

## Guest Editorial

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# Commonly used Neuropsychological Tests for Spanish Speakers: Normative Data from Latin America

Neuropsychology is a sub-specialty of the field of psychology that examines the relationship between brain function and cognitive abilities (Lezak, Howieson, Loring, Hannay, & Fischer, 2004). Neuropsychology began in 1861–1875 when concurrent advances in clinical neurology, anatomy, physiology, and psychology combined to create the field (Benton & Adams, 2000), but in Latin America it has a shorter history. The first neuropsychological laboratory was founded in 1958 in Uruguay, and interest in this sub-specialty spread through other Latin American countries (Dansilio, 2009). In the past few decades there have been important advancements in the academic training and resources available (e.g., textbooks, journals, and conferences in Spanish), and the creation of professional associations that have together facilitated a growing number of practicing neuropsychologists. However, the advancements have not been homogeneous across all Latin American countries.

Despite this heterogeneity, there are a certain number of common barriers to advancing the field of neuropsychology in Latin America, including insufficient academic and clinical training opportunities, poor attitudes towards professional collaboration, and lack of access to neuropsychological tests (Arango-Lasprilla et al., 2014; Arango-Lasprilla, Rivera, Rogers, Panyavin, & Perrin, 2014; Arango-Lasprilla & Rivera, 2015). Even when neuropsychologists gain access to tests, normative data for their countries for those tests often do not exist. In a review of the literature on standardization of tests in Latin America, the major efforts to create norms for neuropsychological tests tend to be

concentrated in Brazil (Beato et al., 2011; Magalhães & Hamdan, 2010), Mexico (Ostrosky-Solís, Ardila, & Rosselli, 1999), Argentina (Allegri et al., 1997; Butman, Allegri, Harris, & Drake, 2000), and Colombia (Rosselli, Ardila, Florez, & Castro, 1990). However, most of neuropsychological tests used in Latin America do not have norms available for the majority of Latin American countries. Thus neuropsychologists from Latin America must often resort to using norms created in other countries (e.g. Spain, US). Because there are numerous differences between the populations of developing regions like Latin America and developed countries, especially in education/literacy levels and cultural issues, using norms created with English speakers in the US or Spanish speakers in Spain can lead to inaccurate assessment and misdiagnosis.

In order to create country-specific norms for some of the most commonly used neuropsychological tests in adults, a multi-center study in 20 cities in 12 countries was conducted. The goal was to provide standardized norms for healthy adults ages 18 to 90 while taking into account age, education, and sex. A sample of 5,402 Spanish-speaking adults native to Argentina, Bolivia, Chile, Colombia, Cuba, El Salvador, Guatemala, Honduras, Mexico, Paraguay, Peru, and Puerto Rico was obtained. The results from 1,425 Colombians have been published elsewhere (Arango-Lasprilla & Rivera, 2015). Therefore, this special issue will present the procedures and results used to generate normative data from 3,977 healthy individuals from 14 cities in the remaining 11 Spanish-speaking Latin American countries.

The first article in this special issue will explain in detail the methodology used to recruit the sample and document the statistical procedures used to obtain normative data for ten of the most commonly used Spanish-language neuropsychological tests for adults. The additional articles will provide information about each test and the resulting norms. The tests included in this special issue are the Boston Naming Test, the Verbal Fluency Tests, the Modified Wisconsin Card Sorting Test (M-WCST), the Stroop Color-Word Interference Test, The Symbol Digit Modalities Test, the Trail Making Test, the Brief Test of Attention, the Rey–Osterrieth Complex Figure, Hopkins Verbal Learning Test–Revised, and the Test of Memory Malinger (TOMM).

To our knowledge, this is the largest multi-center normative study in the world and its results have several implications for the future of Latin American neuropsychology. 321,200,000 Spanish-speakers in these 12 countries now have normative data for a representative reference group of healthy adults from their own country and culture for these most used neuropsychological tests. Furthermore, these norms may be applicable to individuals from these countries who have recently emigrated to other countries and may currently be evaluated using the norms of the country of arrival. Emigration is critically important in the Latin America (Durand & Massey, 2010). There are over 20 million people from Latin America who emigrate to other countries and this totals 4-5% of the region's population (Organization for Economic Co-operation and Development, 2010).

This multi-center study is a step forward, however much more is needed to provide practicing neuropsychologists in Latin America with the tools and resources they need to adequately evaluate the populations they commonly work with. For example, in Latin America, almost 35 million people over age 15 cannot read or write (Croso, Vovio, & Masagao, 2008) and literacy has been shown to influence performance on neuropsychological tests (Ardila, 1998). Therefore, it is important to provide normative data for an illiterate reference group of healthy adults in Latin American countries. Furthermore, assessment and treatment of attention deficit disorder and learning disabilities is quite common for neuropsychologists in Latin America (Arango-Lasprilla, Rivera, Rogers, Panyavin, & Perrin, 2014); however, today, there is a lack of normative data for the most commonly used pediatric neuropsychological instruments used across Latin America. Future multi-center studies with healthy children in Latin America are needed to develop country-specific norms.

Third, to aid clinicians working with individuals with neurological conditions, it is helpful to identify cut-off points on these neuropsychological tests that suggest the presence of specific conditions (e.g., Alzheimer's disease) or symptoms (e.g., memory problems). Future comparative studies using these neuropsychological tests in adults with various neurological conditions in Latin America should be implemented. Finally, there are 9 Latin American countries (e.g., Ecuador, Uruguay, Honduras, Panama, Costa Rica), which are not represented in this multi-center study and the creation of country-specific normative data for all these neuropsychological tests may be warranted.

It is important to emphasize that Latin America is a diverse region composed of a total population of 604,363,900 individuals from 20 countries who represent many ethnic groups and different ancestries (U.S. Census Bureau, 2015). Spanish is the primary, but not the only, language spoken in these countries. Although some of the most commonly used tests were standardized in this multi-center study, all of the tests in this study were originally developed outside of Latin America and translated into Spanish. Clinical neuropsychologists may find that tests created specifically for their country and culture that take into account individual and country characteristics may be needed in order to provide a more accurate evaluation of neuropsychological performance.

In conclusion, successful cognitive rehabilitation depends on the clinician's ability to adequately assess and diagnose neuropsychological deficits and to be able to track changes in performance during treatment and/or disease progression. This multi-center study advances the toolbox available to Latin American Spanish-speaking neuropsychologists by providing them, as well as other neuropsychologists working with Spanish-speaking individuals outside of Latin America, with norms from a country-specific reference group of healthy individuals while taking into account age, education, and sex. It is hoped that neuropsychologists in the region will work together to expand these efforts to benefit the patients and their families.

*Guest Editor*

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