

Guest Editorial

Normative data for Spanish-language neuropsychological tests: A step forward in the assessment of pediatric populations

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Neuropsychology is “the branch of science that studies the physiological processes of the nervous system and relates them to behavior and cognition, in terms both of their normal function and of the dysfunctional processes associated with brain damage” (VandenBos, 2015). The applied practice of neuropsychology is known as clinical neuropsychology, and is primarily focused on assessment and intervention of individuals with suspected or recognized neurological functional impairments (American Psychological Association [APA], 2010; Stringer, 2011; VandenBos, 2015). In contrast, clinical pediatric neuropsychology involves the application of this knowledge to the assessment and treatment of children and adolescents with neurological, medical, neurodevelopmental and other related disorders (APA, 2010; VandenBos, 2015). Some of these disorders, such as autism spectrum disorders, attention-deficit/hyperactivity disorder, and specific learning, motor, tic, and communication disorders, have a deleterious impact on a child’s development and cognitive processing (American Psychiatric Association, 2013).

Due to the great variety of symptoms and needs associated with these disorders, the specialty of clinical pediatric neuropsychology requires developmentally-appropriate instruments to ethically

address the assessment and diagnosis of children and adolescents. Age-appropriate neuropsychological tests are a key element in the objective evaluation of a child’s current functioning in domains such as memory, attention, language, motor skills, visual spatial abilities, executive skills, and emotional-behavioral functioning (Lezak, Howieson, Bigler, & Tranel, 2012; Reynolds & Fletcher-Janzen, 2010).

A variety of neuropsychological tests are utilized in the diagnosis of childhood and adolescent disorders. Because of their importance, researchers from different countries such as the United States (Goodman, Delis, & Mattson, 2010), Korea (Kim & Na, 2008), Taiwan (Shu, Tien, Lung, & Chang, 2000), Italy (Cianchetti et al., 2007), Holland (Hiuzinga & Smidts, 2010), Australia (Davies, Field, Andersen, & Pestell, 2011), Portugal (Townes et al., 2008), Israel (Vakil, Greenstein, & Blachstein, 2010), Iran (Yousefi et al., 1992), among others, have provided normative data for many neuropsychological instruments. Normative data allows a child’s performance to be compared to that of their peers of similar socio-demographic and cultural characteristics. Researchers often strive to create locally-derived norms to promote nondiscriminatory neuropsychological assessment strategies. Such country-specific norms also permit more accurate determination of deficits in the neuropsychological functioning of children within those populations.

Neuropsychologists in Latin America and Spain commonly see pediatric populations in their practices (Arango-Lasprilla, Stevens, Morlett-Paredes, Ardila,

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& Rivera, 2016; Olabarrieta-Landa et al., 2016). These children and adolescents are referred by teachers, school psychologists, and/or pediatricians who suspect potential learning or intellectual disabilities (Arango-Lasprilla et al., 2016; Olabarrieta-Landa et al., 2016). However, in Latin America, and Spain there is paucity of measurement research with regards to neuropsychological instruments, particularly those applicable to children (Arango-Lasprilla et al., 2016; Olabarrieta-Landa et al., 2016). A survey of Latin American and Spanish neuropsychologists, many of whom provided services to children, found that more than 50%, ranging from 49.0% to 62.0% depending on country, reported that lack of normative data for their regions was one of the major problems they encountered in providing neuropsychological evaluations. They reported resorting to use of normative data from other countries or using raw scores to interpret test results (Arango-Lasprilla et al., 2016; Olabarrieta-Landa et al., 2016).

There are a wide variety of neuropsychological tests currently in use to evaluate children and adolescents. However, there is a lack of normative data available for all of these tests, especially for Spanish language speakers. Some norms for Spanish speaking children and adolescents can be found here (Armengol, 2002; Esperanza, 2008; Díaz et al., 2012; Galindo, Balderas, Salvador, & Reyes, 2010; Gallardo et al., 2011; Martín et al., 2012; Nieto, Galtier, Barroso, & Espinosa, 2008; Ostrosky-Solís et al., 2007; Rosselli et al., 2004; Servera & Cardo, 2007). However, the majority of Spanish speaking countries do not have country-specific cultural and normative parameters for almost all neuropsychological tests (Wang et al., 2011; Arango-Lasprilla et al., 2016).

In 2013, a working group of Spanish-speaking neuropsychologists decided to address some of the needs identified in the international survey of Spanish-speaking neuropsychologists. Recognizing the need for country-specific norms, they designed a multi-country study of healthy adult populations and created norms for the most commonly used neuropsychological tests based on state-of-the-art methods. The resulting normative data for Argentina, Bolivia, Chile, Cuba, El Salvador, Guatemala, Honduras, Mexico, Paraguay, Peru, and Puerto Rico was published in the Special Issue: *Commonly used Neuropsychological Tests for Spanish Speakers: Normative Data from Latin America* (Arango-Lasprilla et al., 2015a; Arango-Lasprilla et al., 2015b; Arango-Lasprilla et al., 2015c; Arango-Lasprilla et al., 2015d; Guárdia-Olmos, Rivera, Peró-Cebollero

& Arango-Lasprilla, 2015; Olabarrieta-Landa et al., 2015a; Olabarrieta-Landa et al., 2015b; Rivera et al., 2015a; Rivera et al., 2015b; Rivera et al., 2015c; Rivera et al., 2015d) and data from the Colombian adult sample was published in *Neuropsicología en Colombia: Datos normativos, estado actual y retos a futuro [Neuropsychology in Colombia: normative data, current and future state]* (Arango-Lasprilla, & Rivera, 2015). Next the group, including representation from Spain, focused their data collection efforts on the 10 most commonly used tests for children and adolescents. The normative data results by country for healthy children ages 6 to 17 are published in this special issue. In addition to taking into account age and sex, as is standard in normative data methodology, this study also accounts for mean level of parental education, which is an important factor in child development studies. The method used for generation of norms is based on linear regression models and the standard deviation of residual values, which has numerous strengths, including the determination of the variables that predict test scores, the identification and control of collinearity of predictive variables, and the generation of continuous and more reliable norms than those of traditional methods (e.g. obtaining just the mean and standard deviations). This working group is now collecting data on Spanish-speaking illiterate samples in Latin America, and are beginning to sample adult and child clinical populations as well.

In this special issue, the first article will describe in detail the methodology used to generate normative data for the sample of 6,030 healthy children and adolescents ages 6 to 17 from 33 cities in Chile, Colombia, Cuba, Guatemala, Honduras, Mexico, Paraguay, Peru, Puerto Rico, and Spain, with the results from 1,657 Colombian children and adolescents published elsewhere (Arango-Lasprilla, Rivera, & Olabarrieta-Landa, 2017). The rest of the articles will provide country-specific norms for the other nine Latin American countries and Spain for the following neuropsychological tests: Rey Osterrieth Complex Figure Test (ROCF; Rey, 2009), Stroop Color-Word Interference Test (Golden, 2010), Modified Wisconsin Card Sorting Test (M-WCST; Schretlen, 2010), Trail Making Test A-B (TMT A-B; Reitan & Wolfson, 1985), Symbol Digit Modalities Test (SDMT; Smith, 2002), Shortened version of Token Test (De Renzi & Faglioni, 1978), Concentration Endurance Test (d2) (Brickenkamp, 2009), Phonological and Semantic Verbal Fluency Tests (Benton & Hamsher, 1989), Peabody Picture Vocabulary Test - PPVT-III

(Dunn, Dunn, & Arribas, 2010), and Learning and Verbal Memory Test (TAMV-I; Rivera, Olabarrieta-Landa, & Arango-Lasprilla, 2017).

This study represents a step forward towards the goal of achieving valid norms for the most commonly used neuropsychological tests in Spanish-speaking countries. It is hoped that these normative data will be used as a tool for clinicians in their day-to-day practice to provide more accurate assessment of their clients and as a stimulus for researchers to use the methods to develop similar norms for other tests and/or in other countries. These results are the fruit of a large, coordinated effort of institutions who contributed financially to purchase the rights to the tests and, in some cases, covered researchers' salaries, as well as over 300 test administrators and 33 city data collection coordinators who ensured the validity of test administration and data entry. Furthermore, the study would not have been possible without the involvement of children, adolescents, and their parents, from participating countries, who generously shared their time without economic compensation. This special issue is dedicated to these individuals, with gratitude for their contributions to the advancement of neuropsychology in Ibero-America.

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