identifying as bilingual and bicultural. These people may be unbalanced bilinguals. Another useful paradigm to understand this issue has been proposed by Earle (1967), who talks about the compound bilingual (person who learns more than one language at the same time, usually early in life) and the coordinate bilingual (person who learns more than one language at different times).

Kuhl (1993a, 1993b, 1993c) has suggested that when it comes to bilingualism in children, for instance, early learning exposure to one language affects the “auditory maps” differentially between English and Swedish. Because languages have specific phonemic

patterns, perceptual maps of one language may constrain the learning of a second language. In Kuhl's view, there is a basic circuitry established for the learning of a language, which is affected early on by the phonetic stimulation (i.e., exposure of syllabic sounds from the infant's caretaker) (Kuhl, Williams, Lacerda, & Stevens, 1992). In this paradigm, the notion of a true bilingual person is strongly questioned, unless simultaneous and similar degree of acquisition and exposure to two languages occurs before age 10.

True bilingualism would require equal mastery of both languages in all domains of knowledge and areas of functioning. This implies equal demand for the use, as well as formal instruction in the two languages. In the United States, the mastery of any language other than English is discouraged. Unlike in Europe, bilingualism or multilingualism in the United States is seen as a political threat. The English-only movement is a case in point (Unz, 1997).

In a culture that discourages bilingualism because it is perceived as a political threat, people whose language of origin is not part of a majority culture tend to lose vocabulary, syntactic representation, proficiency, and grammatical mastery. As they acquire concepts and vocabulary in the dominant language of a culture (e.g., English), they would have to back translate the new learned vocabulary into their native language (e.g., Spanish) (Artiola & Mullaney, 1997; Dupont, Dupont, Ardila, Rosselli, & Puente, 1992). Certainly, there are culture-specific items for which there is no adequate translation in the culture of origin. Spanish does not have a word for "modem," much like English does not translate "taco" (a Mexican food item). When people are unable to use equivalent words in another language, transliterations develop. Cobos (1983) refers to these transliterations as the "Hispanicizing" of English terms.

Hispanicizing of English terms dates back to the 1850s, when most of the Western United States belonged to Mexico. Through time, names of functional items needed in daily life were Hispanicized. For instance, "baking powder" in New Mexico and Southern Colorado was Hispanicized into *bequenpaura*. Later on, "windshield" became *güinchil*; "wreck" became *reque* and so on (Cobos, 1983). Mexican Americans in Houston for instance, use *washateria* as the name for laundromat, whereas in Los Angeles, the word has been Hispanicized as *el londri*. New Hispanicisms adding the gender declination of the items are also common. For instance, *la truca* (truck), *la compiura* (computer), *el raite* (ride) and so forth have emerged across time. Another form of Hispanicizing is found in phrases. Miami Cubans, for instance, will use the term *Muy friquiado* to convey the thought "freaked-out." Or they will translate idioms like *Estoy en acuerdo*, instead of *estoy de acuerdo* to mean "I agree." This represents the adaptation of English structures into the syntax and lexicon of the Spanish language. It is then possible to model English syntax with incorrect Spanish (Clary, 1997).

Complicating matters further, the use of these terms is validated by the powerful Hispanic media (television and radio), who advertise for commercial products asking questions such as *¿Lonchamos?* (Should we have lunch?) with catchy jingles. Children in Hispanic households grow up using these terms as legitimate representations of concepts that form a hybrid language, but which cannot be formally assessed (as of yet) in either English nor Spanish. Additionally, children who attend "bilingual" programs at school are exposed to varying degrees of language mastery by their "bilingual" teachers. Some teachers speak Spanish as their native language and have a formal grammatical training and mastery of it, while others learn it marginally as a career enhancement opportunity. The latter usually make idiosyncratic mistakes in their use of Spanish and communicate those mistakes systematically in the classroom. The result is poor language mastery.

Different grammatical processes have taken place in this form of "bilingualism:" borrowing from English, local and regional vocabulary, words and idiomatic expressions pe-

cular to people groups (e.g., Mexicans, Cubans, Puerto Ricans, Salvadorans, etc.) and use of indigenous terms. The dimensions of these elements go beyond our current task, and will not be explored here. The reader is referred to Cobos (1983) and Galván (1995) for a more thorough explanation.

Where bilingualism becomes relevant, of course, is in the area of assessment. Should tests use the proper Spanish names for items that measure language functioning, when the more vernacular Hispanicisms (deplorable as they may sound to the Real Academia de la Lengua Española) are in fact what the subject understands? Could subjects be penalized for using what their context dictates is the proper response, but what has not a standard equivalent in Spanish? More importantly, should there be country (or region) specific tests that consider all colloquialisms in an effort to be fair? This issue can become fastidious if our concern with tests is cultural sensitivity rather than predictive validity and clinical utility.

Previous experience in clinical practice and research provide us with some general guidelines that are suggested here to address the issue of bilingualism in assessment or test development:

- Allow as many possible responses to an item in the continuum of bilingualism as are legitimate.
- Use available publications of Spanish terms used in the United States (e.g., Galván's, 1995, Chicano dictionary; Cobos', 1993, dictionary).
- Use formal tools like *Pequeño Larousse Ilustrado* (García-Pelayo y Gross, 1990), *Diccionario de la Lengua Española* (Real Academia Española, 1984), and *Diccionario Práctico de Americanismos* (Editorial Everest, 1996) that provide definitions of colloquial terms by country or region in Latin America.

Study 1. Bilingualism was studied in a sample of 300 Hispanic subjects who were administered the Neuropsychological Screening Battery for Hispanics (NeSBHIS; cf., Pontón et al., 1996). The 300 subjects were grouped by language of choice, resulting in a subsample of 82 bilingual and 218 monolingual individuals. The subjects were matched by education, in order to minimize its effects on test results. This yielded a third subsample of 145 subjects (66 bilingual, 80 monolingual). To answer the question of whether language of choice impacted test performance on the NeSBHIS, a two-way analysis of variance was performed. Results indicate that language of choice plays an important role on measures of mental control/attention (Digit Span, Digit Symbol, Color Trails I and II), and abstract nonverbal reasoning (Block Design and Raven's Standard Progressive Matrices [SPM]) as can be seen in Table 1.

The above results suggest that bilingualism impacts test performance. This is obviously not a new finding. Harris, Cullum, and Puente (1995) have demonstrated that bilingual subjects who are unbalanced, for instance, perform poorly on measures of memory. The findings from the NeSBHIS suggest, however, that bilingual subjects tended to perform better on most measures even when subjects were matched for education. This may be the result of metacognitive strategies, which bilinguals tend to develop effectively (Galloway, 1982; Hsieh & Tori, 1993; Mohanty, 1990; Ricciardelli, 1992a). Thus, bilingualism may have a positive effect on cognitive functioning, especially when the individual is more educated and has the same degree of mastery of both languages (Bialystok, 1988; Bialystok & Cummins, 1991; Ricciardelli, 1992b).

Further research needs to inform the question of what is the empirical impact of bilingualism on test performance, measured under the balanced/unbalanced (e.g., Harris et al., 1995) or compound/coordinate (e.g., Harding & Reily, 1986) paradigm.

TABLE 1
Impact of Bilingualism on Test Performance

Test	<i>F</i>	<i>p</i>
FAS	0.16	>.10
AVLT V	1.54	>.10
AVLT VII	2.86	.09
AVLT VIII	3.67	.06
PIN (DOM TOT)	0.21	>.10
PIN (NDOM TOT)	0.01	>.10
P-SBNT	0.44	>.10
DIG SPAN F	11.76	.0008
DIG SPAN B	4.33	.04
DIG SPAN TOT	11.14	.001
DIGIT SYMBOL	10.18	.002
CT1	4.32	.04
CT2	10.93	.001
BLOCK DESIGN	4.69	.03
REY-O-COPY	1.61	>.10
REY-O-MEM	2.41	>.10
RAVEN'S TOT	11.02	.001

FAS = Controlled Word Association Test; AVLT V = WHO-UCLA Auditory Verbal Learning Test, trial V; AVLT VII = WHO-UCLA Auditory Verbal Learning Test, trial VII: Interference; AVLT VIII = WHO-UCLA Auditory Verbal Learning Test, trial VIII: 20-minute recall; PIN (DOM TOT) = Total score for dominant hand on Pin Test; PIN (NDOM TOT) = Total score for nondominant hand on Pin Test; P-SBNT = Pontón-Satz version of the Boston Naming Test; DIG SPAN F = Digit Span Forwards; DIG SPAN B = Digit Span Backwards; DIG SPAN TOT = Total score for Digit Span from Escala de Inteligencia Wechsler para adultos (EIWA); DIGIT SYMBOL = from EIWA; CT1 = Color Trails Test, part I; CT2 = Color Trails Test, part II; BLOCK DESIGN = from EIWA; REY-O-COPY = Rey-Osterrieth Complex Figure-Copy; REY-O-MEM = Rey-Osterrieth Complex Figure; 10-minute delay; RAVEN'S TOT = Raven's Standard Progressive Matrices, total score.

Acculturation. In order for neuropsychological testing to become more sensitive to the impact of culture on test performance, the level of acculturation should be seen as an integral part of valid assessment for Hispanics (Herrera, Pontón, Corona, Gonzalez, & Higareda 1998). Since tests and procedures tend to reflect what is relevant to a particular culture, acculturation assumes that the individual becomes familiar with those relevant elements in the new culture, and consequently has a higher probability of understanding and successfully completing tests items developed within the new culture.

Acculturation, as an operationally defined concept, has a tradition in social and cross-cultural psychology (G. Marín & B. V. Marín, 1991; Mena, Padilla, & Maldonado, 1987; Olmedo, 1979). It is defined as a phenomena resulting from the direct and continuous first hand contact of different cultures that produces change in the cultural patterns of one or more of the corresponding groups. Change in cultural patterns is reciprocal and affects people at the individual and group level (Mena et al., 1987), however, levels of acculturation vary widely for individuals and groups. Hence, while Italians, as a group, are considered, acculturated to the United States, recent immigrants from that country may not have attained functional levels of acculturation. Of interest, several researchers (Golding & Burnam, 1990; Neidert & Farley, 1985; Nicassio, 1983) have showed convincingly that the best predictor of acculturation to the United States among immigrants is the socioeconomic status of the immigrant prior to entrance into the new culture. The socioeconomic status of rural and urban immigrants from Latin America varies widely

from country to country and it may well explain rates of acculturation to the United States among different nationality groups (see Llorente et al., 1999, in this issue).

The question at hand is whether acculturation impacts test performance in any relevant way. If so, can it enhance our understanding of this heterogeneous population? This question was posed of the subject sample used in the normative study of the NeSBHIS (Pontón, et al., 1996). We defined acculturation operationally by using the measure developed by G. Marín et al. (1987) to assess this variable in our sample. This acculturation scale was derived from factor analysis of a 16-page questionnaire. It includes five questions about “Language Use and Ethnic Loyalty,” three questions about “Media” preferences, and three questions about “Ethnic Social Relations.” G. Marín et al. (1987) found that “Language and Ethnic Loyalty” explained 40% of the variance in acculturation in their original study, followed by Ethnic and Social Relations (14.1%) and Media preferences (10%).

Study 2. Details of the impact of acculturation on the NeSHBIS are discussed elsewhere (Herrera et al., 1998). For the purposes of this article, a confirmatory factor analysis of this scale was performed using the NeSBHIS normative sample. The results yielded the same three factors reported by Marín and Marín (G. Marín & B. V. Marín, 1991; G. Marín et al. 1987). While intercorrelations among factors were .35, items within the scale correlated strongly with background variables. Table 2 provides a correlational table between the items of the acculturation scale, according to the factor they represent (Language, Media, and Social) and the background variables of Age, Education, Years in the United States, and Country of Origin.

Acculturation affects the way in which people perceive illness (Epstein, Dusenbury, Botvin, & Diaz, 1994), access health services (Land, 1994; Urdaneta, Saldaña, & Winkler, 1995), and respond to research (G. Marín, Gamba, & B. V. Marín, 1992). Therefore, it must be measured in research with Hispanics. The G. Marín et al. (1987) scale appears to be the most useful for neuropsychological research.

Age. Developmental issues have great impact on neuropsychological measures. The Salthouse effect (Salthouse, 1985) is perhaps the best known reference in this regard. However, recent normative efforts (Heaton, Grant, & Matthews, 1991) include age as a factor because of the expected inverse correlation between age and test performance. The effects of aging and dementia among Hispanic populations have been explored by Taussig and colleagues (Taussig, Henderson, & Mack, 1992; Taussig, Mack, & Henderson, 1996) as well as by others (e.g., Ardila, Rosselli, & Rosas, 1989). In the NeSBHIS

TABLE 2
Correlation of the Acculturation Measure with Background Variables
for a Sample of 300 Normal Hispanics

	Acculturation Items										
	L1	L2	L3	L4	L5	M6	M7	M8	S9	S10	S11
Age	-.06	-.01	.01	-.06	-.04	-.24	-.19	-.29	-.01	-.15	.07
Years in the United States	.52	.36	.48	.44	.47	.25	.15	.16	.28	.14	.30
Years of education	.39	.30	.32	.26	.39	.40	.38	.37	.25	.28	.29

L(1–5) = items measuring Language and Ethnic Loyalty; M(5–8) = items measuring Media preferences; S(9–11) = items measuring Social and Ethnic Relations.

Correlations by Age and Education

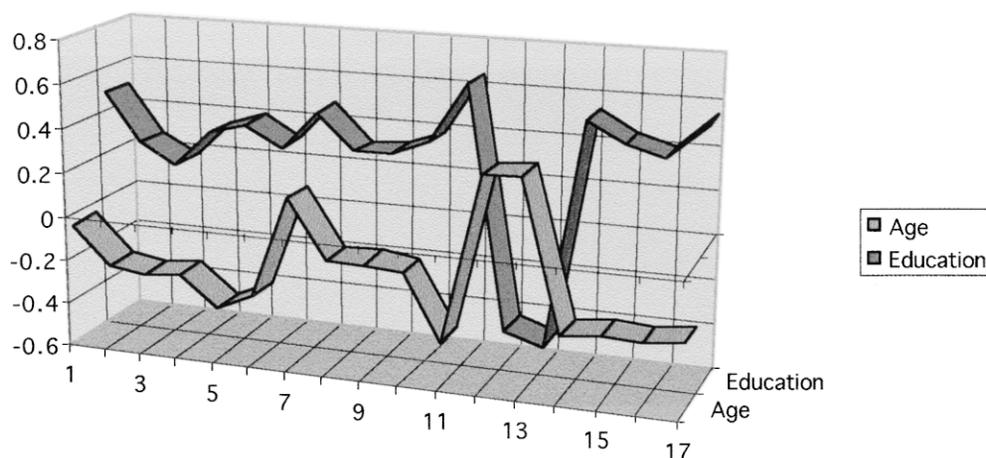


FIGURE 1. Pearson r correlations for each testing variable by age and education. 1. Controlled Word Association Test; 2. WHO-UCLA Auditory Verbal Learning Test, trial V; 3. WHO-UCLA Auditory Verbal Learning Test, trial VII: Interference; 4. WHO-UCLA Auditory Verbal Learning Test, trial VIII: 20-minute recall; 5. Total score for dominant hand on Pin Test; 6. Total score for nondominant hand on Pin Test; 7. Pontón-Satz version of the Boston Naming Test; 8. Total score for Digit Span from the Escala de Inteligencia Wechsler para Adultos (EIWA); 9. Color Trails Test, part I; 10. Color Trails Test, part II; 11. DIGIT SYMBOL from EIWA; 12. BLOCK DESIGN from EIWA; 13. Rey-Osterrieth Complex Figure-Copy; 14. Rey-Osterrieth Complex Figure, 10-minute delay; 15. Raven's Standard Progressive Matrices, total score.

sample, education correlated negatively and significantly with most of the measures (see Figure 1).

Education. Formal education as measured by number of years of education in the NeSBHIS sample (Pontón, et al., 1996) was the single most important factor in test performance. Figure 1 presents a correlational chart of age and education with the different measures of the NeSBHIS.

While formal education was defined in the NeSBHIS normative project as the total number of years of schooling, informal education could not be operationalized nor quantitatively measured. Nevertheless, it is clearly an ongoing element of peoples' experience. There are anecdotal reports of people who have very little formal education, but nevertheless function quite well in a trade or develop large businesses. Mentoring, passing down of skills, or other environmental issues most likely account for this. Natural ability and social or emotional intelligence (Gardner, 1993; Goleman, 1995) are also alternative explanations. The question is whether a naturally intelligent person can develop cognitively aside from formal education. The answer deserves close attention.

José² is a 37-year-old immigrant with 4 years of formal education. After emigrating to the United States as a seasonal farm worker, he became very knowledgeable about plants, landscaping, irrigation, and dealing with customers. His current English vocabulary is mostly work-related, yet he has a successful gardening business that includes clients of

²This is a real case.

whole blocks in posh neighborhoods of Southern California. He employs several people, owns trucks, equipment, two houses (one in California and one in Mexico) and vacations at least 3 weeks every year in his native Mexico. How did he learn his skill and develop it successfully? How many years of informal training or education did he have prior to launching his “career” independently and successfully? Did he learn from trial and error? Did he undergo a formal or informal mentoring process? Is he intelligent despite not being formally educated? The circular argument that intelligent people tend to have higher education may not apply in certain countries of Latin America because access to education is dictated more by the needs and means of the family than by the ability of individual.

If José were to be tested neuropsychologically, how will he perform on our current measures of neuropsychological functioning? What will be the best way to assess him, with verbal or nonverbal measures? Given the language barrier, a clinician may feel more inclined to administer a nonverbal measure of visuospatial functioning to decrease potential biases. Let us suppose that the clinician administers José the Rey-Osterrieth Complex Figure Test (ROCFT; Osterrieth, 1944) as a way to assess his visuoconstructive abilities. José, who now has suffered a head injury after being in a car accident, scores 25 on the copy and 16 on the memory portions of this test. Current normative data (Spreen & Strauss, 1991) would place José’s test results at 6.73 and .96 standard deviations below the mean, respectively (<1st and 18th percentiles), causing one to wonder whether these scores represent potential impairment in visuoconstructive abilities.

However, when the same measure was administered to a group of 81 normal Hispanic individuals with 6 years of education or less (as part of the NeSBHIS), we found that a score of 25 would place José .18 standard deviations below the mean (43rd percentile), while his memory score of 16 on the ROCFT would be .31 standard deviations below the mean (38th percentile), both within normal range for his educational background. When data for the ROCFT from the NeSBHIS were stratified into four educational groups (0–6, 7–11, 12–15, and 16+), it became evident that the lowest educational group differed significantly from all others. This effect can be easily visualized on Figure 2, which depicts performance by normal Hispanic subjects on the ROCFT copy, with varying levels of education.

Thus, education-corrected norms are crucial in understanding this population. As Ardila, Rosselli, & Puente (1994) have pointed out, even visuomotor movements appear to

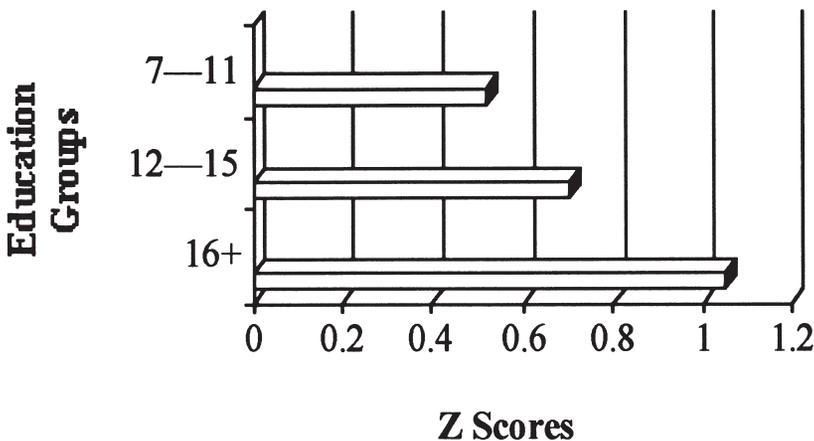


FIGURE 2. Z-score comparison between groups with >7 years of education and the lowest educated group in the Neuropsychological Screening Battery for Hispanics sample for the Rey-Osterrieth Complex Figure, Copy.

be affected by educational attainment. But defining education by the actual number of years of formal schooling may not be as meaningful a parameter as once thought, at least when dealing with these populations. Measures of functional ability that supersede the boundaries of formal testing are clamoring to be developed. We need to have measures that are corrected for education and measures of cognition for subjects who were not formally educated.

CONCLUSION

This article considered the issues involved in the evolution of Hispanic neuropsychology in the U.S. Hispanic neuropsychologists have been actively involved in understanding brain-behavior relationships throughout the Spanish-speaking world with a mostly European influence. Currently, there are active groups of neuropsychologists working in different Latin countries and in the United States. The SLAN in Latin America and the HNS in the United States are two of the many associations that currently represent formal organizational efforts in the dissemination of neuropsychological work within the Spanish-speaking world.

Neuropsychology with Hispanic populations in the United States has developed in response to the needs of an ever-growing segment of the population. The current article provides suggestions for a systematic evolution of the discipline with this group by considering five crucial variables that should impact its theory and practice:

- Ethnicity
- Language spoken
- Acculturation
- Education
- Age

While it is possible to have the number and kinds of tests available in Spanish define neuropsychology with Hispanics, this article has argued that clinicians and researchers interested in this area must focus on the development of a discipline that studies the complex issues of ethnicity (with its heterogeneity), bilingualism (with its many gradations), acculturation (with an empirical definition), age and education (formal and informal) in order to provide meaningful answers to questions of cognitive functioning in this population, rather than focus narrowly on how Hispanics perform on a test battery vis-à-vis a non-Hispanic group. Data currently available from the NeSBHIS (Pontón et al., 1996), as well as work from other researchers (Harris, et al., 1995, Taussig et al., 1996) strongly suggest that neuropsychology with Hispanic populations cannot ignore any of the above variables if it is concerned about ecological validity.

This article has only hinted at the complexity of the above variables and has provided some data supporting the argument of their impact on cognition. There are direct implications for the training of future neuropsychologists stemming from these issues. As the profession of neuropsychology expands and the Hispanic population grows, the encounter of these two groups becomes inevitable. So does the need to take these concerns seriously. Recent surveys suggest a vast lack of awareness of ethical and psychometric problems in the assessment of Hispanics (Echemendia, Harris, Congett, Diaz, & Puente, 1997). HNS, its consortium, and the several independent efforts from various groups, as well as a growing sense of awareness are now converging to fill the previous void in this

field. Their efforts will likely lead to meaningful and practical solutions for clinicians and researchers alike and because of these and similar efforts, the future of neuropsychology with Hispanic populations in the United States appears promising.

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