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RESEARCH ARTICLE

Cross-cultural adaptation, validation, and reliability of the child development evaluation test (EDI) in Colombia

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Abstract

Background: *Monitoring child development requires not only the determination of developmental milestones but also surveillance and continuous monitoring, hence the importance of having valid and reliable evaluation instruments. This research aimed to cross-culturally adapt the Child Development Evaluation (CDE) test for Colombia and determine its validity and reliability.* **Methods:** *The cross-cultural adaptation process was conducted in four phases: I. Adaptation to Colombian Spanish: adjustments of the test to Colombian Spanish and analysis of equivalences; II. Content and face validity: evaluation by five expert judges who performed quantitative and qualitative assessments of the test; III. Review by the original author; IV. Pilot test. Reliability analyses for internal consistency and intra-rater reliability were performed.* **Results:** *For the adaptation to Colombian Spanish, most test items were equivalent to Mexican Spanish, with some requiring minimal conceptual and contextual changes to maintain their meaning; culturally relevant formulations and expressions were adjusted. In the content and face validity assessment, adequate results were found regarding the importance, influence, and observability of the items. Internal consistency reliability was moderate, with Cronbach's α values between 0.41 and 0.57, and intra-rater reliability was very good, with Kappa index values > 0.76.* **Conclusion:** *The CDE test demonstrates cross-cultural adaptation, content and face validity, and reliability for its application and use in Colombia.*

Keywords: *Child development. Surveys and questionnaires. Cross-cultural comparison. Reproducibility of results. Validation study.*

Adaptación transcultural, validación y confiabilidad de la Prueba de Evaluación de Desarrollo Infantil (EDI) en Colombia

Resumen

Introducción: *El proceso de seguimiento al desarrollo infantil requiere no solo la determinación de los hitos del desarrollo, sino también un proceso de vigilancia y monitoreo continuo, de ahí la importancia de contar con instrumentos válidos y confiables para evaluación. La investigación tuvo como objetivo adaptar transculturalmente la prueba de Evaluación de Desarrollo Infantil para Colombia y determinar su validez y confiabilidad.* **Métodos:** *Proceso de adaptación transcultural se realizó con cuatro fases: I. Adecuación al español colombiano: ajustes de la prueba al español colombiano y análisis de*

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equivalencias; II. Validez de contenido y apariencia: participación de 5 jueces expertos que realizaron evaluación cuantitativa y cualitativa de la prueba; III. Revisión por autor original; IV. Prueba piloto. Se realizó análisis de confiabilidad por consistencia interna e intraevaluador. **Resultados:** *Para la adaptación al español colombiano la mayoría de ítems de la prueba fueron equivalentes al español mexicano, algunos requirieron mínimos cambios desde lo conceptual y contextual para mantener su significado, se ajustaron formulaciones y expresiones culturalmente relevantes; en la validez de contenido y apariencia se hallaron adecuados resultados de evaluación de importancia, influencia y observancia de los ítems. La confiabilidad por consistencia interna fue moderada, con valores Alfa de Cronbach entre 0.41 y 0.57, y la confiabilidad intraevaluador muy buena con valores de índice de Kappa superiores a 0.76.* **Conclusión:** *La prueba EDI cuenta con adaptación transcultural, validez de contenido y apariencia, y confiabilidad para su aplicación y uso en Colombia.*

Palabras clave: *Desarrollo Infantil. Encuestas y cuestionarios. Comparación transcultural. Reproducibilidad de los resultados. Estudio de validación.*

Introduction

Child development is a fundamental human process that crucially influences potential performance and functioning in later ages[1], so building a solid foundation in early childhood is relevant for individual and social well-being. Actions taken during the 1st years of life should focus on improving outcomes in the areas of nutrition, health, cognitive development, and psychosocial development to achieve the best quality of life and well-being[2].

The state policy for comprehensive early childhood development ("From Zero to Forever" Law [*Ley de cero a siempre*], 1804 of 2016) in Colombia, in its commitment to the country's economic, social, political, and cultural development, aims to contribute to the comprehensive development of girls, boys, and adolescents to generate conditions of well-being and access to opportunities with equity[3]. This policy would be aligned with the Global Sustainable Development Goals adopted by the United Nations, which intend for everyone to enjoy peace and prosperity[4]; therefore, it is essential to consider child development variables for such purposes. In this sense, it is important to recognize that early childhood care represents the opportunity to enhance children's capabilities and acquire the necessary competencies for their development. Hence, evaluation processes must be a priority and have sufficient characteristics to perform early screenings and differentiated interventions.

At present, literature reports on child development in Hispanic America are limited, mainly due to the need for regular measurement systems that are generalized across different types of consultation[5]. A systematic review study aimed to identify the metric properties of validated evaluation scales in Hispanic America for measuring psychomotor development in children up to 18 years of age and found that while the scales mostly showed positive indices, it is necessary to continue with validation studies that allow for decision-making and their clinical and research use[5].

Given this context, it is necessary to have evaluation instruments that are sufficiently valid and reliable, allowing professionals to have adequate tools to detect early situations that may affect children's normal development. In recent years, the development of screening systems based on responses from children's primary caregivers has gained strength[6], consistent and concordant with clinical evaluations. Hence, child development evaluation (CDE) instruments should ideally contain both aspects: questioning parents and caregivers to provide specific information about risk factors, warning signs, developmental milestones, and child abilities.

Different neurodevelopmental screening tests exist for children under 5 years of age[7]. In the United States, these include the Ages and Stages Questionnaires, Battelle Developmental Inventory, Bayley Scales of Infant and Toddler Development, Brigance Early Childhood Screen, clinical adaptive test/clinical linguistic and auditory milestone scale, Child Development Inventory, Denver Development Screening Test, and Parents Evaluation of Developmental Status. For Latin America, there are the EEDP Psychomotor Development Evaluation Scale, EDIN Child Integral Development Scale, NPED Pediatric Neurodevelopment, PRUNAPE, and TEPSI Psychomotor Development Test.

In Colombia, there are standardized and validated instruments, particularly the Abbreviated Development Scale (EAD)[8-10], which emerged to assess child development and enable monitoring and timely detection of children at risk for alterations. The EAD currently has its third version, EAD-3, which focuses on children up to 7 years old. Its final result generates a development level in children; however, it does not objectively consider other variables that contextualize their condition regarding risk factors, warning signs, and alerts, among others.

The scarcity of Colombian instruments to evaluate child development presents an opportunity to identify new tools that can be applied to its population. Hence, the CDE Test (EDI)[11] of Mexican origin is recognized as an appropriate instrument for cross-cultural adaptation and studying psychometric properties of validity and reliability. This would provide an instrument with health and research utility for characterizing developmental and epidemiological profiles in the Colombian child population.

The EDI test is a screening instrument for early detection of neurodevelopmental problems[11-14], applied to children under 5 years of age. It generates a qualitative development result and identifies risk factors, warning signs, and alert signs. This test has a sensitivity of 74% (95% confidence interval [CI] 0.65-0.82) and a specificity of 60% (95% CI 0.51-0.68) for children under 16 months, and a sensitivity of 89% (95% CI 0.82-0.95) with a specificity of 62% (95% CI 0.53-0.71) for the group over 16 months, reaching more than 80% when analyzing each development domain or subdomain separately[13].

The cross-cultural adaptation of instruments is the first step in obtaining adequate tools that must subsequently be validated to verify their psychometric properties. It is also necessary for use in linguistic and cultural contexts different from those in which they were originally constructed[15-17]. The objective of the research was to cross-culturally adapt the EDI test for Colombia and determine content and face validity, internal consistency reliability, and intra-rater reliability.

Methods

The study design consisted of two phases: I. Cross-cultural adaptation and face and content validation; II. Determination of internal consistency and intra-rater reliability. For phase I, cross-cultural adaptation and face and content validation of the EDI test, a process based on international guidelines was conducted[15,16]. The researchers contacted the original authors in Mexico, who authorized the process and use of the test. Four stages were carried out: adaptation to Colombian Spanish, content and face validity, review by original author, and pilot testing.

The instrument used was the EDI test, a tool for early detection of developmental problems[11], which was applied to children under 5 years of age and consisted of items distributed across 14 specific age groups. Its application methods are conducted through directed questions and direct observation of the child, comprising the evaluation of various axes: gross motor, fine motor, language, social, and knowledge areas, as well as biological risk factors, alert signs, warning signs, and neurological examination. Each item is qualitatively assessed according to whether it meets the corresponding performance and generates a development result through a traffic light system, in which red represents the risk of developmental delay, yellow represents developmental lag, and green represents normal development.

Regarding the study procedure, in the first phase, adaptation to Colombian Spanish, researchers expert in child development made two adaptations of the EDI test from Mexican Spanish to Colombian Spanish blindly and independently for each of the items in the 14 test groups to obtain a version with the respective linguistic and contextual adaptations.

Analysis and classification of equivalences were performed: semantic, idiomatic, experiential, and conceptual[18-20]. Semantic equivalence refers to writing, grammar, and use of words that, when modified, preserve the meaning of the original version; idiomatic equivalence corresponds to colloquial expressions specific to the original culture that must be replaced by those more appropriate and natural to the new context; experiential equivalence represents expressions that mainly designate daily life situations and specific cultural experiences that must be adapted for better understanding, and conceptual equivalence corresponds to expressions and words whose meaning is different in each culture. The adaptations were then harmonized into a consensus version by the entire research team, and the first version of the EDI test for Colombia was obtained.

In the second phase, content and face validity, the test was sent to a committee of five expert judges with postgraduate training, teaching and research positions, experience in child development, and some with training and experience in translation and applied linguistics. The expert judges performed an independent quantitative and qualitative evaluation of the test. The quantitative evaluation was done through rating criteria of importance, influence, and observance for each item in the 14 test groups. Each item was rated on a 4-point Likert scale as follows: 1: strongly disagree, 2: disagree, 3: agree, 4: strongly agree. The expert judges' ratings' results underwent quantitative and qualitative analysis.

In the quantitative analysis, means (M), standard deviations (SD), and coefficients of variation (CV) were considered for each item and each evaluation criterion – importance, influence, and observance. From this, decisions regarding required changes and adjustments to items were made according to the following criteria:

– Items showing high scores in importance and influence (M ≥ 3.0) and low variability (SD < 1.0) were either kept or underwent minor modifications
– Items showing reasonable scores in observance (M > 2.5) and low variability (SD < 1.5) were either kept or underwent minor modifications
– Scores lower than the above required the item to be adapted again
– Using the CV, the relationship between SD and mean was analyzed for each item; items obtaining a CV ≥ 0.4 required modification.

The qualitative evaluation corresponded to additional observations and comments made regarding each item. From this, the second version of the EDI test for Colombia was obtained. Once this version was obtained, the third phase proceeded, in which the test was sent to and approved by its original authors from the *Hospital Infantil de México Federico Gómez* (Federico Gómez Children's Hospital).

Finally, in the fourth phase, the EDI test for Colombia underwent pilot testing with a sample of 45 evaluators, of whom 15 were children's caregivers who evaluated the directed questions, and 30 were expert evaluators in child development who had previously received training and calibration from the original authors. The test was applied by an expert evaluator to 14 children, one per age group, applying all test blocks: block 1 of personal data, block 2 of the five axes in both directed questions and child observation, and block 3 of global scoring. This application was video-recorded, and the 30 evaluators blindly and independently applied the test for an average of 40 min. Both expert evaluators and caregivers completed a questionnaire about the clarity, comprehension, and precision of the items.

Once the adapted EDI test for Colombia was obtained, phase II proceeded to determine the psychometric properties of reliability through internal consistency and intra-rater reliability. For this, a sample of 195 children aged 0-5 years participating in programs of the Foundation for Child Care (*Fundación de Atención a la Niñez*, FAN) in Medellín, Colombia, was used, considering five children per test item, the minimum sample required for this type of study. The evaluators were experts in child development, with health and early childhood education training, and trained in test applications. Internal consistency was determined through Cronbach's α coefficient, and intra-rater reliability was conducted with test application by the same evaluator at two different times, with a time difference of < 1 week; its analysis was performed with the Kappa index considering a $p \leq 0.05$.

Regarding ethical considerations, the study was approved by the bioethics committee of the *Universidad Autónoma de Manizales*, Colombia, in act No. 086, and the parents and caregivers of the minors previously signed an informed consent.

Results

Phase I resulted in the adapted and validated EDI test for Colombia. Regarding this result, it should be detailed that for the adaptation to Colombian Spanish, the researchers conducted a systematic review of each test item blindly and independently. Subsequently, through team consensus, the final adaptation was obtained, resulting in changes and adjustments to some items to achieve a test with linguistic and contextual adaptation and adequacy without reporting doubts or ambivalence. Items were analyzed and classified as equivalent, non-equivalent, and with problems in some words. Equivalent items had no issues in their translation and adaptation from Mexican Spanish to Colombian Spanish and required minimal changes, especially from the conceptual and cultural component due to terminology differentiation associated with culture; almost all items in each group were classified as equivalent items.

Non-equivalent items corresponded to those where translation to Colombian Spanish was not possible, and significant translation and writing changes were necessary to preserve their meaning; in this case, no items were found for this classification. Items with problems, in some words, corresponded to those where changes and adjustments were necessary to maintain their meaning, but different culturally relevant formulations and expressions were used for the Colombian population. Most items requiring adjustments were due to experiential equivalence, followed by idiomatic equivalence and conceptual equivalence. Group 9 required the most adjustments, followed by group 13. It should be noted that in a single item, adjustments for one or several equivalences were necessary (Tables 1 and 2).

In the results of content and face validity, it was found that the alert signs axis in groups 1, 2, 3, 4, 5, 6, 7, and 8 required the most changes in some of its items, as they obtained SD ≥ 1.0 and CV ≥ 0.4 in the importance and influence criteria; in the observance criterion, only one item in group 1 obtained a CV = 0.4. Groups 9, 10, 11, 12, 13, and 14 did not require changes or adjustments since the quantitative results met the permitted values.

The qualitative evaluation was conducted for each item through observations or comments by each judge, who simultaneously suggested the recommended change.

Table 1. Item equivalence analysis

EDI test axes	EDI test groups (number of items)	Number of equivalent items	Number of non-equivalent items	Number of items adjusted for semantic equivalence	Number of items adjusted for idiomatic equivalence	Number of items adjusted for conceptual equivalence	Number of items adjusted for experiential equivalence
ALE MG MF LE SO CO ALA	1 (12)	11	0	0	1	0	1
	2 (15)	14	0	0	1	0	1
	3 (14)	12	0	0	1	1	1
	4 (14)	12	0	0	1	1	1
	5 (16)	13	0	0	0	0	3
	6 (15)	14	0	1	1	0	1
	7 (14)	12	0	0	1	0	2
	8 (17)	14	0	0	1	1	2
	9 (19)	15	0	0	3	11	2
	10 (17)	17	0	0	0	0	0
	11 (16)	14	0	1	1	0	0
	12 (21)	17	0	2	2	1	2
	13 (24)	19	0	0	4	0	5
	14 (25)	19	0	0	3	0	2
FRB (7)		4	0	0	1	1	2
EN (3)		3	0	0	0	0	0
Total (249)		224	0	4	21	16	25

ALE: warning signs. Developmental areas; MG: gross motor; MF: fine motor; LE: language; SO: social; CO: knowledge; ALA: alarm signals. FRB: biological risk factors. EN: neurological examination.

Table 2. Examples of items adapted and adjusted to Colombian Spanish according to equivalences (the items are expressed in Mexican and Colombian Spanish to preserve the linguistic and idiomatic differences, given the fact that in English translation it could be lost)

EDI test groups	EDI test axes	Original item in Mexican Spanish	Item adapted to Colombian Spanish	Type of equivalence
6	Social	Cuando le da de beber líquidos, ¿le ayuda a detener el biberón o la taza?	Cuando le da de beber líquidos, ¿le ayuda a sostener el tetero o la taza?	Semantic, experiential, idiomatic
13	Gross motor	Cuando le avientan a su niño (a) una pelota grande ¿puede cacharla?	Cuando le lanzan a su niño (a) una pelota grande ¿puede atraparla?	Experiential, idiomatic
	Fine motor	¿Puede meter una agujeta o cordón por los agujeros de una cuenta o de un zapato?	¿Puede meter un cordón por los agujeros de un zapato o de un juguete de ensartar?	Experiential, idiomatic
	Language	¿Puede platicarle algo de lo que hizo ayer?	¿Puede hablarle sobre algo de lo que hizo ayer?	Experiential, idiomatic

The researchers, by consensus, analyzed and identified differences in the content of phrases due to the use of synonyms, prepositions, verb tenses, and pronouns, among others, and determined the final wording of items where adjustment was recommended. Changes were made to most items, such as changes from singular to

Table 3. Examples of items adapted and adjusted to Colombian Spanish according to qualitative evaluation by expert judges. (the items are expressed in Mexican and Colombian Spanish to preserve the linguistic and idiomatic differences, given the fact that in English translation it could be lost)

EDI test group	EDI test axis	Original item in Mexican Spanish	Item adapted for Colombian Spanish
1	Warning signs	¿Considera que el desarrollo de su niño (a) es inadecuado?	Considera que el desarrollo de su niño (a) *es inferior al de otros niños de su misma edad?*
2	Gross motor	Cuando acuesta su bebé boca abajo, ¿levanta su cabeza durante al menos 3 segundos?	Cuando *el (la) niño (a) está acostado (a) boca abajo* ¿Levanta su cabeza durante al menos 3 segundos?
3	Fine motor	¿Tiene su niño (a) las manos abiertas la mayor parte del tiempo?	¿Tiene *el (la) niño* (a) las manos abiertas la mayor parte del tiempo?
4	Language	¿Balbucea o grita para llamar su atención?	¿*Su niño (a) balbucea o grita* para llamar su atención?
7	Warning signs	¿Hace esfuerzos por desplazarse o gatea?	¿ *El (la) niño (a) hace esfuerzos* por desplazarse o gatear?**
9	Warning signs	¿Se enoja mucho y tiene dificultad para calmarse, comparado con otros niños (as) de su edad?	¿Comparado (a) con otros niños (as) de su edad, se enoja mucho y tiene dificultad para calmarse?
11	Warning signs	¿Muestra indiferencia excesiva al entorno?	¿*Su niño (a) muestra* indiferencia excesiva con el entorno? *Por ejemplo: parece como si estuviera en su propio mundo, sin interesarse en nada de lo que pasa, parece no escuchar cuando se le habla.*
12	Language	Cuando está con personas que no conoce, ¿éstas entienden la mayoría de las palabras que dice?	*Cuando su niño (a) está con personas* que no conoce ¿*Estas personas entienden* la mayoría de las palabras que dice?
Biological risk factor		Madre menor a 16 años al momento del parto.	Madre *menor* de 16 años *en el* momento del parto.
Neurological examination		¿Presenta alteración en la movilidad de alguna parte del cuerpo?	*El (la) niño (a) presenta alteración* en la movilidad de alguna parte del cuerpo, *por ejemplo: ¿Sus movimientos son anormales o no realiza ningún movimiento?*

plural terms; wording changes, for example, in some items, more precise words were adjusted, and representative examples were included for better understanding; changes in punctuation marks; adjustments to statements regarding the explicit use of articles, subject, and possessive determiners. In this way, the items were transformed to improve the language, grammatical structure, and precision of what is being evaluated.

Regarding the biological risk factor axis, a significant change in its content was necessary, given that in Colombia, gestational weeks and birth weight that represent a risk in newborns are standardized. Hence, risk factors 3 and 4 were modified. In the Mexican version, the statements were "Gestation < 34 weeks" and "Child's birth weight 1500 g or less," and were changed to "Gestation < 36 weeks" and "Child's birth weight of 2500 g or less." Only 10 items from the entire EDI test did not require changes and remained the same as their original Mexican version (Table 3).

The original authors reviewed the Colombian version of the test, and no comments, changes, or adjustments arose; therefore, the EDI test for Colombia was approved to continue with pilot testing.

The pilot test results showed that the EDI test met the criteria for comprehension, clarity, and precision, and it was not necessary to make adjustments or modifications to the test structure or any of its items. For the methodological process of test reliability, it was necessary to develop an instruction manual and protocol to achieve rigorous test application.

After obtaining the cross-culturally adapted and valid EDI test for Colombia, phase II proceeded, in which data collection was carried out to obtain the psychometric properties of reliability. For this, a sample of 195 children was used, distributed across the 14 test groups. They ranged

in age from 1 to 59 months, with a mean of 18 months. 43.1% were female and 56.9% male; the majority (95%) belonged to socioeconomic strata 1, 2, and 3.

The results of internal consistency reliability were calculated for two dimensions together, the developmental areas and biological risk factors, and were found to be acceptable with Cronbach's α values of 0.41 and 0.57, respectively.

The intra-rater reliability was found to be very good, with Kappa index values > 0.76, except for the neurological examination area (Table 4).

Table 4. Intra-rater reliability

EDI test dimension	Variable	Kappa index
Biological risk factors	Attendance to two or more prenatal consultations	1*
	Pregnancy complications	0.99*
	Gestation < 36 weeks	1*
	Birthweight < 2500 g	1*
	Risk of cerebral hypoxia	0.98*
	Hospitalization in ICU before 1 month for 4 days or more	1*
	Mother < 16 years	1*
Biological risk factors		0.99*
Warning signs		0.78*
Neurological examination area		0.3*
Alarm signals		0.9*
Gross motor development area		0.78*
Fine motor development area		0.69*
Language development area		0.81*
Social development area		0.94*
Knowledge development area		0.96*
EDI global development level		0.76*

*p ≤ 0.001. ICU: intensive care unit.

Discussion

Assessment and screening processes for child development are priorities for timely and quality early childhood care. Children must live and enjoy the highest possible level of health and nurturing environments, which makes it imperative to conduct adequate, complete, and pertinent evaluations of their developmental process. In addition, advances in neuroscience have determined that the 1st years of life are fundamental for establishing developmental foundations, where new skills sequentially lead to other competencies. Therefore, investment in improving early childhood development is necessary to achieve cost-effectiveness for equitable and sustainable development in countries[21].

Using validated screening instruments can improve early diagnosis and timely intervention in high-risk children, where long-term improvements have been demonstrated, especially in cognitive and academic performance[22,23]. The EDI test constitutes an ideal instrument for the early detection of developmental alterations in children, comprising important axes that allow the identification of risk factors, warning signs, and alerts, in addition to evaluating developmental milestones in motor, communicative, social, and cognitive areas[24]. Therefore, the opportunity to obtain its cross-cultural adaptation, validity, and reliability for Colombia was evident.

Cross-cultural adaptation processes for instruments should include, among others, translation phases and content and face validity[25]. This study adapted from Mexican Spanish to Colombian Spanish, resulting in adjustments to most items, especially regarding experiential and idiomatic equivalences. Content and face validity were successfully conducted and led to adjustments for greater clarity and comprehension of items, allowing for the final version of the EDI test for Colombia. In its modified Mexican version, the EDI test also developed a face validity process to answer the question: Does the scale appear to measure what it should measure? And does it reflect the domain structure of the phenomenon to be evaluated?[26] This process analyzed the characteristics of purpose and conceptual framework, comprehensibility, replicability, suitability, and ease of use of the test. Subsequently, questions were reorganized into axes, scoring criteria were modified to obtain greater congruence, and observed modality was added to items where necessary, thus obtaining a version that adequately met appearance and content requirements[26].

In addition, it is important to recognize that the EDI test for Colombia showed adequate psychometric properties of reliability, moderate internal consistency, and very good intra-rater reliability. For the latter, it is important to identify that it was lower for the neurological exploration area, which may be related to the expertise and mastery of the evaluator in the test application. Regarding these results, one study mentions that using child development assessment instruments and diagnosis classification of children under 5 years is unreliable when performed only once, as children in

this age group experience highly varied changes and require frequent evaluations during their growth. The tests are not predictive and only provide results that classify the situation at a specific moment. In this sense, child development assessment should focus beyond skill acquisition, including other aspects related to development, such as risk factors[27].

For the Colombian context, it is important to acknowledge recent studies on the validation and reliability of child development instruments. One study aimed to identify the sensitivity and specificity of the Ages and Stages Questionnaires: Social-Emotional, Second Edition (ASQ: SE-2) for ages 6, 12, 18, 24, 30, and 36 months, and conducted a comparative analysis between the ASQ: SE-2 and the Personal-Social Subscale of the Abbreviated Development Scale (EAD-3). The study showed a relationship between both instruments in identifying risk and social-emotional development in the 6-month (X^2 [1, 85] = 7.869, p = 0.005), 18-month (X^2 [1, 97] = 15.966, p = 0.000), and 36-month (X^2 [1, 50] = 11.387, p = 0.001) questionnaires. The ASQ: SE-2 reports optimal specificity and adequate sensitivity levels in the 12 and 18-month questionnaires[28].

Similarly, another study aimed to evaluate the internal consistency, test–retest reproducibility, level of agreement, and convergent construct validity of a cultural adaptation for Colombia of the Child Development Screening Questionnaire for Household Surveys. The study found internal consistency between 0.23 and 0.76, ICC reliability between 0.60 and 0.92, and almost perfect convergent validity (p = 0.96)[29]. Other studies in Latin America also demonstrate solid validity values for these types of instruments[30].

The Canadian Task Force on Preventive Health Care evaluated evidence on the effectiveness of population screening for developmental delay in primary care settings and generated a guideline of recommendations on screening tools to identify this problem. This guide recommends that primary care providers should remain vigilant in monitoring a child's development at each clinical encounter and should focus on confirming a diagnosis in children where difficulties are suspected. In particular, health professionals should remain attentive to deficits in children's performance in gross and fine motor skills, cognition, speech and language, and personal and social skills[31]. Problems related to developmental delay describe below-average skills in one or more domains, which can accumulate throughout life, leading to social and economic difficulties, making it a relevant issue for doctors, parents, educators, and public policymakers[32].

Therefore, it is necessary to develop child development screening processes. While the clinical judgment of professionals is important for detecting these problems, it is essential to use standardized and norm-based instruments, as it is known that more than 30% of cases of children with developmental disorders are not diagnosed in time[33]. This leads to delayed treatments that do not favor a positive and adequate developmental process and consequently result in limited benefits and socioeconomic disadvantages for communities.

Having the EDI test for Colombia will provide professionals with an instrument for the timely detection of warning signs or risk signals for children's development, thus enabling timely interventions that promote a healthy environment for healthy growth and development. Simultaneously, this would implement actions aligned with comprehensive early childhood health care through the new Comprehensive Health Care Routes (*Rutas Integrales de Atención en Salud*) within the framework of the Territorial Comprehensive Care Model (*Modelo de Atención Integral Territorial*)[34].

Adequate and timely information about children's developmental levels is necessary, as there is a demand for population-based diagnostics on well-being, development, and other children's rights[35]. This will enable the design and development of programs that strengthen quality actions to improve living conditions for this population, especially those with greater vulnerability characteristics[35].

The study did not have relevant limitations that hindered its development and the achievement of its objectives.

Given the relevance of conducting child development assessment processes, it is recommended to carry out studies related to the use of the EDI test that considers larger samples and other variables that allow finding correlations and predictions regarding children's development in Colombia.

Conclusion

The cross-cultural adaptation of the EDI test for Colombia resulted in obtaining a test with concept, structure, composition, and content characteristics equivalent to its original Mexican version. In addition, it has sufficient psychometric properties of content and face validity, as well as reliability for its application and consequent characterization of child development in Colombia.

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Conflicts of interest

The authors declare no conflicts of interest.

Ethical considerations

Protection of humans and animals. The authors declare that no experiments involving humans or animals were conducted for this research.

Confidentiality, informed consent, and ethical approval. The authors have followed their institution's confidentiality protocols, obtained informed consent from patients, and received approval from the Ethics Committee. The SAGER guidelines were followed according to the nature of the study.

Declaration on the use of artificial intelligence. The authors declare that no generative artificial intelligence was used in the writing of this manuscript.

References

1. O'Shea-Cuevas G, Rizzoli-Córdoba A, Aceves-Villagrán D, Villagrán-Muñoz VM, Carrasco-Mendoza J, Halley-Castillo E, et al. Sistema de Protección Social en Salud para la detección y atención oportuna de problemas del desarrollo infantil en México. Bol Med Hosp Infant Mex. 2015;72:429-37.
2. Suárez-Villa M, Borré-Ortiz YM, Expósito MY, Pérez Almagro M. Practicas educativas en salud: eje fundamental en el desarrollo de la primera infancia en centros de desarrollo integral. Salud Uninorte. 2020; 36:325-41.
3. Ley 1804 de 2016. Por la cual se establece la política de Estado para el Desarrollo Integral de la Primera Infancia de Cero a Siempre y se dictan otras disposiciones. Available from: https://www.suin-juriscol.gov.co/viewDocument.asp?ruta=Leyes/30021778 [Last accessed on 2016 Aug 26].
4. Herrera Araujo F, Wartenberg L, Zubiria J, Acosta OL, Corredor Martínez C, Wilches-Chaux G, et al. Objetivos de Desarrollo Sostenible, Colombia: Herramientas De Aproximación Al Contexto Local. PNUD; 2015. Available from: https://www.alianzaporlaninez.org.co/wp-content/uploads/2016/08/ODS-colombiacompressed.pdf
5. Hoyos-Quintero AM, Ordoñez-Mora LT. Escalas de evaluación del desarrollo psicomotor en Hispanoamérica. Rev Cubana Pediatr. 2022;94:e2120.
6. Alcantud Marín F, Alonso Esteban Y, Rico Bañón D. Validez y fiabilidad del sistema de detección precoz de los trastornos del desarrollo: 3 a 36 meses. Rev Esp Discapac. 2015;3:107-21.
7. Romo-Pardo B, Liendo-Vallejos S, Vargas-López G, Rizzoli-Córdoba A, Buenrostro-Márquez G. Pruebas de tamizaje de neurodesarrollo global para niños menores de 5 años de edad validadas en Estados Unidos y Latinoamérica: revisión sistemática y análisis comparativo. Bol Med Hosp Infant Mex. 2012;69:450-62.
8. Ortiz Pinilla N. Escala Abreviada De Desarrollo. Colombia: Ministerio de Salud; 1999.
9. Muñoz-Caicedo A, Zapata-Ossa HJ, Pérez-Tenorio LM. Validación de criterio de la Escala Abreviada del Desarrollo (EAD-1) en el dominio audición-lenguaje. Rev Salud Pública. 2013;15:386-97.
10. Hormiga CM, Camargo DM, Orozco LC. Reproducibilidad y validez convergente de la Escala Abreviada del Desarrollo y una traducción al español del instrumento Neurosensory Motor Development Assessment. Biomédica. 2008;28:327-46.
11. Rizzoli-Córdoba A, Schnaas-Arrieta L, Liendo-Vallejos S, Buenrostro-Márquez G, Romo-Pardo B, Carreón-García J, et al. Validación de un instrumento para la detección oportuna de problemas de desarrollo en menores de 5 años en México. Bol Med Hosp Infant Mex. 2013;70:195-208.
12. Rizzoli-Córdoba A, Ortega-Ríosvelasco F, Villasís-Keever MÁ, Pizarro-Castellanos M, Buenrostro-Márquez G, Aceves-Villagrán D, et al. Confiabilidad de la detección de problemas de desarrollo mediante el semáforo de la prueba de Evaluación del Desarrollo Infantil: ¿es diferente un resultado amarillo de uno rojo? Bol Med Hosp Infant Mex. 2014; 71:277-85.
13. Rizzoli-Córdoba A, Schnaas-Y-Arrieta L, Ortega-Riosvelasco F, Rodríguez-Ortega E, Villasís-Keever MÁ, Aceves-Villagrán D, et al. Child Development Evaluation Test analysis by field improves detection of developmental problems in children. Bol Med Hosp Infant Mex. 2014; 71:154-62.
14. Rizzoli-Córdoba A, Campos-Maldonado MC, Vélez-Andrade VH, Delgado-Ginebra I, Baqueiro-Hernández CI, Villasís-Keever MÁ, et al. Evaluación diagnóstica del nivel de desarrollo en niños identificados con riesgo de retraso mediante la prueba de Evaluación del Desarrollo Infantil. Bol Med Hosp Infant Mex. 2015;72:397-408.
15. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. Spine (Phila Pa 1976). 2000;25:3186-91.
16. Balluerka N, Gorostiaga A, Alonso-Arbiol I, Haranburu M. La adaptación de instrumentos de medida de unas culturas a otras: Una perspectiva práctica. Psicothema. 2007;19:124-33.
17. Cardoso Ribeiro C, Gómez-Conesa A, Hidalgo Montesinos MD. Metodología para la adaptación de instrumentos de evaluación. Fisioterapia. 2010;32:264-70.
18. Guillemin F. Cross-cultural adaptation and validation of health status measures. Scand J Rheumatol. 1995;24:61-3.
19. Salamanca LM, Naranjo MM, González AP. Traducción al español del cuestionario para diagnóstico de trastorno del desarrollo de la coordinación. Rev Cien Salud. 2012;10:195-206.
20. Carvajal A, Centeno C, Watson R, Martínez M, Sanz Rubiales A. ¿Cómo validar un instrumento de medida de la salud? An Sist Sanit Navar. 2011; 34:63-72.
21. Pérez-Escamilla R, Rizzoli-Córdoba A, Alonso-Cuevas A, Reyes-Morales H. Avances en el desarrollo infantil temprano: desde neuronas hasta programas a gran escala. Bol Med Hosp Infant Mex. 2017;74:86-97.
22. Vitrikas K, Savard D, Bucaj M. Developmental delay: when and how to screen. Am Fam Physician. 2017;96:36-43.
23. Lipkin PH, Macias MM, Chen BB, Coury D, Gottschlich EA, Hyman SL, et al. Trends in pediatricians' developmental screening: 2002–2016. Pediatrics. 2020;145:e20190851.
24. Santos-Álvarez N, Barajas-González. P, Gómez-Alonso C. Evaluación del desarrollo infantil en niños de 2 a 4 años en el primer nivel de atención. Rev Enferm Inst Mex Seguro Soc. 2021;29:57-64.
25. Muñiz J, Elosua P, Hambleton RK. Directrices para la traducción y adaptación de los tests: Segunda edición. Psicothema. 2013;25:151-7.
26. Rizzoli-Córdoba A, Delgado-Ginebra I. Pasos para transformar una necesidad en una herramienta válida y útil para la detección oportuna de problemas en el desarrollo infantil en México. Bol Med Hosp Infant Mex. 2015;72:420-8.
27. Melo NP, Souza JM, Cordeiro SM, Veríssimo ML. Clinical validation of the nursing diagnosis "Risk for delayed child development". Rev Esc Enferm USP. 2022;56:e20220229.
28. Castellanos-Páez V, González-Gamboa D, Montañez, LY. Sensitivity and specificity of "Ages and Stages Questionnaires: social-emotional" (ASQ: SE-2) in a Colombian population. Tesis Psicol. 2022;17:1-21.
29. Lemos C, Patiño Segura MS, Sánchez Martínez YL. Confiabilidad y validez de un cuestionario de desarrollo infantil en encuestas nacionales. Rev Chil Pediatr. 2020;91:76-84.
30. Valentini NC, Zanella LW, Webster EK. Test of Gross Motor Development- third edition: Establishing content and construct validity for Brazilian children. J Mot Learn Dev. 2017;5:15-28.
31. Tonelli M, Parkin P, Leduc D, Brauer P, Pottie K, Jaramillo Garcia A, et al. Recommendations on screening for developmental delay. CMAJ. 2016;188:579-87.
32. Veldhuizen S. Systematic screening for developmental delay in early childhood: problems and possible solutions. Curr Dev Disord Reports. 2016;3:184-9.
33. Álvarez Gómez MJ, Soria Aznar J, Galbe Sánchez-Ventura J. Importancia de la vigilancia del desarrollo psicomotor por el pediatra de Atención Primaria: revisión del tema y experiencia de seguimiento en una consulta en Navarra. Rev Pediatr Aten Primaria. 2009;11:65-87.
34. Ministerio de Salud y Protección Social. Resolución 3280 de 2018: Por medio de la cual Se Adoptan Los Lineamientos Técnicos Y Operativos De La Ruta Integral De Atención Para La Promoción Y Mantenimiento de la Salud y la Ruta Integral de Atención en Salud para la Población Materno Perinatal y se Establecen Las Directrices Para Su Operación. Bogotá, D.C.; 2018. Available from: https://www.minsalud.gov.co/sites/rid/Lists/BibliotecaDigital/RIDE/DE/DIJ/resolucion-3280-de-2018.pdf
35. de Castro F, Vázquez-Salas RA, Villalobos A, Rubio-Codina M, Prado E, Sánchez-Ferrer JC, et al. Contexto y resultados del desarrollo infantil temprano en niños y niñas de 12 a 59 meses en México. Salud Publica Mex. 2019;61:775-86.