TRANSLATION AND CULTURAL ADAPTATION OF THE COGNITIVE ASSESSMENT SYSTEM 2: RATING SCALE

TRADUCCIÓN Y ADAPTACIÓN CULTURAL DEL COGNITIVE ASSESSMENT SYSTEM 2: RATING SCALE

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ABSTRACT

In Puerto Rico there are no scales in Spanish for teachers to assess the neurocognitive processes underlying the academic and social functioning of students, as established in the Individuals with Disabilities Education Act (IDEA). This paper documents the process of translation and cultural adaptation of the Cognitive Assessment System 2: Rating Scale, which allows teachers to assess the neurocognitive processes of the PASS theory (Planning, Attention, Simultaneous and Successive Processing) in children and adolescents. A concurrent triangulation was used with a sample that included 2 translators, 8 experts in neurocognitive processes and 15 teachers. Chávez and Canino's (2005) methodology was used to obtain semantic and content equivalence. The procedure included: translation into Spanish, review by bilingual experts and teachers, back-translation and final review by experts. According to the results, the reviewers understood the translation of all items, but suggested semantic (e.g. grammatical) and content (e.g. examples of cultural concepts) changes to maintain equivalence with the original version. This work shows the importance of avoiding literal translations, while using comprehensive models of translation and adaptation. In addition, it provides a tool for the identification and early intervention of Specific Learning Disorders (SLD) in Spanish-speaking students, in compliance with IDEA.

KEYWORDS: CAS 2:RS, Cultural adaptation, neurocognitive processes, PASS.

RESUMEN

En Puerto Rico no existen escalas en español para que los maestros puedan evaluar los procesos neurocognitivos subyacentes al funcionamiento académico y social de los estudiantes, establecido en el Acta Educativa de Individuos con Discapacidades (IDEA). Este artículo documenta el proceso de traducción y adaptación cultural del Cognitive Assessment System 2:Rating Scale, el cual permite a los maestros evaluar los procesos neurocognitivos de la teoría PASS (Planificación, Atención, Procesamiento Simultáneo y Sucesivo) en niños y adolescentes. Se llevó a cabo una triangulación concurrente incluyendo una muestra de 2 traductores, 8 expertos en procesos neurocognitivos y 15 docentes. Se utilizó la metodología de Chávez y Canino (2005) para obtener equivalencia semántica y de contenido. El procedimiento incluyó: traducción a español, revisión por expertos bilingües y docentes, traducción inversa y revisión final por expertos. Según los resultados, los revisores entendieron la traducción de todos los ítems, pero recomendaron cambios semánticos (ej. gramaticales) y de contenido (ej. conceptos culturales), manteniendo equivalencia con la versión original. Este trabajo evidencia la importancia de evitar las traducciones literales utilizando modelos comprensivos de traducción y adaptación. Además, provee una herramienta de identificación e intervención temprana de Trastornos Específicos de Aprendizaje (TEA) en estudiantes hispanohablantes, cumpliendo con IDEA.

PALABRAS CLAVE: Adaptación cultural, CAS 2:RS, procesos neurocognitivos, PASS.

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INTRODUCTION

According to the Individual with Disabilities Educational Act (IDEA) (2004), the assessment of cognitive processes is essential to determine the presence of a Specific Learning Disability (SLD) in students. Specifically, the law defines SLD as follows:

> "a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which disorder may manifest itself in the imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations" (IDEA 2004, p. 86)

IDEA (2004), a regulation that applies to the educational system in Puerto Rico, also highlights the active role of teachers during the assessment process to identify a SLD. Notwithstanding the important role of teachers, Puerto Rico does not include them as part of the team performing the assessments, determining the diagnosis, and eligibility for services. Teachers usually only identify signs of behavioral or academic problems and refer the student to professional psychologists for a formal assessment. This formal assessment usually takes several weeks or months, creating a gap between the identification of a disorder and early intervention. The lack of early intervention for students with SLD not only impacts the student's academic and social functioning, but also has long-term negative effects such as dropping out of school, delinquency and unemployment (National Center for Learning Disabilities, 2014).

The limited role of the teachers and the lack of scales to assess neurocognitive processes in the diagnoses of SLD arise because our academic system is still using the traditional IQ-achievement discrepancy model. The discrepancy model establishes that if a student's score on the intelligence test (IQ) is at least two standard deviations (30 points) higher than his or her scores on an achievement test, there is a SLD. This model excludes the assessment of neurocognitive processes encouraged by the IDEA definition of SLD and therefore does not include the use of teachers' rating scales as part of the identification and intervention processes. The IQ-achievement model still prevails because it is an established practice that demands little or no time from classroom teachers because IQ and achievement tests are conducted by a separate team of professionals (Rosen, 2018). However, this model is fraught with problems deeply discussed in the literature (Moreno, 2013; Shifrer, Muller, & Callahan, 2011; Sotelo, Flanagan, & Alfonso, 2011).

The use of the traditional discrepancy model in Puerto Rico is not due to a lack of other alternatives in agreement with IDEA. The most recent review of the IDEA also permits ''the use of other alternative research-based procedures'' for determining SLD, interpreted as involving the evaluation of a ''pattern of strengths and weaknesses'' via tests of academic achievement, cognitive abilities, and neuropsychological processes (Hale et al., 2010; Zirkel & Thomas, 2010).

The Planning, Attention, Successive and Simultaneous Processing model (PASS), the theoretical frame of this study, is one of these research-based procedures that assess cognitive processes in order to fulfill the requirements of the law. Initially described by Das, Naglieri, and Kirby (1994) based on Luria theory (1973), describes the brain as a functional mosaic, with parts that make specific contributions to a larger interacting network.

The four PASS processes of the model represent a fusion of cognitive and neuropsychological constructs such as executive functioning (Planning and Attention), selective, sustained, and focused activity (Attention), processing of information into a coherent whole (Simultaneous), and serial processing of information (Successive) (Naglieri & Otero, 2017). The authors define Planning as a frontal lobe function, which

helps humans achieve goals through the development and use of strategies to accomplish tasks for which a solution is required. Attention is defined as a cognitive processing ability that is associated with Luria's first functional unit (the reticular formation), which allows an individual to selectively focus cognitive activity toward a stimulus over a period of time without being distracted by other competing stimuli. Simultaneous processing is associated with parietal-occipital-temporal brain regions and defined as needed for organizing information into groups or a coherent whole. Finally, Successive processing is associated with the frontal-temporal lobe and defined as an integral ability involved with the serial organization of sounds, such as learning sounds in sequence (e.g., phonological skills) and early reading.

The PASS model was operationalized by the Cognitive Assessment System 2 (CAS-2) (Naglieri, Das, & Goldstein, 2014) and the Cognitive Assessment System 2: Rating Scale (CAS2:RS) (Naglieri, Das, & Goldstein, 2014), providing a framework for assessment, but also leading to neurocognitive intervention (Naglieri & Pickering, 2010).

The validity of the PASS model for the identification of SLD, operationalized by CAS, has been documented across several studies (Bermonti, Díaz, Moreno, & Rodríguez, 2014; Naglieri & Goldstein, 2011; Naglieri & Otero, 2011). Specifically, using the PASS model for this purpose requires examining the individual profile of the four PASS processes, to determine cognitive weaknesses—scores below the student's PASS average and below the national norm (Naglieri & Otero, 2018).

The CAS2:RS, translated and culturally adapted in the present study, allows evaluators to know how the student is applying their cognitive processes in the classroom, in order to develop accurate and early interventions, and provides important information to be integrated with formal individual assessment with the CAS2 (Naglieri et al., 2014). The description of the CAS2:RS will be discussed under a subsequent section. However, its important to note that the CAS2:RS, as part of the PASS comprehensive model, supports compliance with IDEA (2004). Within this context, it is important to have a translated and culturally adapted version of this scale in Puerto Rico.

Translation and Cultural Adaptation

The use of instruments originally developed in a specific language requires a translation and adaption process to consider the role of culture in the constructs. That is, the instruments should be systematically modified to consider language, culture, and context in such a way that they are compatible with the client's cultural patterns, meanings, and values (Bernal, Jiménez, & Domenech, 2009).

The use of English instruments in sociocultural and linguistically different contexts had been limited to the use of literal translations, which have important implications for the findings and their interpretation (Mora-Ríos, Bautista-Aguilar, Natera, & Pedersen, 2013). For example, it may result in phrases that do not make sense, sentences that are poorly constructed, or even the loss of the original meaning of the items (van Widenfelt, Treffers, de Beurs, Siebelink, & Koudijs, 2005). Further, this approach assumes that culture has only a minimal impact on the constructs being measured, and therefore the way the constructs are defined and operationalized in one culture can be applied directly in another culture (Herdman, Fox-Rushby, & Badia, 1997).

Recently, more culturally sensitive models for the translation and adaptation of instruments have emerged. These models view psychological constructs as universal, but assume that instruments used to assess them in another country will likely need to go through culture-specific adaptation (van Widenfelt et al., 2005). Borsa, Damasio, & Bandeira (2012) specify that the instruments should pass through a rigorous and

systematic processes to ensure that the translated and culturally adapted versions are suitable for the new context and are consistent with the original version. The culturally sensitive and comprehensive model used in this study to translate and adapt the CAS2:RS will be discussed in the next section.

Cross-cultural equivalence model for translation and cultural adaptation

The cross-cultural equivalence model for the translation and cultural adaptation of instruments was developed by a group from the Behavioral Sciences Research Institute at the University of Puerto Rico, led by Drs. Ligia M. Chávez and Glorisa Canino, who published the guidelines for translation and cultural adaptation of instruments (2005). This methodology considers the culture as a web that structures human thought, emotion, and interaction. It also assumes that psychological phenomena are universal, yet considerably influenced by the socio-cultural context in which they occur. For this reason, the cross-cultural equivalence model approaches the constructs from two different perspectives, which together have been called the emic-etic paradigm (Brislin, Lonner, & Thorndike, 1973). The emic perspective studies the phenomenon "from the inside" of the culture in an attempt to explain its significance and interrelationship with other intra-cultural elements and the etic perspective, "from the outside", tries to identify and compare equivalent phenomena across different cultural contexts (Chávez, Matías-Carrelo, Barrio, & Canino, 2007).

The systematic process of translation and adaptation described by Chávez and Canino (2005) is based on the cross-cultural equivalence model proposed by Flaherty (1987). It establishes that obtaining equivalence between cross-language and cross-cultural versions of an instrument can be achieved by obtaining evidence about their semantic, content, technical, criterion and conceptual (construct) equivalence. According to Chávez and Canino (2005), semantic equivalence means that the meaning of each item in the instrument is similar in the language of each cultural group, while content equivalence refers to whether the content of each item is relevant to each cultural group or population under study. Even though the current study focuses on attaining semantic and content equivalence, it is important to include the additional equivalences in future studies in order to attain the cultural equivalence of the Spanish CAS2:RS.

Specifically, the cross-cultural equivalence model also establishes that in order to attain semantic and content equivalence, a sequence of techniques should be employed: independent translation by a professional translator, initial review by a Bilingual Committee, review by a Multi-National Bilingual Committee (MNBC), focus groups, subsequent back-translation, and lastly, qualitative re-evaluation by the Bilingual Committee and the Multi-National Bilingual Committee (MNBC) (Chávez & Canino, 2005). This methodological approach has demonstrated to be valid for the translation and cultural adaptation of health instruments (Alegría et al., 2004; Chávez et al., 2007; Cortés et al., 2007; Matias-Carrelo et al., 2003). For a complete description of every step it is recommended the reader to review the Toolkit on Translating and Adapting Instruments published by Chávez and Canino (2005).

According to classic literature usually little is reported in research publications about the translation and adaptation process thus making it difficult for readers and reviewers to adequately evaluate the equivalency and quality of an instrument (van Widenfelt et al., 2005). The purpose of this paper is to document the translation and cultural adaptation of the Cognitive Assessment System 2: Rating Scale (CAS2:RS) to serve as an instrument to assess the four cognitive processes of the PASS model in Spanish-speaking children and adolescents from 4 to 18 years. Specifically, the study aims to obtain semantic and content equivalence between the original version of CAS2:RS and the

adapted version for the Puerto Rican population, following the comprehensive cross-cultural equivalence model of translation and adaptation of instruments proposed by Chávez and Canino (2005).

METHOD

This study builds on the concurrent triangulation design in which quantitative and qualitative data has the same level of importance. The data was collected and analyzed separately, but concurrently. The results were integrated at the interpretation phase, where they were compared to achieve a better understanding of the phenomenon under study. The sample included 25 participants distributed through the phases of translation, experts' review, teachers' focus groups, back-translation and equivalence determination. The two (2) translators were advanced psychology students, older than 21 years and bilingual. They had theoretical and practical knowledge about cognitive processes and the PASS model. The Committee of Experts (CE) consisted of bilingual professional psychologists with expertise in psychometrics, the PASS model and the assessment of cognitive processes (see Table 1). The inclusion of experts with knowledge about Puerto Rican and mainland United States cultures may be important for the use of the CAS2:RS Spanish version with Puerto Rican students who have migrated to the United States.

TABLE 1.
Characteristics of the Committee of Experts.

Expert	Cultural Context	Academic Degree	Experience with PASS Model
#1	Puerto Rico	PhD in School Psychology	Application of the PASS model in the practice of children and adolescents assessment in Puerto Rico. Study and application of the cultural-historical approach in research and teaching.
#2	Puerto Rico	PhD in Psychology	Offers conferences, workshops and trainings about PASS model. Research with executive functions and language using measures such as Cognitive Assessment System (CAS). Study and application of the cultural-historical approach in research and teaching.
#3	Cuba and Puerto Rico	PhD in Investigative Academic Psychology	Application of the PASS model in the practice of children and adolescents assessment in Puerto Rico. Study and application of the cultural-historical approach in research and teaching.
#4	Guatemala	Bachelor in Psychology & Master in Counseling	Application of the PASS model in the practice of Psychology. Worked on CAS translation processes.
#5	New York and Puerto Rico	PhD in Academic Research Psychology	Research on interventions based on the PASS model for children with Specific Learning Disabilities and ADHD.
#6*	Puerto Rico	Post-Doctorate in Neuropsychology & PhD in Investigative Academic Psychology	Collaborator of the CAS' authors in the application of the PASS model in Latin America. Application of the PASS model in Neuropsychological assessment.
#7^	Chicago and Puerto Rico	Post-Doctorate in Neuropsychology, PhD in Health Psychology & Master in School Psychology	Collaborator of the CAS' authors in the application of the PASS model with Hispanic population in United States.
#8^	Virginia	PhD in Educational Psychology	One of the authors of the PASS model, the CAS and CAS2: RS instruments.

Note. *Expert that took the final decision about the review of the Committee of Experts; ^Expert that reviewed the equivalence between the original version and the translated and adapted version.

The focus groups included 15 teachers from the central and metropolitan area of Puerto Rico divided in three groups: pre-service, in-service and retired teachers. The pre-service group included two females and two males with a mean age of 24.5 years. They were enrolled in their last year of a Bachelor of Education. The in-service group was composed of five female teachers with a mean age of 50 years. They were in direct contact with students and had a mean of 22 years of experience as educators. The third group included six teachers, five female and one male, with a mean age of 58 years, retired less than 10 years ago. Additionally, they all had direct contact with students during their last five years of service. All teachers graduated from accredited institutions and had different levels of experience. In terms of specialties, 33.3% (n=5) had a Bachelor of Elementary Education and 26.7% (n=4) had a Bachelor of Elementary and Special Education. Other specialties included were Art, Sciences, History and English. The majority of the teachers reported lack of formal education about the neuroscience of learning or neuropsychology (93.3%, n=14). However, 80.0% (n=12) indicated that they frequently had special education students in their classrooms.

Sampling procedures

The study used a convenience sampling. The translators were suggested by one of the principal investigators. They were contacted by email and agreed to participate. For the CE, the researchers created a bank of resources with contact information for several professional psychologists. The potential participants were contacted by email to determine their availability to participate. All of them responded to the message and were included in the sample. The same process was conducted with in-service and retired teachers, but they were contacted by telephone. In the case of pre-service teachers, the coordinator of a Pedagogy practicum course was contacted in order to access potential participants. She presented the project and provided the contact information of the researchers to those students who were interested in participating.

Once the potential participants accepted the invitation to be part of the study, they completed the informed consent form. The translators completed the document electronically and the rest of the participants completed it in person. The informed consent form included a summary of the study with the main objectives, procedures, the role of the participants in every phase of the study and a statement about benefits, risks and confidentiality. The questions were addressed before the participants gave written consent.

Instruments

Personal background form. This form was used to collect teachers' socio-demographic and professional experience information (e.g. age, gender, academic degree and specialty, academic institution, grade or subjects offered and years of experience). The instrument also collected information regarding formal or informal training about neuropsychology or neuroscience of learning and experience working with special education students.

Pre/post test. A pre/post test was designed to measure the teacher's knowledge before and after receiving a workshop about Luria's theory of brain functioning, the PASS model, cognitive processes and their assessment in the classroom. The test had 20 questions, 10 to assess theoretical knowledge and 10 to assess the ability of teachers to apply the knowledge to the classroom scenario. The minimum score was 0 and maximum score was 20 points. The test could be completed in 10 to 15 minutes.

Worksheets. Several Microsoft Office worksheets were developed to document every stage of the translation and review process (see Table 2).

TABLE 2.
Worksheets used for every phase of the translation and adaptation of the CAS2:RS.

Worksheet name	Content by columns (C)
Worksheet for English to Spanish translation	C1: Item or instructions of the CAS2:RS C2: Spanish translation C3: Comments or suggestions
Worksheet for the first Committee of Experts' review	C1: Item or instruction of the CAS2:RS C2: Translated item or instructions C3: Question about the item understanding C4: Suggestions if it was not C5: Question about cultural relevance C6: Suggestions if it was not
Worksheet for Teachers' review (Focus groups)	C1: Item or instructions of the CAS2:RS C2: Item or instructions reviewed by the experts C3: Question about the item understanding C4: Suggestions if it was not C5: Question about cultural relevance C6: Suggestions if it was not
Worksheet for the second Committee of Experts' review.	C1: Item or instructions of the CAS2:RS C2: Translated item or instruction C3: Item or instructions reviewed by the experts C4: Item or instructions reviewed by the teachers C5: Comments or suggestions
Worksheet for the Back- translation.	C1: Translated and adapted item or instruction C2: Space for the English translation C3: Comments or suggestions
Worksheet for Equivalence Determination	C1: Item or instructions of the CAS2:RS C2: Translated and adapted item or instructions C3: Space to indicate equivalence C4: Comments or suggestions

CAS2:RS. The CAS2:RS is a norm-referenced teacher rating scale that measures behaviors that reflect PASS neurocognitive abilities of individuals between the ages of 4 and 18 years (Naglieri et al., 2014). It assesses the frequency with which a student presents specific behaviors during the past month throughout 10 items for every PASS scale, for a total of 40 items, rated using a Likert scale from 0 (never) to 4 (always). The CAS2:RS also provides a Total Score that combines the four scales to obtain a composite score that should be used when there is not considerable variability in PASS scores.

According to the CAS2:RS authors, the information provided by the scale tells us the extent to which the student is applying his or her PASS abilities effectively (Naglieri et al., 2014). That information can be used for instructional decision making, for initial screening of a potential cognitive weakness, and to augment results in a comprehensive evaluation. The rater of the CAS2:RS should be a classroom, special education, or remedial teacher, or an individual in a related profession who is well acquainted with the student's instructional behavior and who has been with the student long enough to provide accurate ratings of his or her behaviors. Also, they should have a good idea about what is and is not average or typical behavior for the student's local peer group.

The CAS2:RS was normed on a representative sample of 1,383 students in 30 states. In terms of reliability, internal consistency, test-retest and inter-rater reliability high coefficients strongly suggest that the CAS2:RS possesses relatively little test error and end users can have confidence

in the results (Naglieri et al., 2014). In terms of validity, the authors established that the standard scores that result from giving the CAS2:RS will be similar to those obtained from giving the criterion tests such as the CAS2 (Naglieri, Das, & Goldstein, 2014) and the Universal Multidimensional Abilities Scales (McCallum & Bracken, 2012). Likewise, exploratory and confirmatory factor analysis confirmed the theoretical model on which the CAS2:RS is based (Naglieri, Das, & Goldstein, 2014).

Procedures

An authorization was requested to ProEd, the official publisher of the instrument, and the project was presented to the Ponce School of Medicine Institutional Review Board (IRB) to receive the institutional approval for the research (140512-MM).

To assure teacher's knowledge about constructs of the CAS2:RS, a workshop about cognitive processes and the PASS model was designed including original material developed by Drs. Jack Naglieri, Tulio Otero and Mary A. Moreno. According to Chavez and Canino (2005), a sample of people that will use the translated and adapted instrument should be included in the translation and adaptation process, but they should be knowledgeable about the constructs that the instrument assesses.

The content of the workshop lasted approximately one hour and focused on the translation and cultural adaptation of instruments, identification of SLD from a neuropsychological perspective, Luria's brain theory and its influence in the PASS model, the CAS2:RS, and how to identify cognitive processes in the educational context. It also included dynamic group activities to translate the theoretical information to the identification of the specific PASS processes assessed by the CAS2:RS. Finally, several hypothetical cases were presented for group discussion to assure accurate application of the provided information. This workshop was piloted with students of the psychology graduate research practicum who provided suggestions about the content of the presentation.

To achieve maximum language and cultural equivalency this research was carried out using the methodology for the translation and adaptation of instruments proposed by Chávez and Canino (2005). Specifically, steps related to achieving semantic and content equivalence were followed (see Figure 1). The Committee of Experts' review, the teacher's focus groups and the meeting for equivalence determination were conducted in person and were lead by the principal investigator. The other steps were conducted electronically and the principal investigator provided assistance and monitored them.

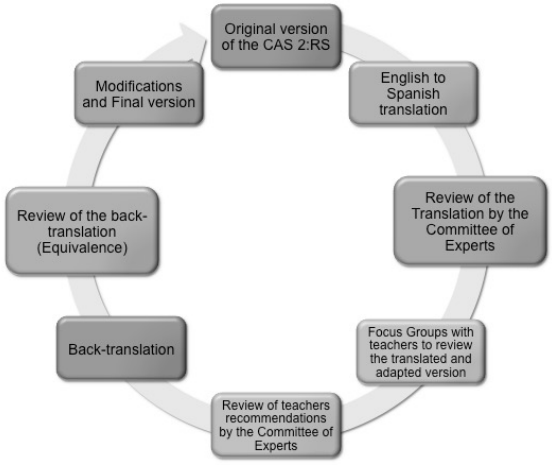

FIGURE 1.
Process of Translation and Adaptation of an Instrument (Semantic and Content Equivalence).

English to Spanish translation. A bilingual advanced graduate psychology student with knowledge of the PASS model received the Worksheet for English to Spanish translation by email. The student translated the original version of CAS2:RS into Spanish, including the comments and questions about the process.

Committee of Experts' Review. Then, five bilingual professional psychologists, with knowledge of the PASS model and psychometrics conducted the first review of the instructions and items. Every expert worked on the Worksheet for the first Committee of Experts' review to assess if the items or instructions were clear, if they were culturally relevant, and to suggest modifications. During the review process, one of the authors of the CAS2:RS was consulted to clarify what some of the original items intended to assess. The consensus about the review was documented. For items in which consensus was not reached, another professional with expertise in the PASS model, who collaborated with one of the authors of the CAS2:RS, was consulted.

Teachers' focus groups. This reviewed version by experts was used to conduct the three focus groups with pre-service, in-service and retired teachers. Every session started with a time to fill out the personal background form. It continued with the workshop about the constructs measured by the CAS2:RS. To assess previous knowledge, teachers received the pre-test. One of the teachers did not complete the pre-test due to visual problems. Following the presentation and discussion, teachers completed the post-test to assess their knowledge. According to Chávez and Canino (2005) it is important that the members of the focus groups be knowledgeable about the constructs that are supposed to be measured by the instrument before they review them.

During the second part of the focus group sessions, teachers reviewed the translated and reviewed version of the CAS2:RS using the Worksheet for teachers' review. The instrument was reviewed item by item and participants were asked if the instructions and questions were understandable and culturally relevant. They were also asked to suggest changes to questions they thought were necessary. The sessions were audiotaped to ensure that important data was not omitted. The consensus was documented and presented in the CE meeting.

Committee of Experts' Review. The CE received a report summarizing the discussion and the changes suggested by teachers in each focus group. Using the Worksheet for the second Committee of Experts' review experts reviewed the document to determine which of the suggested changes should be accepted and how they would be incorporated into the translated and adapted version of the CAS2:RS. During this phase, the professional with expertise in the PASS model was recruited again to make decisions about items in which consensus was not attained. The final version was prepared for the back-translation process.

Back-translation and equivalence determination. CAS2:RS was back-translated by another bilingual advanced psychology student with knowledge about the PASS model. This translator received by email the Worksheet for the back-translation and the instructions for the back-translation process. The student included comments or questions about the process.

A professional with expertise in the assessment of cognitive processes with Hispanic students in the United States worked individually on the Worksheet for equivalence determination to assess if the instructions and items of the CAS2:RS Spanish version retained the original meaning. Any items that showed discrepancy were identified. The equivalence of both versions was also assessed in a group discussion with one of the authors of the scale, two of the experts that collaborate with him and the principal investigator of this study. The translation and

adaptation process was discussed and the CAS2:RS Spanish version was presented to the group using the worksheet previously reviewed by the expert. A consensus of suggestions was documented to make the final modifications.

Data Analysis

Descriptive analyses were conducted to determine the proportion (%) of items modified through the review of experts and teachers. In the second phase (focus groups), a Shapiro-Wilk Test of Normality was conducted to compare the distribution of the pre-test and post-test scores with the normal distribution and determine if a t-test was possible. Due to the normal distribution of the scores a paired sample t-test was conducted to determine if the mean obtained by the group of teachers in the pre-test was different than the post-test mean. The effect size was calculated to determine the magnitude of the difference. Descriptive analyses were also conducted to determine the proportion (%) of the Spanish CAS2:RS items that retained the original meaning.

An inductive content analysis was carried out to know the type of changes that teachers and experts suggested. The suggestions written on every worksheet were reviewed and open coded. These codes were grouped, reducing the number of categories by combining them into broader categories. Finally, the codes were transformed into variables to determine their frequency. The result of this analysis was combined to quantitative results for a better understanding of the translation and adaptation process of the CAS2:RS.

RESULTS

English to Spanish translation. In terms of the items translation, the analysis showed that the translator provided modifications and comments about 5 of 40 items. The translator substituted words to avoid literal translation for two items. In other two items, translator did not report difficulties in the translation process, but wrote comments about the possibility to add examples in parenthesis. The fifth item "Like to draw designs?" was translated to "¿Demostró que le gustaba dibujar diseños?". However, the translator mentioned that it was not clear what type of designs the item referred to. This question was consulted with one of the authors of the CAS2:RS In general, the 40 items were translated and passed to the review of the CE including the comments of the translator. The translator suggested that the name of the CAS2:RS Spanish version should be CAS2: Escala de Reporte.

Committee of Experts' Review. The results of the review carried out by the CE showed that they understood 100% (n=40) of the items. That is, although some changes could have made the items clearer and more culturally relevant, they understood what they were asking. However, after a systematic review, they suggested changes to most them (65%, n=25). The results of the content analysis showed that the majority of these changes were grammatical changes, followed by syntax changes (semantic equivalence). The changes made to attain content equivalence were less frequent than semantic changes.

In terms of semantic equivalence, the order of words in the literal translation was modified. For instance, the item "Imitate a long sequence of sounds?" was translated to "¿Imitó una larga secuencia de sonidos?", but the experts modified the order to "¿Imitó una secuencia larga de sonidos?". In other instances, some words were changed for more common and understandable words. For example, the item "Listen carefully?" the word "carefully" was translated initially as "cuidadosamente", and then changed by the experts for the word "atentamente", which is more commonly used.

Similarly, some phrases were substituted to achieve semantic equivalence. For example, the item "Solve a problem with a new solution when the old one did not work?" was translated as "¿Solucionó nuevos problemas utilizando una solución nueva

cuando la solución anterior no funcionó? However, the experts recommended modification of the item to "¿Resolvió un problema utilizando una solución nueva cuando la anterior no le funcionó?" to avoid redundancy and obtain clarity. There were items in which the addition of parentheses was necessary for a better understanding of the intended meaning. For instance, "Like to draw designs?" was translated to "¿Demostró que le gustaba dibujar diseños?", but the experts added "ej. Figuras geométricas o patrones" as a clarification in parentheses.

Interestingly, as part of the review to obtain semantic equivalence, the experts identified that one of the items was written in a negative way, while the rest of the scale was not. Specifically, the item said "Not allow the actions or conversations of others to interrupt his or her work? It was translated as "¿No permitió que la conducta o conversaciones de otros interrumpieran su trabajo?". Nevertheless, the suggestion of the experts was to change it to a positive one, that is, "¿Continuó con su trabajo a pesar de interrupciones causadas por las conductas o conversaciones de otros?. This modification increased clarity and maintained homogeneity with the rest of the scale.

In terms of content equivalence, the experts suggested to modify the item "Recall a phone number after hearing it?", originally translated as "¿Recordó un número de teléfono luego de escucharlo?". They argued that "recall a phone number" it was not a culturally relevant activity and suggested to change phone number by series of numbers, adding the phone number as an example in parentheses. Specifically, item was modified to "¿Recordó una serie de números luego de escucharlos (ej. # de teléfono)".

The CE suggested to change the name of the CAS2:RS Spanish version to "CAS2: Escala de Evaluación" instead of "CAS2: Escala de Reporte" as suggested in the translated version. They indicated that the rating process goes beyond a reporting process.

Teachers' focus groups. In terms of teachers' focus groups, the results of the pre-test showed that the group obtained an average of 12.00 correct answers with a standard deviation of 2.86. This represents a content domain point of 60% prior to the workshop. Using as referent an adequate knowledge domain point of 70% or more, this result suggests the lack of knowledge about cognitive processes and the PASS model. In the post-test the teachers obtained an average of 16.71 correct answers with a standard deviation of 2.16, representing a content domain point of 83.5%.

The Shapiro-Wilk Test of Normality showed that the pre and post test scores had a normal distribution and that a paired t test proceeded to determine if the differences between the pre and post test means for all teachers were statistically significant (*SW*=.974, *df*=14, *p*=.927; *SW*=.950, *df*=14, *p*=.568). The results of the paired t-tests showed a statistically significant difference between knowledge about cognitive processes before the workshop (*M*=12.00, *SD*=2.86) and knowledge about cognitive processes after the workshop (*M*=16.71, *SD*=2.16); *t*(13)= -6.60, *p*<.001. Cohen effect size index for changes in knowledge was large (*d*=1.76). On average, knowledge about cognitive processes was about 4.71 higher after the workshop. The 95% confidence interval for mean difference between the two ratings was -6.26 to -3.17. These results suggests the effectiveness of the workshop in the acquisition of knowledge about the constructs measured by the CAS2:RS.

In the second part of the focus groups, teachers reviewed the version of the CAS2:RS, previously reviewed by the CE. First, they suggested changing the word "niño o adolescente/children or adolescent" by "estudiante/student" in the instructions for every group of items. Second, like the experts, the teachers reported they understood all the items in the form they were presented. Nevertheless, they suggested changes for 47.5% (*n*=19) to make them clearer, more

understandable and culturally relevant. The CE accepted the modifications suggested by teachers for 63.2% (12) of the items. The results of the content analysis showed that in the teachers' review most of the modifications were also grammatical changes, while syntax changes were not suggested. Further, in comparison with the CE, teachers suggested more modifications to reflect the cultural and classroom context.

In terms of semantic equivalence, the teachers recommended changing some words for synonyms to increase understanding. For example, in the item "Effectively solve new problems?/¿Resolvió problemas nuevos de forma efectiva?", they changed the word "forma" for "manera". Similarly, in the item "Figure out how parts of a design go together?/¿Entendió cómo las partes de un diseño encajaban unas con otras?", they substituted the word "encajaban" for "conectaban". In some items, they suggested paraphrasing the translated and reviewed version because it was confusing. For instance, in the item "Stay with one task long enough to complete it?/¿Se mantuvo en una misma tarea por suficiente tiempo como para completarla?" they recommended substituting "¿Se mantuvo en una misma tarea el tiempo suficiente para completarla?".

Regarding content equivalence, the teachers suggested changes to represent the kind of activities relevant to the classroom context and the target population. For example, in the item "Produce a well-written sentence or a story?/¿Redactó una oración o cuento bien escrito?" they suggested including "párrafo" after "oración" arguing that is common that students write essays before stories. Similarly, in the item "Have many ideas about how to do things?/¿Tuvo muchas ideas sobre cómo hacer las cosas?", they modified the word "cosas" with "tareas o actividades", words more related to the educational context. For the item "Work well with physical objects?/¿Trabajó bien con objetos reales?", they substituted the word "reales" for "concretos", a word more commonly used by teachers.

Equivalence determination. The result showed that 97.5% (*n*=39) of the Spanish CAS2:RS were equivalent to the original version. Initially, the expert that reviewed both versions identified difficulties in three items, but according to one of the authors of the scale only one item was not equivalent to the original. Specifically, in the item "Use information from many sources when doing work?" back-translated as "Use information from several sources while he/she is performing the tasks?" they found a subtle but important difference and suggested modifying it. The reviewers highlighted that the original version used the word "when/cuando" instead of "while/mientras", because "while" may be understood as simultaneously while "when" is a more encompassing word. Because it represented a minimal change, the word "cuando" was changed to "mientras" in the Spanish version without passing through the review process again.

In summary, both experts and teachers understood all the items of the Spanish translation of CAS2:RS, but they identified necessary modifications for many items. Most of these changes were grammatical and syntax modifications that made the items clearer and more understandable. However, several changes were suggested to make the items more relevant for Puerto Rican culture, highlighting the importance of the adaptation process. Likewise, teachers suggested changes to the version reviewed by experts that reflected the school context, emphasizing the importance of including them as consumers of the CAS2:RS. Despite these modifications, the Spanish version of the CAS2:RS remained equivalent to the original version of the scale.

DISCUSSION

This article presents a detailed description of the translation and cultural adaptation of the CAS2:RS, using the systematic and comprehensive cross-cultural model proposed by Chávez and Canino (2005). The findings of this study confirm the importance to use an emic-etic perspective in the

translation and adaptation of instruments aimed for the assessment of psychological constructs. That is, a perspective where phenomena are studied from the interior of the culture to understand their peculiarities (emic), maintaining the universality of the constructs (etic). The inclusion of experts and teachers, as well as the discussions with one of the authors of the CAS2:RS, produced a culturally relevant scale, without affecting the intended meaning of the original version. The changes made by the experts and the teachers, showed clearly that even though the cognitive processes assessed by the CAS2:RS are universal phenomena, the way in which they manifest, are understood, and identified vary between cultures. Furthermore, the amount of changes suggested by experts and teachers after the first translation confirm the inadequacy of literal translations and the need to use comprehensive models for the translation and cultural adaptation of instruments.

The results of this study agree with literature using cross-cultural equivalence model. Specifically, the changes in grammar and syntax, the use of paraphrasing for a better understanding of the items and the inclusion of culturally relevant examples in parentheses were also reported in several studies (Chávez et al., 2007; Matías-Carelo et al., 2003). However, they differ from literature because no complete items were added (questions) to expand the operationalization of the constructs under study (Alegría et al., 2004; Matías-Carelo et al., 2003; Chávez et al., 2007).

According to the results, the process of translation and adaptation conducted in this study allowed to achieve semantic and content equivalence. However, more work has to be done to establish the psychometric properties of the culturally adapted CAS2:RS and to assess the technical, criterion and construct equivalence.

Implications

This study has implications in terms of assessment, diagnosis and intervention, as well as in social and methodological spheres. The translation and cultural adaptation of the CAS2:RS provides the first scale for Puerto Rican teachers to address SLD from a contemporary view aligned with state and federal regulations. The availability of the Spanish CAS2:RS allows teachers to assume an active role in the assessment, diagnosis and intervention of SLD. Using this scale, Puerto Rican teachers can conduct an early assessment of a student's cognitive processes underlying the academic and social skills while also identifying their strengths and needs. The CAS2:RS profile can serve as guide for the development and early implementation of interventions, and appropriate educational strategies for each student, in conjunction with a comprehensive assessment. The use of this scale does not replace a comprehensive assessment process carried out by specialists but does reduces the gap between assessment and intervention. Furthermore, the availability of CAS2:RS allows teachers to intervene without waiting for the discrepancy between the IQ and achievement that usually is identified after several years of struggling.

In terms of social implications, the culturally adapted CAS2:RS also provides a tool to prevent future academic and social difficulties in Puerto Rican students. Providing early intervention may help to avoid anxiety, frustration, low self-esteem and dropping out of school (Nelson & Harwood, 2011). The methodological implications include the contribution of a new and culturally adapted assessment instrument for the Psychology field in Puerto Rico, as well as the contribution of literature detailing the comprehensive process of translation and cultural adaptation, that could be used as a framework for future studies.

Limitations

This study has two main limitations: 1) the sample of teachers and experts was selected for availability, not representing most teachers and experts in Puerto Rico and, 2) no processes were carried out in order to assess the technical, criterion, and conceptual equivalences proposed by Flaherty (1987).

In order to assess these equivalences we suggest future lines of research. First, it would be appropriate to establish test-retest reliability administrating the culturally adapted version of the CAS2:RS and then re-administrating it a week or two later to determine the stability possessed by the scale. The test-retest reliability coefficients should be compared with those obtained with the original English version. Similar results to those obtained with the original version constitute evidence of the technical equivalence of the instrument in both cultures and ethnic groups studied (Chávez & Canino, 2005). Second, future research should correlate the CAS2:RS Spanish version with the Cognitive Assessment System, an assessment that measures ability based on the PASS theory of neurocognitive processes designed for ages 5 through 18 years. The similarity between the results using the adapted version of the CAS2:RS and those obtained with the English version instrument attests to the criterion equivalence between both versions. Finally, additional research should be conducted to examine construct validity through factorial analysis in order to assess the similarities in factor structures among both versions of CAS2:RS.

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