

## Cultural Adaptation of the Evaluation in Ayres Sensory Integration® (EASI) for Spanish-Speaking Populations

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### **Abstract**

*Importance:* Spanish-speaking populations represent a significant percentage of occupational therapy clientele globally. Culturally appropriate Spanish translations of assessments are therefore imperative. This study describes the process of a culturally adapted translation of a set of tests for use with Spanish-speaking pediatric populations.

*Objective:* To produce a culturally adapted Spanish translation of the Evaluation in Ayres Sensory Integration® (EASI) for international use.

*Method:* We used cultural adaptation methodology that included direct and back translations of the EASI by bilingual translators and interviews with pediatric occupational therapists and children ages 3–6 yr from Spain. Linguistic experts helped revise the translations, and pediatric occupational therapy leaders in five Spanish-speaking North and South American countries reviewed the translations for comprehensibility and cultural appropriateness.

*Results:* Back translations demonstrated equivalence with the original EASI tests except for a few test instructions and scoring criteria. Interviews with occupational therapists and children in Spain revealed some comprehension difficulties for several tests, which were revised in consultation with a linguistic expert. Additional adaptations were made on the basis of recommendations to address cultural differences by occupational therapy leaders from five North and South American countries. Most changes in wording were made in one EASI test (Praxis: Following Directions) that is heavily dependent on language comprehension.

*Conclusions and Relevance:* We used currently recommended methodologies to develop and adapt a Spanish translation of the EASI for use across diverse cultures.

*What This Article Adds:* A Spanish translation of the EASI has been developed for use in culturally diverse Spanish-speaking countries around the world.

**AOTA Taxonomy:** age 0-5, age 15-21, age 6-14, early Intervention, research center (as researcher), sensory processing disorder, standardized assessment tools

**Keywords:** child, linguistics, occupational therapists, pediatrics, sensory integration, Spain, bilingualism

Ayres Sensory Integration® (ASI), a research-based clinical frame of reference originated by A. Jean Ayres (1963, 1964, 1972, 1989), has been updated and expanded by numerous researchers (e.g., Bundy & Lane, 2020; Mailloux et al., 2011; Roley et al., 2018; Schaaf & Mailloux, 2015; van Jaarsveld et al., 2012). ASI provides occupational therapy practitioners with a theoretical as well as evidence-based understanding of how sensory integration function and dysfunction can support or hinder the participation of children in a variety of occupations, including play, learning, and daily and family-related activities (Armstrong et al., 2013; Little et al., 2015; Reynolds et al., 2011).

Appropriate use of ASI begins with a comprehensive evaluation of sensory integration functions, including sensory perception and sensory reactivity, and related functions, such as postural and ocular–motor control, bilateral integration, and praxis (Schaaf & Mailloux, 2015). Most of the assessment tools available to occupational therapy practitioners for measuring sensory integration in children were developed and standardized in the United States (Ayres, 1972, 1989; Dunn, 1999; Parham et al., 2007). However, because interest in and application of ASI concepts have expanded globally, assessment tools are needed that are culturally appropriate in languages other than English (Baltazar et al., 2017).

The Evaluation in Ayres Sensory Integration® (EASI; Mailloux et al., 2018) is a comprehensive and affordable test of sensory integrative functions for the clinical evaluation of children. Development of the EASI included the collection of international normative data, and the instrument has been translated into 14 languages. This study focuses specifically on the Spanish translation. For the EASI to provide valid information for clinical evaluation, the Spanish translation must be adapted to culturally diverse Spanish-speaking countries while retaining the original meaning of test instructions and items. This study was designed to ensure that the Spanish translation of the EASI tests, instructions, and materials needed for their administration accurately convey the original meaning when used in geographically diverse Spanish-speaking locations. The objective of this study was to produce a Spanish translation of the EASI tests that is appropriate for use with and by culturally diverse Spanish-speaking populations.

## **Method**

We used the methodology for cultural adaptation proposed by Ramada-Rodilla et al. (2013). These methods include direct and back translation, linguistic expert review, and cognitive interviews. The study was approved by the Clinical Research Ethics Committee of Galicia (Spain).

### ***Instruments***

The EASI is a set of 20 tests that measure sensory perception, postural and ocular–motor control, bilateral integration, praxis, and sensory reactivity (Mailloux et al., 2018). Designed for children ages 3–12 yr, the EASI tests are intended for use internationally. Validity and reliability studies have demonstrated statistically significant group differences and internal consistency determined by both Rasch and traditional analyses (Mailloux et al., 2018, in press).

### ***Participants***

Seven groups of participants were involved in this study (Table 1):

- Group 1 was the research team (four of the authors of this article: Berta Gándara-Gafo, Tania Moriyón, Sergio Serrada-Tejeda, and Pilar Toledo).
- Group 2 consisted of three bilingual experts, who provided the first direct translation of the EASI test sheets from English to Spanish.

- Group 3 was the back translation team, made up of two bilingual experts (not part of Group 2) who performed the back translation of Spanish to English and then worked with Group 1 to review and revise the translated test sheets.
- Group 4 consisted of occupational therapists ( $n = 11$ ) working in pediatric private practices who had a diploma or graduate degree in occupational therapy, were trained in ASI, and were Spanish nationals from several regions (Canary Islands, Madrid, and Asturias).
- Group 5 was a convenience sample of typically developing children ages 3–6 yr ( $n = 8$ ) who were not receiving any special education or specialized medical services and who were siblings of children receiving therapy at the pediatric private practices.
- Group 6 consisted of two linguistic experts (philologists) who reviewed all translated tests and made recommendations to ensure suitable adaptation for Spain.
- Group 7 was made up of pediatric occupational therapy leaders ( $n = 5$ ) from Spanish-speaking countries in North and South America (Argentina, Colombia, Mexico, Peru, and Uruguay) who reviewed the translated tests to determine whether they were comprehensible and appropriate for use in their countries. All Group 7 participants were occupational therapists who had been trained in ASI and were the designated leaders for EASI international normative data collection in the country they represented.

**Table 1.** Participant Groups

Group	<i>n</i>	Who	From	Tasks
1. Research team	4	Occupational therapists who originated this project	Asturias, Canary Islands, and Madrid (Spain)	Selected participants for all groups Obtained official English EASI test sheets
2. Direct translation team	3	Bilingual experts (1 bilingual occupational therapist, 2 professional translators)	Asturias, Canary Islands, and Madrid (Spain)	Translated EASI test sheets from English to Spanish
3. Back translation team	2	Bilingual experts (1 bilingual occupational therapist, 1 professional translator)	Canary Islands (Spain)	Translated EASI test sheets from Spanish back to English Incorporated revisions from Group 1 after their review of the back translation
4. Comprehensibility team—professionals	11	Convenience sample of 11 occupational therapists working in pediatric practices	Asturias, Canary Islands, Galicia, and Madrid (Spain)	Participated in interviews and provided feedback about their comprehension of the translated items
5. Comprehensibility team—children	8	Convenience sample of children ages 3–6 yr who were siblings of children receiving intervention at the pediatric practices of Group 4	Asturias, Canary Islands, Galicia, and Madrid (Spain)	Participated in interviews and provided feedback about their comprehension of the translated items
6. Linguistic experts	2	Philologists	Madrid and Canary Islands (Spain)	Participated in review and suggested several modifications to adapt the text to linguistic norms in Spain without changing the meaning.
7. International occupational therapy leadership team	5	International occupational therapy leaders from 5 Spanish-speaking countries	Argentina, Colombia, Mexico, Peru, and Uruguay	Reviewed revised Spanish EASI test sheets for any words and phrases that might be confusing Worked together and with Group 1 to find suitable and understandable alternatives

*Note.* EASI = Evaluation in Ayres Sensory Integration®.

## ***Procedures***

The steps in this study are described in detail in the sections that follow.

### *Direct and Back Translation*

Group 2 (direct translation team made up of one bilingual occupational therapist and two professional translators) conducted the direct translation from English to Spanish. Each member of the team worked independently using the original English versions of each test sheet to produce a first draft in Spanish. Group 1 (research team) then reviewed and discussed the translations with Group 2.

Group 3 (back translation team, made up of a different bilingual occupational therapist and a different professional translator) provided a back translation from Spanish to English. Team members independently translated the tests back to English and submitted them to Group 1 (research team), who compared them to the original English versions to determine whether any semantic differences were present. Group 1 identified several terms in the back translation that, although the meaning was equivalent, did not fully represent the original English version. Group 1 proposed alternative terms, and Group 3 reviewed and accepted these changes.

### *Comprehensibility Interviews*

Group 1 (research team) conducted comprehensibility interviews with Group 4 (11 pediatric occupational therapists working in pediatric private practices) and Group 5 (8 typically developing children). The interviews were guided by the methodology proposed by Willis (2004), in which cognitive interviews are used to identify and correct problems in assessment tools and to determine whether the items are generating the information being sought (Carrasco, 2003); this methodology has been used for cultural adaptation in similar research studies (Beaudry-Bellefeuille & Lane, 2015; Gándara-Gafo et al., 2019; Román-Oyola & Reynolds, 2010). We used the comprehensibility interviews to determine whether the adapted test items were understandable.

In comprehensibility interviews with Group 4 (pediatric occupational therapists working in pediatric private practices), the participants read the test instructions and items, indicated their understanding of this material to the research team, and suggested alternative words or phrases that would likely improve comprehension of the text. Comprehensibility interviews with Group 5 (typically developing children) involved asking them to explain, in their own words, what they understood after hearing the instructions to the test. If two or more participants in Group 4 or 5 found the test instructions, test items, or scoring criteria difficult to understand, Group 1 (research team) made revisions to improve comprehensibility following the methodology used in similar studies (Beaudry-Bellefeuille & Lane, 2015; Gándara-Gafo et al., 2019; Román-Oyola & Reynolds, 2010).

### *Initial Linguistic Expert Review*

When the comprehensibility interviews were complete, one linguistic expert from Group 6 reviewed the test sheets and made recommendations for additional minor modifications to ensure suitable adaptation for Spain. The modifications consisted of several alternative words or phrases to replace those likely to be misunderstood by children during testing or by the Spanish-speaking occupational therapists who administer and score the EASI. This new feature in the Spanish version of the EASI tests maximizes the likelihood that test instructions and materials are presented in a manner that is easily understood by occupational therapists and children living in diverse Spanish-speaking cultures.

### *Review by Pediatric Occupational Therapy Leaders From Spanish-Speaking North and South American Countries*

Group 7 (occupational therapy leaders from five Spanish-speaking countries in North and South America) reviewed the Spanish translations of the EASI tests. With the aim of developing a single Spanish-language version of the EASI, Group 1 (research team) met with Group 7 to consider whether any of the words or phrases might lead to confusion in their country. When Group 7 participants identified a word or phrase that had the potential to generate confusion in one or more of the countries, the two groups identified a suitable and understandable alternative and included it in parentheses.

### *Final Linguistic Expert Review and Finalized Translation*

Once the preceding steps were completed, the translated test sheets were sent to the second linguistic expert from Group 6 for a final grammatical and cultural revision incorporating all changes recommended by Group 7 (occupational therapy leaders). Group 1 (research team) then submitted the finalized translation to the test authors for use in international normative data collection.

## **Results**

### *Direct and Back Translation*

Group 1 (research team) agreed that the direct translations of most EASI tests maintained a close conceptual equivalence with the original tests. The team suggested clarifications to improve the translations of some of the test instruction, descriptions of test items, and directions for test scoring. Overall, the modifications were minor and consisted mainly of changes in word use to clarify and to more closely align the text with the English version. Table 2 provides examples of the types of changes made during the direct and back translation process.

**Table 2.** Examples of Modifications to Direct and Back Translations

Test	Original English	Spanish Translation	Recommended Change	Final Translation and Rationale
Praxis: Ideation	Videotape the child's performance to score later.	Graba en video la evaluación del niño para puntuarlo más tarde.	Evaluación to desempeño	Grabe en video el desempeño del niño para puntuarlo más tarde.
Praxis: Following Directions	Now do this: Put one hand on your ear and one hand on your stomach. Child points outside 1 cm allowance, or indicates more than 1 point, or points to wrong localization.	Ahora te toca a ti. Pon una mano en tu oreja y la otra en tu barriga. El niño se distancia del punto tocado en más de 1 cm o señala más de un punto o señala punto/s incorrecto/s.	Ahora te toca a ti to Ahora haz esto Se distancia del punto tocado to Señala el punto que se le ha tocado	Ahora haz esto. Pon una mano en tu oreja y la otra en tu estómago (vientre, barriga, panza). El niño señala el punto que se le ha tocado con más de 1 cm de diferencia, o bien señala más de un punto o señala punto/s incorrecto/s.

### ***Comprehensibility Interviews***

Both Group 4 (occupational therapists in pediatric private practices) and Group 5 (typically developing children) indicated good comprehension of the translated text, although a few areas of difficulty with the test instructions were found. For both groups, the test that posed the greatest challenge was Praxis: Following Directions. This finding is not surprising because this is the only EASI test in which instructions to the child are entirely language dependent, requiring the child to follow verbal instructions without demonstration. On the basis of the interviews with the children, Group 1 (research team) made modifications including the examples shown in Table 3.

**Table 3.** Examples of Changes After the Comprehensibility Interviews

Test and Item	Original English	Spanish Translation	Recommended Change	Final Translation and Rationale
Praxis: Following Directions, Item 1H	Put your thumb on one finger of the other hand.	Pon tu pulgar sobre cualquier dedo de la otra mano.	pulgar to dedo gordo	Pon tu dedo gordo sobre cualquier dedo de la otra mano.
Praxis: Following Directions, Item 3H	Make one hand look like a ball and cover it with the other hand.	Forma una bola con una mano y cúbrela con la otra.	4 children had difficulty with cúbrela; 3 of them proposed tápala	Haz que tu mano parezca una pelota y tápala con la otra.

### ***Linguistic Expert Review***

Group 6 (linguistic experts) suggested several modifications to adapt the text to linguistic norms in Spain without changing the meaning. For example, for the tactile tests, the occupational therapists in Group 4 suggested changing *sentir* (*feel*) to *tocar* (*touch*). However, the linguistic experts maintained the word *sentir* because its meaning was closer to the original wording. In another example on a tactile test, the English scoring criterion “The child points to incorrect finger or more than one finger” was changed from the first translation of “*El niño señala el dedo equivocado o más dedos*” to “*El niño señala el dedo equivocado o bien señala más de un dedo*” to more closely reflect the meaning in the original wording.

### ***Review by Pediatric Occupational Therapy Leaders From Spanish-Speaking North and South American Countries***

Group 7 (occupational therapy leaders from Spanish-speaking countries in North and South America) reached consensus on word usage for all translated text except for a few specific word translations that varied among the countries. When word translations varied across countries, alternative words or phrases suggested for different countries were incorporated as optional word or phrases into the original wording to maximize user comprehension. For example, one item on the Praxis: Following Directions test is “Now do this: Put one hand on your ear and one hand on your stomach.” The translation for the word *stomach* is different among the countries, so several words were incorporated into the instructions: “*estómago (vientre, barriga, panza)*.” A generalized change was to modify the verbs from first to second person. For example, the test instruction “Record the child’s performance to score later,” which translated to “*Graba en video la evaluación del niño para puntuarlo más tarde*,” was modified to “*Grabe en video la evaluación del niño para puntuarlo más tarde*.” Several word changes were recommended for Praxis:

Following Directions; for example, “*Tapa el dedo gordo con los dedos*” (“Cover your thumb with your fingers”) was changed to “*Esconde tu dedo gordo con tus dedos*” (“Hide your thumb with your fingers”). The second linguistic expert in Group 6 reviewed the recommendations by Group 7 and incorporated them all.

## **Discussion**

This article reports on a cultural adaptation of the EASI for Spanish-speaking populations and constitutes the first translation into Spanish and cultural adaptation of a set of performance-based tests of sensory integrative functions. Given that we followed internationally established methods for cultural adaptations, we consider the translated EASI to have conceptual and semantic equivalence to the original English version (Mailloux et al., 2020). In addition, because this project included participants from six Spanish-speaking countries, occupational therapy practitioners can have high confidence that the text will be comprehensible to many Spanish-speaking populations.

Best practice in evaluation of sensory integrative functions includes the use of a combination of performance-based and proxy-report assessments (Schaaf & Lane, 2015). Currently, the main performance assessment occupational therapy practitioners use to assess sensory integration constructs is the Sensory Integration and Praxis Tests (Ayres, 1989), which do not have norms or cultural adaptations available for Spanish-speaking countries. Thus, performance-based assessment of sensory integration function and dysfunction in Spanish-speaking populations has been limited in both clinical practice and research. The cultural adaptation of the EASI represents a step forward in increasing the accessibility of psychometrically sound assessment tools and the implementation of evidence-based practice in sensory integration in Spanish-speaking countries (Beaton et al., 2000; Harachi et al., 2006).

The methodology used in this study offers a valuable model for the cultural adaptation of verbal test instructions and materials. This model produced semantic and conceptual characteristics equivalent to those of the original tests, resulting in word choices that are flexible, culturally appropriate, and comprehensible. The methodology we used for the EASI Spanish cultural adaptation followed recommended guidelines for cultural adaptation, including the use of bilingual experts, comprehensibility interviews, linguistic expert review, and stakeholder (e.g., children) review.

Muñiz and colleagues (2013) proposed that to obtain the greatest accuracy in translation, bilingual experts with experience in the subject should be included in the translation process. To this end, we included bilingual occupational therapists on the direct and back translation teams. We also included linguistic experts as participants to ensure optimal grammar and cultural appropriateness of the Spanish version of the EASI. The research team served as a panel of experts to review and give feedback on the translations. Thus, we followed procedures similar to those used by other authors of cultural adaptations of assessments, such as Gomes et al. (2016), who adapted the Sensory Processing Measure–Preschool into Portuguese, and Mattos et al. (2015), who adapted the Sensory Profile into Brazilian Portuguese. The panel of occupational therapist experts in addition to the research team added an additional element of rigor to the process, further ensuring a useful and comprehensible adaptation.

As an open access test, the EASI can help decrease social and economic disparities by facilitating access to comprehensive assessment for children worldwide. The Spanish cultural adaptation will be valuable in establishing psychometric properties and global norms, including norms for Spanish-speaking populations. This adaptation of the EASI allows for valid comparison of normative data in English-speaking countries with that of Spanish-speaking countries.

## Limitations

Although we followed accepted practices for cultural adaptation, this study has a few limitations. First, we used convenience samples of occupational therapists and typically developing children for the comprehensibility interviews, which may have resulted in some bias; however, we consider these participants to appropriately represent the populations who will be using or will be evaluated with these tests. In addition, participants from only six Spanish-speaking countries participated in the process, and the children were from Spain rather than Mexico or South America. Users in other Spanish-speaking countries may need to consider alternative wording for some items to ensure that practitioners and children understand them accurately in their settings.

## Implications for Occupational Therapy Practice

The results of this study have the following implications for occupational therapy practice:

- The cultural adaptation of the EASI for Spanish-speaking populations can be used confidently to evaluate the sensory integration functioning of children in South America, Mexico, and Spain.
- The methodology for cultural adaptation described in this article provides a model for others who wish to create cultural adaptations of occupational therapy assessments.
- The use of assessments in which test instructions and materials are adapted for the cultures and languages of the populations being served supports evidence-informed occupational therapy practice on an international scale.

## Conclusion

The results of this study provide evidence that the Spanish-language version of the EASI is a suitable tool for use in clinical practice and research with culturally diverse Spanish-speaking populations.

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