

Profession of neuropsychology in Latin America

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ABSTRACT

The purpose of this study was to analyze characteristics of individuals working in the profession of neuropsychology in Latin America in order to understand their background, professional training, current work situation, assessment and diagnostic procedures used, rehabilitation techniques employed, population targeted, teaching responsibilities, and research activities. A total of 808 professionals working in neuropsychology from 17 countries in Latin America completed an online survey between July 2013 and January 2014. The majority of participants were female and the mean age was 36.76 years (range 21–74 years). The majority of professionals working in neuropsychology in Latin America have a background in psychology, with some additional specialized training and supervised clinical practice. Over half work in private practice, universities, or private clinics and are quite satisfied with their work. Those who identify themselves as clinicians primarily work with individuals with learning problems, ADHD, mental retardation, TBI, dementia, and stroke. The majority respondents cite the top barrier in the use of neuropsychological instruments to be the lack of normative data for their countries. The top perceived barriers to the field include: lack of academic training programs, lack of clinical training opportunities, lack of willingness to collaborate between professionals, and lack of access to neuropsychological instruments. There is a need in Latin America to increase regulation, improve graduate curriculums, enhance existing clinical training, develop professional certification programs, validate existing neuropsychological tests, and create new, culturally-relevant instruments.

KEYWORDS

Evaluation; Latin America; neuropsychologist; practice; rehabilitation; training

Neuropsychology is defined as the study of the brain organization of cognitive processes under normal and abnormal conditions, while clinical neuropsychology is an applied branch of psychological science concerned with brain-behavior relationships (Barth et al., 2003; Boller, & Grafman, 1988/1997; Frederiks, 1985). According to Barth et al. (2003), clinical neuropsychologists conduct assessment, diagnosis, treatment, and/or rehabilitation of patients across the lifespan with neurological, medical, neurodevelopmental and psychiatric conditions, as well as other cognitive and learning disorders.

In contrast to neuropsychology in the United States, where there are well-established guidelines for education, training, and practice (e.g., see Barth et al., 2003), neuropsychology in the developing world is a relatively younger field that is not well regulated. More specifically, there is a lack of information regarding who professionals working in the field of neuropsychology are and exactly what type of activities they conduct in Latin American countries. Concerns about the practice of neuropsychology with Hispanics in the United States

has been raised and documented (e.g., Judd et al., 2009; Llorente, 2007; Pontón & Ardila, 1999; Puente & Ardila, 2000), and this issue is frequently discussed and analyzed by the Hispanic Neuropsychological Society (<http://hnps.org>). However, a minimal amount is documented regarding professionals in the field of neuropsychology in Latin America.

The history of the field of neuropsychology in Latin America is well documented in several sources (e.g., Ardila, 1990; 1999; Pontón & Ardila, 1999). Briefly summarized, Latin American neuropsychology formally began in 1958 when Uruguayans Carlos Mendilaharsu and Selika de Mendilaharsu created the Laboratory of Brain Dysfunctions, a division within Uruguay's Montevideo Neurological Institute. Interest in neuropsychology in Latin America grew in the 1960s and 70s, especially in Mexico and Peru (Ardila, 1999). In 1961, a "Brain Mechanisms and Learning" symposium was held in Uruguay and was attended by important European and Latin American researchers. The first graduate program in psychobiology, with a focus on

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neuropsychology, was created at the Autonomous University of Mexico in 1973. Also in the 1970s, Luria's classic neuropsychology textbooks were translated into Spanish, which marked a pivotal moment that strengthened the discipline in Latin America.

Much growth in Latin American neuropsychology took place in the 1980s. In Brazil in 1980, the Brazilian president inaugurated a Network of Rehabilitation Hospitals known as SARAH, which created a new model of public health specific to neurorehabilitation. In 1981, Colombia hosted the International Congress of Neuropsychology (Ardila, 1999; Pontón & Ardila, 1999). This Spanish language meeting was attended by more than 700 people from 14 countries and marked the first opportunity for the various groups from Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Uruguay to become aware of each other's work and exchange ideas. Conference discussions focused around the need for formal neuropsychology training programs, the creation of a Spanish language neuropsychological journal, and the need for increased collaboration among countries. In 1983, Mexico hosted a meeting of the International Neuropsychological Society (INS) during which the creation of a Latin American branch of the INS was proposed. However, economic and scientific heterogeneity in Latin America proved too great an obstacle and this did not materialize (Ardila, 1990). Between 1983 and 1988, national neuropsychology societies were created in Argentina, Chile, Colombia, Honduras, Mexico, Nicaragua, and Peru. In the early twenty-first century, Brasilia was chosen as the host city for the conferences of The International Brain Injury Association in 2000, The International Neuropsychological Society in 2001, and The World Federation for Neurorehabilitation in 2008. In 2004, the SARAH network organized the 1st International Neuroscience and Rehabilitation Congress in Brazil.

At a country-specific level, Latin American neuropsychology has developed at differing paces. Although important advancements in the professionalization of neuropsychology occurred in South America, Mexico, and some Central American countries in the 1980s, most Central American countries lacked professionalization of the field at that time (de la Cadena et al., 2009). As of 2009, several countries had developed postgraduate (master's level) education tracks in neuropsychology, including Argentina (Labos, 2009), Chile (Díaz, Delgado, & Maudier, 2009), Colombia (Arango-Lasprilla & Rivera, 2015), Costa Rica (de la Cadena et al., 2009), Mexico (Ostrosky-Solís & Matute Durán, 2009), and Brazil. However, several countries did not have any formal postgraduate training in neuropsychology, including Bolivia (Barba, 2009), Cuba (Vega et al., 2009), Uruguay (Dansilio, 2009), Venezuela

(Iribarren, 2009), El Salvador, Honduras, and Panama (de la Cadena et al., 2009).

In addition to the varying rates of academic or pedagogic development, the practice of neuropsychology differs across countries. For example, neuropsychology has been conducted in private practice in some countries, such as Ecuador (Balarezo & Mancheno, 2009) and Guatemala (de la Cadena et al., 2009). However, other countries, such as El Salvador, do not have neuropsychology clearly delineated as a field of study or practice at the governmental level (de la Cadena et al., 2009). Other countries, such as Bolivia, have not compiled data about their practicing neuropsychologists (Barba, 2009) or, such as Nicaragua, have a very limited number of trained neuropsychologists (de la Cadena et al., 2009). In contrast, in Brazil, the practice of neuropsychology was recognized in 2004 by the Conselho Federal de Psicologia (CFP; Federal Council of Psychology) as a specialty (Conselho Federal de Psicologia, 2016). Every year the CFP organizes specialty exams and training programs can apply for accreditation from this organization. In 2011, The Conselho Federal de Fonoaudiologia (Federal Council of Speech Pathology) recognized neuropsychology as a specialty as well (Título de Especialista, n.d.).

Neuropsychology in Latin America has developed relatively slowly for several reasons, including the heterogeneity of cultural and linguistic backgrounds across its countries, differences in scientific and economic development that influence access to academic and professional resources, and differing educational and health systems (Pontón & Ardila, 1999). Today there are different post-graduate training programs in several countries including Mexico, Colombia, Argentina, Chile, Ecuador, Paraguay, Brazil, Costa Rica and Guatemala. There are professional societies of neuropsychology in many countries. There are several specialized Spanish-language journals including: *Neuropsicología*, *Neuropsiquiatría y Neurociencias* (<http://www.asoclatneuropsicologia.com/revista-1.html>), *Neuropsicología Latinoamericana* (<http://www.neuropsicolatina.org/>), *Revista Argentina de Neuropsicología* (<http://www.revneuropsi.com.ar/>), and the *Revista Chilena de Neuropsicología* (<http://www.neurociencia.cl/>), and there are also two international Spanish-language societies: Asociación Latinoamericana de Neuropsicología (ALAN) and Sociedad Latinoamericana de Neuropsicología (SLAN).

During recent years, several surveys have tracked multiple aspects of neuropsychological practice, including socio-demographic characteristics of practitioners, professional activities, education and training, fees and salary ranges, and ethical beliefs and behaviors (e.g.,

Elbulok-Charcape, Rabin, Spadaccini, & Barr, 2014; Rabin, Barr, & Burton, 2005; Rabin, Borgos, & Saykin, 2008; Sharland & Gfeller, 2007; Shultz, Pedersen, Roper, & Rey-Casserly, 2014; Sweet, Nelson, & Moberg, 2006). These surveys, however, include information mostly from professionals in the USA, with very little information about the state of neuropsychology as a profession in other countries and no survey data concerning the profession in Latin America. There is a lack of multi-country data describing those who are considered to be neuropsychologists in Latin America, in what settings they work, or what practice and ethical guidelines exist. Therefore, the purpose of this study was to analyze the characteristics of the profession of neuropsychology in Latin America, including the background professional training, current working situation, assessment and diagnostic procedures used, rehabilitation techniques employed, population targeted, teaching responsibilities, and research activities.

Method

Participants

Participants were self-identified psychologists or other health professionals who worked in the field of neuropsychology in Latin America and who completed the survey. Participants' data were included for analyses if they: (a) reported having at least a Bachelor's degree; (b) considered themselves to be a neuropsychologist and/or to be performing at least some of the activities related to neuropsychology (i.e., assessment, diagnosis, treatment, teaching or research) over the past year; and (c) completed the socio-demographic questions, which were at the very beginning of the survey, and (d) reported currently living in Latin America.

A total of 1,046 individuals began the survey. Of these, 88 reported not having a bachelor's degree (exclusion criteria 1), 93 reported not considering themselves to be a neuropsychologist or not performing at least some of the activities related to the area (exclusion criteria 2), and 57 of the individuals did not complete the demographic questions (exclusion criteria 3). All 808 individuals who continued on in the survey reported living in Latin America (exclusion criteria 4). Thus, the final sample for analysis was 808 individuals who met all inclusion criteria.

The final sample consisted primarily of participants from Colombia ($n = 316$; 39.1%), Brazil ($n = 184$; 22.8%), and Mexico ($n = 173$; 21.4%), with 16.5% of the sample ($n = 135$) from other Latin American countries including Argentina, Bolivia, Chile, Cuba, Dominican Republic, Ecuador, Guatemala, Honduras,

Panama, Paraguay, Peru, Puerto Rico, Uruguay, and Venezuela. The majority of participants were female (71.9%) and the mean age was 36.76 years (range 21–74 years). Participants' average number of years of experience in neuropsychology was 6.8 (range 0–40) and the majority of their neuropsychological work took place in private practice (22.8%) or at a college or university (18.9%).

Measures

A group of researchers in the field of neuropsychology at the University of Deusto, in Spain, developed the survey utilized in this study using the following procedure. First, an exhaustive review of the literature was conducted through which seven areas of interest were identified: (a) professional training, (b) current work situation, (c) evaluation and diagnosis, (d) rehabilitation, (e) teaching, (f) research, and (g) ethics. Questions were generated to address each of these areas, as well as demographic information. Subsequently, the survey was sent to a group of experts in neuropsychology from each Latin American country that was to be surveyed to ensure the questions were adapted to the cultural and linguistic context of each country.

Once the comments from the experts were incorporated, the final survey was composed of 67 questions that were entered into an online survey platform (www.surveymonkey.com). Five neuropsychologists completed the survey in order to ensure accuracy, validity, and proper operation and data capture of the online survey prior to distribution.

The questions were developed in Spanish. For countries where Portuguese is spoken, Chapman and Carter (1979) methodology was used to translate the survey into Portuguese. Bilingual researchers translated the items, back-translated into Spanish, and any discrepancies were resolved mutually. For the present study the section in ethics was excluded from the analysis, since those results can be found in another article (Panyavin, Goldberg-Looney, Rivera, Perrin, & Arango-Lasprilla, 2015).

Procedure

Once the ethics committee at the University of Deusto approved the study, recruitment was conducted by sending an email inviting participation from neuropsychology professionals who were members of professional neuropsychology organizations in Latin America, specifically Argentina, Brazil, and Mexico. The associations in Brazil and Mexico posted the link to the survey on their social networks. The email was

also distributed by the national professional psychology organization in Colombia. It is important to note that these four Latin American countries have the most developed history of neuropsychology in the region. The current presidents of ALAN and SLAN were contacted and asked to distribute the email to their members. The email contained the study details, the hyperlink to the online survey, and a request for their assistance in recruiting additional neuropsychology professionals as participants (snowball sampling). Data collection occurred from July 1, 2013 to January 1, 2014. The sections of the survey related to evaluation and diagnosis, rehabilitation, teaching, and research were only completed by respondents if they reported engaging in that type of activity in the prior year.

Statistical analysis

The database was downloaded from the Survey Monkey server and analyses were conducted using SPSS 22.0 (IBM Corp., Armonk, NY). Frequencies and means were reported for each question and/or response. The denominator used to calculate percentages was adapted to the number of individuals who responded to a particular question. Because not all individuals might endorse having worked in evaluation and diagnosis, rehabilitation, teaching, and/or research in the prior year, in some cases the denominator was determined by the number endorsing the activity.

Results

Professional training

Table 1 summarizes participant responses related to issues of professional training. Briefly, the majority (74.6%) of participants reported having received training in neuropsychology during their post-graduate studies (one-year specialization, master's, or doctoral programs). This training and the quality of clinical supervision they received was characterized as "very good" by 41.9% and 31.7% respectively. It is interesting to note that, out of the 804 participants who answered the question, 19 (2.4%) professionals who considered themselves to be neuropsychologists reported not having received training of any kind. In regards to their qualifications, 37.4% reported having an official certification to act as a neuropsychologist. The majority (77.7%) endorsed a belief that professionals practicing as clinical neuropsychologists should have a degree (at any level) in Psychology. The Top 3 most frequently identified barriers to the development of neuropsychology in Latin America were a lack of academic training

Table 1. Professional training of neuropsychologists in Latin America.

	Frequency	Percentage
Received training during graduate studies (<i>n</i> = 808)		
Yes	603	74.6
No	205	25.4
Assessment of training received (<i>n</i> = 804)		
Excellent	153	19.0
Very good	337	41.9
Good	208	25.9
Fair	63	7.8
Poor	24	3.0
No training received	19	2.4
Clinical supervision received during training (<i>n</i> = 801)		
Excellent	150	18.7
Very good	254	31.7
Good	222	27.7
Fair	85	10.6
Poor	35	4.4
No supervision received	55	6.9
Neuropsychology Qualifications (<i>n</i> = 808)		
Have obtained official certification	302	37.4
Have not obtained official certification; none exists	207	25.6
Have not obtained official certification; certification exists	173	21.4
Have not obtained official certification; unaware if any exists	126	15.6
Degree required to practice as a clinical neuropsychologist (<i>n</i> = 775)		
Psychology degree needed	516	66.6
Psychology degree not needed	259	33.4
Barriers for the development of neuropsychology in Latin America (<i>n</i> = 808) ^a		
Lack of academic training programs	379	46.9
Lack of clinical training opportunities	367	45.4
Lack of willingness to collaborate between professionals	290	35.9
Lack of access to neuropsychological instruments	283	35.0
Lack of professional leaders in the field	250	30.9
Lack of access to literature/ libraries	91	11.3
There are no barriers	67	8.3
Lack of access to technology/ computers	30	3.7
Lack of access to the internet	10	1.2

^aMultiple response options available, responses do not add up to 100%. Percentages are calculated out of total *n* = 808.

programs (46.9%), a lack of clinical training opportunities (45.4%), and a lack of willingness to collaborate between professionals (35.9%). Please see Table 1 for additional barriers.

Current work situation

According to the 727 respondents answering these questions out of the 808 who met inclusion criteria, the average length of time they spent working in the area of neuropsychology was 6.8 years, with 707 participants reporting working an average of 24.1 hours per week. The reported average monthly income was USD \$1,479.08 Finally, regarding the satisfaction with their salary, which was measured using a scale from 1 to 10 with 1 being "Extremely dissatisfied" and 10 "Extremely satisfied", those answering the question (*n* = 686) reported an average of 5.1; and in relation

Table 2. Current work situation of neuropsychologists in Latin America.

	Frequency	Percentage
Employment status (<i>n</i> = 763)		
Full time	329	43.1
Part time	334	43.8
Unemployed	91	11.9
Retired	9	1.2
Setting of neuropsychology practice (<i>n</i> = 735)		
Private practice	184	25.0
University	153	20.8
Private clinic	121	16.5
Hospital system	107	14.6
School system	46	6.3
For profit rehabilitation facility	37	5.0
Medical school	35	4.7
Non-profit rehabilitation facility	27	3.7
Other	25	3.4

to their work as neuropsychologist 691 participants reported an average satisfaction of 8.0.

As summarized in Table 2, most participants were employed either full-time (43.1%) or part-time (43.8%). The Top 3 most frequently endorsed primary work settings were private practice (25.0%), university (20.8%), and private clinic (16.5%).

Evaluation

A total of 654 of 735 (88.9%) participants reported having performed neuropsychological assessments over the past year. Out of these, 85.2% (*n* = 557) conducted neuropsychological assessments on an average of 14.3 patients per month, taking on average 8.4 hours to evaluate, qualify, interpret the results, and write the report.

As summarized in Table 3, 48.1% used personalized/flexible batteries to carry out these assessments. From a list of 60 commonly used neuropsychological instruments for neuropsychological assessment and diagnosis, Table 3 presents those 20 that were reported to be most commonly used, with the majority using the Stroop test (66.7%), the MMSE (52.0%), and the Clock Drawing Test (51.1%).

Over half of respondents (52.5%) reported using normative data from their own countries to score neuropsychological tests. Over half (66.5%) reported obtaining neuropsychological instruments by purchasing them from the publisher (66.5%), while 34.7% reported making photocopies or reproducing the instruments, and 34.7% reported borrowing them from colleagues. The problems with neuropsychological instruments most commonly identified included a lack of normative data in their country (61.8%, *n* = 404) and that measures are not adapted to their culture (56.4%). Please see Table 4 for more detailed information.

Table 3. Type of assessment battery, and instruments used by neuropsychologists in Latin America.

	Frequency	Percentage
Type of battery used (<i>n</i> = 572) ^a		
Personalized/flexible batteries	275	48.1
Flexible batteries	211	36.9
Standardized batteries	86	15.0
20 most used instruments (<i>n</i> = 654) ^b		
Stroop Test (Stroop Neuropsychological Screening Test)	436	67.0
MMSE (Mini-Mental State Examination)	340	52.0
Clock Drawing Test	334	51.0
TMT A&B (Trail Making Test A&B)	321	49.0
Token (Token test)	314	48.0
ROCFT (Rey-Osterrieth Complex Figure Task)	310	47.0
RAVLT (Rey Auditory Verbal Learning Test)	266	41.0
ENI (Evaluación Neuropsicológica Infantil)	264	40.0
BNT (Boston Naming test)	250	38.0
NEUROPSI (Evaluación Neuropsicológica Breve en Español)	246	38.0
Bender (Bender Visual Motor Gestalt Test)	235	36.0
Barcelona (Test de Barcelona)	216	33.0
CVLT (California Verbal Learning Test)	192	29.0
SDMT (Symbol Digit Modalities Test)	186	28.0
NEUROPSI AyM (Neuropsi Atención & Memoria)	144	22.0
D2 Test (Concentration Endurance Test)	143	22.0
CPT (Continuous Performance Task)	141	22.0
BDAE (Boston Diagnostic Aphasia Examination)	121	19.0
TAVEC (Test de Aprendizaje Verbal Española Complutense)	103	16.0
CERAD (Consortium to Establish a Registry for Alzheimer's Disease)	100	15.0

^aOnly 654 of 735 participants endorsed conducting neuropsychological evaluations within the past year. ^bmultiple response options available, responses do not add up to 100%. Percentages are calculated out of total *n* = 654.

When respondents were asked about the patient populations they worked with, 35.0% reported individuals with ADHD, 33.0% reported individuals with learning disabilities, and 26.0% reported individuals with a mental retardation. Individuals with neurological conditions such as traumatic brain injury, dementia, and stroke were also among the patient populations most frequently tested. Table 5 presents the complete list of patient populations and the neuropsychological domains assessed. All domains are assessed with relatively similar frequencies endorsed by 82.0% to 88.0% of survey respondents. In addition, the majority of respondents supplement their neuropsychological assessment and diagnosis with additional sources of information. These include medical/psychiatric history (79.1%; *n* = 517), environmental demand characteristics (77.7%; *n* = 508), developmental history (76%; *n* = 497), significant other interview (73.7%; *n* = 482), behavioral assessment (73.1%; *n* = 478), mood and affect measures (72.2%; *n* = 472) school records (71.1%; *n* = 465), neuropsychological test data (69.6%; *n* = 455), functional assessments (69.0%; *n* = 451), mental status exam (69.0%; *n* = 451), previous neuropsychological tests data

Table 4. Scoring procedures used, method of obtaining instruments, and problems with instruments identified by neuropsychologists in Latin America.

	Frequency	Percentage
Scoring procedures utilized (<i>n</i> = 654) ^a		
Use of normative data from own country	424	52.5
Use of normative data from another country	340	42.1
Custom procedures through clinical practice	196	24.3
Use of raw scores without normative group comparison	59	7.3
Other	32	4.0
Method of obtaining neuropsychological instruments ^a		
Purchasing from publisher	435	66.5
Making photocopies or reproducing instruments	230	35.2
Borrowing from colleagues	227	34.7
Downloading from the internet	182	27.8
Borrowing from libraries or laboratories	161	24.6
Requesting from author	68	10.4
Other	24	3.7
Main problems with neuropsychological instruments ^a		
Lack normative data for my country	404	62.0
Not adapted to my culture	369	56.0
Too costly/ expensive	323	49.0
Aimed at individuals with high levels of education	163	25.0
Are often not applicable because my patients cannot read or	152	23.0
Not translated to my language	126	19.0
Do not have good psychometric properties	101	15.0
Take a long time to administer	88	13.0
There are no problems with the instruments that I use	52	8.0
Too complicated to administer and/ or score	35	5.0
Other	18	3.0

^aMultiple response options available, responses do not add up to 100%. Percentages are calculated out of total *n* = 654.

(68.3%; *n* = 446), referral source (55.4%; *n* = 362), work records (53.7%; *n* = 351), current social support (50.5%; *n* = 330), personality test (28.9%; *n* = 189), and other (3.8%; *n* = 25).

The three primary reasons for consultation were determination of diagnosis (76.8%; *n* = 502), rehabilitation and treatment (48.3%; *n* = 316), and educational planning (30.0%; *n* = 196). Table 6 lists all the referral sources received by neuropsychologists, of which the most frequently endorsed were neurology (67.0%), psychology (63.0%), and the school system (54.0%).

Rehabilitation

A total of 670 of the 808 participants who meet inclusion criteria (83.0%) answered the questions regarding having worked in neuropsychological rehabilitation during the past year, with 61.0% (*n* = 409) of these responding affirmatively. Within this sub-group, services were provided to, on average, 12.6 patients per month, with an average of 11.6 hours per week devoted to therapy. Table 7 provides details about the diagnostic groups and areas of neuropsychological treatment. The majority of respondents reported

Table 5. Groups of patients assessed and frequency of evaluation of various cognitive domains by neuropsychologists in Latin America.

	Frequency	Percentage
Groups of patients assessed (<i>n</i> = 654) ^a		
ADHD	232	35.0
Learning disabilities	214	33.0
Mental retardation	169	26.0
Dementia	159	24.0
Stroke/vascular	135	21.0
Depression	129	20.0
Pervasive Developmental Disorder	122	19.0
Traumatic Brain injury	116	18.0
Seizure disorders	91	14.0
Anxiety disorder	89	14.0
Movement disorder	58	9.0
CNS tumor	53	8.0
Bipolar disorders	52	8.0
Substance abuse	51	8.0
Personality disorders	51	8.0
Schizophrenia	50	8.0
Multiple sclerosis	36	6.0
Pain	23	4.0
Toxic/metabolic	22	3.0
Other	15	2.0
AIDS	11	2.0
Cognitive domains assessed (<i>n</i> = 670) ^b		
Attention	573	88.0
Executive functions	572	87.0
Language	571	87.0
Visuospatial skills	568	87.0
Nonverbal memory	568	87.0
Verbal memory	565	86.0
Intelligence	563	86.0
Construction	557	85.0
Motor skills	557	85.0
Auditory perception	555	85.0
Achievement	554	85.0
Tactile perception	539	82.0

^aMultiple response options available, responses do not add up to 100%. Percentages are calculated out of total *n* = 654. ^bmultiple response options available, responses do not add up to 100%. Percentages are calculated out of total *n* = 670.

Table 6. Referral sources of patients attending neuropsychology services.

	Frequency	Percentage
Referral sources (<i>n</i> = 654) ^a		
Neurology	439	67.0
Psychology	411	63.0
School system	353	54.0
Psychiatry	328	50.0
Pediatrics	218	33.0
Self-referral	214	33.0
Rehabilitation (rehab. nurse, counselor, or other rehab.)	211	32.0
Neurosurgery	209	32.0
Geriatrics	172	26.0
Friends	159	24.0
Family (general medicine)	131	20.0
Internal medicine	69	11.0
Insurance company	67	10.0
Psychiatry	65	10.0
Alcohol/ drug facilities	62	9.0
Law (attorney)	47	7.0
Occupational Medicine	41	6.0
Cardiology	24	4.0
Other	22	3.0
Orthopedics	10	2.0

^aMultiple response options available, responses do not add up to 100%. Percentages are calculated out of total *n* = 654.

Table 7. Diagnostic groups for neuropsychological rehabilitation treatment and areas in which neuropsychologists in Latin America perform neuropsychological rehabilitation treatment.

	Frequency	Percentage
Diagnostic groups (<i>n</i> = 409) ^a		
ADHD	237	58.0
Learning disabilities	237	58.0
Traumatic brain injury	173	42.0
Dementia	159	39.0
Stroke/vascular	152	37.0
Mental retardation	142	35.0
Pervasive Developmental Disorder	125	31.0
Anxiety disorders	73	18.0
Depression	67	16.0
Seizure disorders	67	16.0
Movement disorders	47	11.0
Multiple sclerosis	38	9.0
Schizophrenia	36	9.0
Substance abuse	35	9.0
Bipolar disorders	33	8.0
CNS tumor	32	8.0
Personality disorders	30	7.0
Pain	15	4.0
Other	13	3.0
AIDS	13	3.0
Toxic/metabolic	7	2.0
Areas of neuropsychological rehabilitation treatment (<i>n</i> = 409) ^a		
Attention/ Concentration	354	87.0
Memory	326	80.0
Executive functioning	325	79.0
Communication/ Speech & language	247	60.0
Visual-perceptual & constructional abilities	221	54.0
Emotional/ behavioral adjustment & well-being	216	53.0
Autonomy & independence	197	48.0
Family functioning	192	47.0
Awareness of disability/ disease	127	31.0
Motor skills/ strength	117	29.0
Returning to work	95	23.0
Sexual adjustment problems	39	10.0

^aMultiple response options available, responses do not add up to 100%. Percentages are calculated out of total *n* = 409.

providing rehabilitation services to individuals with ADHD and/or learning disabilities (each endorsed by 58.0% of respondents) and the Top 3 most commonly assessed areas of functioning were attention and concentration (87.0%), memory (80.0%), and executive functioning (79.0%).

As seen in Table 8, the overwhelming majority of respondents (78.0%) reported providing individual therapy, and using personal computers (76.5%) as a technological tool used during rehabilitation. Table 8 provides the complete list of therapies endorsed and technological tools utilized by respondents.

Teaching

A total of 648 of the 808 participants who meet inclusion criteria (80.2%) answered the questions regarding having engaged in teaching activities related to neuropsychology during the past year, with 46.0% (*n* = 298) of these responding affirmatively. Of these, 295 participants reported high satisfaction with their role as professors in the area of neuropsychology

Table 8. Types of treatment provided and technological tools used in rehabilitation by neuropsychologists in Latin America.

	Frequency	Percentage
Types of treatment provided (<i>n</i> = 374) ^a		
Individual therapy	293	78.3
Mixed (individual and group) therapy	64	17.1
Group therapy	17	4.5
Technological tools used in rehabilitation (<i>n</i> = 409) ^b		
Personal computers	313	76.5
iPads or tablets	157	38.4
Mobile phones or smart phones	79	19.3
Neurofeedback	32	7.8
Virtual reality	24	5.9
Neuromodulation (TMS, tDCS)	11	2.7
Other	30	7.3

^aMultiple response options available, responses do not add up to 100%. Percentages are calculated out of total *n* = 374 (those who provided specific information about the treatment they perform). ^bmultiple response options available, responses do not add up to 100%. Percentages are calculated out of total *n* = 409.

(average of 8.2, using a scale of 1–10, where 1 is “not at all satisfied”, and 10 “completely satisfied”). As seen in Table 9, the majority (53.8%) reported teaching at private institutions, with most respondents reporting teaching and directing theses or dissertations with topics in neuropsychology at the undergraduate level (70.8% and 53.7%, respectively).

Research

A total of 643 of the 808 participants who meet inclusion criteria (79.6%) answered the questions regarding having conducted research in the area of neuropsychology in the last year, with 61.7% (*n* = 397) of these responding affirmatively. The overwhelming majority of respondents reported that their institutions had an ethics committee (81.0%; *n* = 306). Out of 383 respondents that answered these questions, 80.9% (*n* = 310) reported they always sought ethics committee approval prior to starting a new research project.

Table 9. Teaching by neuropsychologists in Latin America.

	Frequency	Percentage
Institution where teaching occurs (<i>n</i> = 298) ^a		
Private institution	155	53.8
Public institution	95	33.0
Both	38	13.2
Level at which teaching occurs ^a		
Undergraduate	211	70.8
Specialization (1 year programs)	106	35.6
Master's	66	22.1
Doctoral	29	9.7
Level at which thesis or dissertations were supervised ^a		
Undergraduate	160	53.7
Specialization (1 year programs)	63	21.1
Master's	63	21.1
Doctoral	30	10.1

^aNote: multiple response options available, responses do not add up to 100%. Percentages are calculated out of total *n* = 298 (those who reported having engaged in teaching related to neuropsychology within the past year).

Almost all (95.8%; $n = 366$) reported obtaining informed consent from their participants.

Of 96.5% ($n = 383$) of participants that reported on their research training, the majority reported receiving training in neuropsychology research during their clinical education or training (79.6%; $n = 305$), never receiving grant funding for research (60.8%; $n = 230$), and having insufficient resources and material to conduct neuropsychological research (59.9%; $n = 226$).

Regarding the use of statistical software and statistical analysis, slightly more than half (55.5%; $n = 202$) reported a medium level of proficiency in Excel and slightly less than half (47.6%; $n = 169$) reported medium level of proficiency in SPSS. The majority reported having no knowledge of analysis in SAS (78.8%; $n = 204$) or R (80.3%; $n = 200$). The majority of respondents (52.8%; $n = 198$ of the 375 participants that answered this question) reported conducting their own statistical analysis when performing research.

Discussion

To our knowledge, this is the first study reporting information about the characteristics and practice of neuropsychology professionals in Latin American countries. Several conclusions can be drawn from the current survey. First of all, professional background in general, type of patients, testing instruments, environments, and referral sources, are not so different in Latin America from other regions in the world. Most frequently, the majority of neuropsychologists have a background in psychology, with some additional specialized training and supervised clinical practice, and work either in private practice, university settings, or private clinics. These characteristics are similar to those of neuropsychologists in the United States and Canada (Rabin et al., 2005). Notably, women represent about two thirds of the professional neuropsychologists in Latin America, whereas women are underrepresented in the United States and Canada (Rabin et al., 2005). Importantly, neuropsychologists in Latin America find their professional activities in general quite satisfactory, and report being neither satisfied nor dissatisfied with their salaries.

Professional training

Today, the only degree needed to practice neuropsychology in the majority of the countries in Latin America is a 5-year, subject-specific bachelor's degree (Arango-Lasprilla & Rivera, 2015; Fonseca-Aguilar et al., 2015). However, most practicing neuropsychologists have studied psychology for five years and

completed an undergraduate thesis and supervised practicum. The training is not necessarily specific to the subspecialty of neuropsychology and yet these individuals can be engaged in activities related to the field of neuropsychology after graduation. Therefore, a major challenge that requires immediate attention in Latin American neuropsychology is the need to establish some type of certification. Three out of four professionals working in neuropsychology have postgraduate degrees in neuropsychology (e.g., 1-year specialist, one or 2-year masters, or 3–5-year doctoral degrees). However, not all Latin American countries offer graduate training programs, and approximately 25% of the sample do not have a postgraduate degree. This results in a significant number of practicing neuropsychologists in Latin America who are inadequately prepared to be engaged in neuropsychological activities.

Because of the tremendous diversity found in the number of working professionals, availability of practicums, existence of academic programs, and overall development of neuropsychology as a profession, certifications in Latin American countries will likely need to be country specific. For instance, neuropsychologists in a given country should work together with national psychological associations within their country to create regulations that take into account the current state of professional development. This approach will be successful if all the stakeholders involved come together and work towards the same goal. Some leaders in the field have proposed creating a neuropsychology board in Latin America; currently ALAN is the only program/association in Latin America developing a certification program for neuropsychologists, however this idea is only at its initial stages of development.

The current problems that the field of neuropsychology in Latin America must face are not unique to this profession. In this field and many others, collaboration between professionals can be difficult. One out of three survey respondents identified the issue of lack of collaboration as one of the major obstacles to professional and scientific development. Recently, with the advancement of communication technologies such as access to the Internet and email, social networks such as Facebook, and professional networks such as LinkedIn, neuropsychologists within the same country and across different countries can collaborate more easily than before. As a result, numerous international meetings, online journals, multicenter studies, and working groups of neuropsychologists have contributed significantly to advancement in this area in recent years (Arango-Lasprilla & Rivera, 2015; Fonseca-Aguilar et al., 2015). Furthermore, guild organizations could work together to advance the development of

the field. For instance, if the two main Latin American neuropsychological associations—ALAN and SLAN—were to unite, this union might increase opportunities for international professional collaboration and have the potential to more rapidly advance the practice of neuropsychology in the region.

Current work situation

Although participants reported an average of six years of work in the area, less than half reported working full time. One possible explanation may be the fact that the role of the neuropsychologist is not known to many people, professionals from other disciplines, and institutions in Latin America, therefore, few sites offer full-time positions for neuropsychologists. Moreover, many hospitals or rehabilitation centers do not hire full-time neuropsychologists and those few that do tend to pay minimum salaries (Colegio Colombiano de Psicólogos, 2009; Elfernan, Soto, Coble, & Ramos, 2009; Salas, 2014). Therefore, many professionals have to balance their working life as neuropsychologists with a second job or with their private practice (Arango-Lasprilla & Rivera, 2015). In this study, participants spend an average of 24 hours a week engaged in neuropsychological activities and work in private practice, teaching at the university, or in private clinics.

Evaluation

According to results on questions about the types of populations worked with for assessment and diagnosis (e.g., learning disabilities, ADHD, and mental retardation), it appears that many individuals working in the area of neuropsychology commonly assess children. In spite of the studies developed during the past two decades to validate and standardize neuropsychological tests in various countries in Latin America (Arango-Lasprilla et al., 2015), the current limited amount of assessment instruments developed directly in Latin America represents a major obstacle for the professional practice of neuropsychology. Currently there are a few normative studies with “classical” neuropsychological instruments [e.g., Boston Diagnostic Aphasia Examination, Rey-Osterrieth Complex Figure, Token Test, (Ardila & Rosselli, 1994; Pineda et al., 2000; Rosselli & Ardila, 1991)]; and frequently these studies are published in local journals with limited dissemination across countries. Furthermore, the sociocultural conditions across different countries within Latin America are not the same; thus the applicability of these instruments is questionable and raises concerns. For instance,

Argentinean norms are not applicable to individuals in Guatemala.

The lack of assessment tools developed specifically for Latin America or for specific sociodemographic characteristics of each country could be one reason why four out of 10 practicing neuropsychologists report scoring the instruments with norms from other countries, or in many cases, use tests that are not culturally adapted or that are poorly translated (Arango-Lasprilla & Rivera, 2015; Fonseca-Aguilar et al., 2015). This practice can lead to errors in diagnosis and difficulties in designing, implementing, and determining the effectiveness of treatment programs. However, this problem has recently begun to gradually resolve itself with the creation of new instruments developed specifically for Latin American population (e.g., ENI, Neuropsi) and the implementation of multicenter studies of standardization and validation of the main neuropsychological tests used in Latin America (Arango-Lasprilla & Rivera, 2015; Guàrdia-Olmo, Pero-Cebollero, Rivera, & Arango-Lasprilla, 2015).

Despite the aforementioned advancements, much remains to be done, as the vast majority of tests used with children in clinical practice do not have norms for the Latin America population (Arango-Lasprilla & Rivera, 2015, Arango-Lasprilla et al., 2015a, 2015b, 2015c, 2015d; Olabarrieta-Landa et al., 2015a, 2015b; Rivera et al., 2015a, 2015b, 2015c, 2015d). Therefore, the implementation of multicenter studies for the validation and standardization of instruments used with children are necessary. Future neuropsychological studies of children in Latin America should include effort measures and embedded validity indicators, (see Kirkwood, 2015). Lastly, most of the post-graduate training that is available within one-year specialization, master’s, or doctoral programs in Latin America is focused on adult neuropsychology. Specialized programs in child neuropsychology must be developed in order to adequately train the numerous individuals assessing and diagnosis children within the field of neuropsychology.

Rehabilitation

Only half of those working in the field of neuropsychology report being engaged in activities related to rehabilitation. This reflects the fact that even though the area of neuropsychology in Latin America is still very new, rehabilitation is an even younger field. The first Spanish-language books on rehabilitation were published in 1996 (Ostrosky et al., 2014) and 2006 (Arango-Lasprilla, 2006). In addition, from 1990 to 2010, many master’s programs in Latin America did not include courses specifically related to

rehabilitation. However, in the last five years, more and more attention is being focused on this area. For instance, more Spanish language books have been published (Delgado & Weidman, 2012; Guerrero-Bote & Moya-Anegón, 2012), centers and clinics dedicated solely to rehabilitation of people with brain damage in countries like Cuba, Peru, Uruguay, Paraguay, Colombia, Mexico, Argentina, Brazil, Puerto Rico, among others, have begun to be established, and new course offerings, conferences, and master's programs that focus exclusively on these topics have been developed (Arango-Lasprilla & Rivera, 2015).

Despite the increase in centers, programs, and professionals dedicated to neuropsychological rehabilitation in Latin America, it is important to note that most of the progress in this field has been made in the area of rehabilitation for adults with brain damage. There has been very little advancement in the neuropsychological rehabilitation of children (Arango-Lasprilla & Rivera, 2015). This is surprising and an important need identified from the results of this survey because more than half of respondents working in the field of neuropsychological rehabilitation report working with children to treat ADHD and learning disabilities.

This is especially important because the vast majority of patients undergoing rehabilitation in Latin America are children. Therefore, in the future, reference materials (such as textbooks, manuals, etc.) must be translated into Spanish, more support and training should become available for these professionals, children's rehabilitation programs ought to be developed and disseminated in Spanish, specialized master's and doctoral programs must be created in this area, and centers that offer rehabilitation services directed at children must be established to meet the needs of the region.

Teaching

Almost 300 participants in the study reported having taught courses in neuropsychology, but mostly for private universities. The results of this study indicate that most teaching activities are focused on undergraduate courses. Few respondents teach at the doctoral level. At present, there are very few doctorate programs in neuropsychology in Latin America. It is possible to specialize in neuropsychology within a doctoral program in psychology and complete a doctoral dissertation within the psychology Ph.D. (Salas, 2014). Therefore, as indicated by the survey participants, more postgraduate courses (academic and clinical) must be made available to help train future professionals.

However, there is a larger issue at hand: who is qualified to teach courses in neuropsychology or supervise

neuropsychology students at the post-graduate level? This issue highlights the need for regulations to establish an official certificate of neuropsychology in Latin America (that may be country-specific) and a need to have some type of minimum standards for program curricula that are standardized across Latin America because professionals often study abroad to obtain training that is lacking in their home country. Professionals who meet these qualifications should be the only professionals certified to teach or supervise within the field. This approach is one way to guarantee that new professionals are appropriately trained and have the knowledge, skills, and resources to adequately carry out their chosen profession.

Research

The scientific and professional progress of neuropsychology depends greatly on the research that can be developed and carried out. As found in the survey, an important number of neuropsychology professionals carry out some clinical research, but its impact on the international literature is still limited due to the lack of international publications (Ardila, 2014a). However, several international collaborative research programs are progressively, albeit slowly, increasing the development of international publications.

Several reasons could explain the slow rate of research publications in Latin America. First, although almost 80% of the respondents reported receiving research training in their training programs, it is possible that many professionals lack adequate training in scientific writing and dissemination of results, specifically in the area of neuropsychology (Ardila, 2014b). Second, as previously discussed, there is a lack of doctoral research training programs in this region (Salas, 2014). Third, as reported by slightly more than 60% of the sample, researchers in the Latin America the lack of resources needed to conduct research, such laboratories, access to psychometric testing, office equipment, computer software, access to journals, and so forth (Salas, 2014). Fourth, professionals may lack the English language proficiency needed to read and write within the field of science. To help to start to address this issue, internationally recognized researchers in the field could provide courses, on-line or on-site, in Spanish or via interpreters that teach study design and methodology, data analysis, how to write a manuscript that gets published in high impact journals, and how to apply for awards or international grant funding calls.

Conclusions drawn from this study should be interpreted with the following caveats. First, the survey was administered using an Internet platform where evident

intrinsic bias is found; only those professionals with access to the Internet and a willingness to answer the survey are represented in the sample. Furthermore, it is impossible to identify who received the email notification but chose not to answer the survey, thus affecting generalizability of the results. Second, because of the diverse development of neuropsychology in specific Latin American countries and the lack of data available in the majority of these countries regarding the very topics of study in this survey, it is very difficult to assess the representativeness of the present sample. In addition, a limitation common to survey research is that some responders did not answer all survey questions and dropouts may bias the results presented. Third, the questions included in the survey are limited and many areas were not explored, such as type of reports used in neuropsychology, participation in professional teams, multi-disciplinary interactions, and so forth. Finally, as in any survey, the analyses were based on self-report answers, and, although unreasonable and/or contradictory answers were excluded from analysis, it is impossible to know if the answers provided are true. However, despite these limitations the results of the present survey provide a much better understanding of the current state of neuropsychology as a profession in Latin America.

Conclusions

This is the first survey to take stock of the training neuropsychologists in Latin America receive, as well as the various clinical, pedagogical, and investigative facets of their work. The findings of this survey also identify areas that the field of neuropsychology still needs to address. For example, there is a need in Latin America to increase professional regulations, improve graduate curriculums, enhance existing clinical training, develop professional certification programs, validate existing neuropsychological tests, and create new, culturally-relevant instruments.

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