

Childhood Autism Rating Scale – CARS-2: Cross-cultural adaptation and evidence of content validity for the Brazilian context

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Abstract

This study aimed to translate and culturally adapt the Childhood Autism Rating Scale – Second Edition (CARS-2) for Brazilian Portuguese. The CARS-2 comprises the standard version (CARS-ST), the high-functioning version (CARS-HF), and a caregiver questionnaire (CARS-QPC). The translation was performed by two independent translators, followed by a synthesis of the translated versions. Nine experts in psychological assessment and/or autism reviewed the two assessment forms and the questionnaire (three for each), suggesting modifications to better align with the current understanding of autism, reduce stigmatization, eliminate gender biases, and improve the clarity of terms within the Brazilian culture. All items in the assessment forms achieved satisfactory content validity coefficients (CVC > .80), with only a few items in the questionnaire requiring adjustments (CVC < .80). An evaluation was then conducted with the target audience, including healthcare providers and the autistic community, to assess applicability and potential changes. The revisions aimed to provide a more current description of autism and use non-ableist terms. Finally, the assessment forms were back-translated for review and approval of the Brazilian version of the CARS-2 by the publisher WPS. These steps have ensured satisfactory evidence of the content validity of the CARS-2, considering semantic, idiomatic, experiential, and conceptual aspects. In conclusion, the initial version of the instrument has been adapted to the Brazilian context, and further studies of validity evidence and normative data are required to complete the process and enable its professional use in the context of autism spectrum disorder.

Keywords: autism spectrum disorder, behavior rating scale, translating, validation study, diagnosis

CHILDHOOD AUTISM RATING SCALE – CARS-2: ADAPTAÇÃO TRANSCULTURAL E EVIDÊNCIAS DE VALIDADE DE CONTEÚDO PARA O CONTEXTO BRASILEIRO

CARS-2: Adaptação transcultural e evidências de validade de conteúdo

Resumo

Este artigo teve como objetivo traduzir e adaptar transculturalmente para o português brasileiro a *Childhood Autism Rating Scale – Second Edition* (CARS-2). A CARS-2 é composta pelas versões padrão (CARS-2-ST) e de alto funcionamento (CARS2-HF), além de um questionário para cuidadores (CARS-QPC). A tradução foi feita por dois tradutores independentes, seguida de uma síntese das versões traduzidas. Nove especialistas em avaliação psicológica e/ou autismo analisaram os formulários e o questionário (três para cada um), sugerindo modificações para melhor alinhar com a conceituação atual do autismo, reduzir estigmatização, eliminar vieses de gênero e melhorar a clareza dos termos na cultura brasileira. Todos os itens dos formulários de avaliação obtiveram índices satisfatórios de coeficiente de validade de conteúdo (CVC > 0,80), e poucos itens do questionário precisaram de ajustes considerando o indicador quantitativo (CVC < 0,80). Uma avaliação foi realizada com o público-alvo, incluindo profissionais da saúde e comunidade autista, para verificar a aplicabilidade e possíveis alterações. As mudanças visaram uma descrição mais atual do TEA e a utilização de termos não capacitistas. Por fim, os formulários de avaliação foram retrotraduzidos para apreciação e aprovação da versão brasileira da CARS-2 pela editora WPS. Essas etapas garantiram evidências satisfatórias de validade de conteúdo da CARS-2, considerando aspectos semânticos, idiomáticos, experienciais e conceituais. Conclui-se que a versão inicial do instrumento está adaptada ao contexto brasileiro, aguardando estudos de evidências de validade e normas para completar o processo e possibilitar seu uso profissional no contexto do TEA.

Palavras-chave: transtorno do espectro autista, escala de avaliação comportamental, tradução, estudo de validação, diagnóstico

CHILDHOOD AUTISM RATING SCALE – CARS-2: ADAPTACIÓN TRANSCULTURAL Y EVIDENCIAS DE VALIDEZ DE CONTENIDO PARA EL CONTEXTO BRASILEÑO

CARS-2: Adaptación transcultural y validez de contenido

Resumen

Este artículo tuvo como objetivo traducir y adaptar culturalmente la *Childhood Autism Rating Scale – Second Edition* (CARS-2) al portugués brasileño. La CARS-2 comprende la versión estándar (CARS-ST), la

versión de alto funcionamiento (CARS-HF) y un cuestionario para cuidadores (CARS-QPC). La traducción fue realizada por dos traductores independientes, seguida de una síntesis de las versiones traducidas. Nueve expertos en evaluación psicológica y/o autismo revisaron los dos formularios y el cuestionario (tres para cada uno), sugiriendo modificaciones para alinear mejor con la comprensión actual del autismo, reducir la estigmatización, eliminar sesgos de género y mejorar la claridad en la cultura brasileña. Todos los ítems en los formularios de evaluación lograron coeficientes de validez de contenido satisfactorios ($CVC > 0.80$), con solo unos pocos ítems en el cuestionario requiriendo ajustes ($CVC < 0.80$). Posteriormente, se realizó una evaluación con el público objetivo, incluidos profesionales de la salud y la comunidad autista, para evaluar la aplicabilidad y posibles cambios. Las revisiones buscaban actualizar la descripción del autismo y usar términos inclusivos. Finalmente, los formularios de evaluación fueron retrotraducidos para su revisión y aprobación de la versión brasileña de la CARS-2 por la editorial WPS. Estos pasos han asegurado evidencia satisfactoria de validez de contenido de la CARS-2 en aspectos semánticos, idiomáticos, experienciales y conceptuales. Se concluye que la versión inicial del instrumento ha sido adaptada al contexto brasileño y se encuentra a la espera de estudios de evidencias de validez y normas para completar el proceso y posibilitar su uso profesional en el contexto del trastorno del espectro autista.

Palabras clave: trastorno del espectro autista, escala de evaluación de la conducta, traducción, estudio de validación, diagnóstico

Autism spectrum disorder (ASD) is characterized by alterations in two main domains: (a) socioemotional impairments evident in verbal and nonverbal communication, interaction, and socioemotional exchange; and (b) the presence of restricted and repetitive patterns of behavior, interests, or activities. As a spectrum condition, ASD presents in diverse forms, with differences primarily reflected in the quality and functional impact of behaviors (American Psychiatric Association [APA], 2023). The International Classification of Diseases 11th Revision (ICD-11; World Health Organization [WHO], 2022) is conceptually aligned with the APA (2023). The ICD-11 describes ASD as a single diagnostic category, recognizing variability in clinical presentation and reinforcing the understanding of autism as a spectrum condition, with differences in the quality and functional impact of sociocommunicative impairments and behavioral patterns.

A recent and comprehensive systematic review encompassing global health databases found that approximately 240 million children worldwide have developmental disorders (DD), such as attention-deficit/hyperactivity disorder (ADHD), ASD, cerebral palsy, and intellectual developmental disorder, among others (Olusanya et al., 2023). In the United States, a study indicated that 17% of children between three and 17 years of age have a DD and that this percentage increased when comparing the periods 2009–2011 and 2015–2017 (Zablotsky et al., 2019).

Considering neurodevelopmental disorders, ASD has drawn increasing attention due to rising prevalence rates. The APA estimates a prevalence of 1% to 2% in the U.S. population. More recent reports from the Centers for Disease Control and Prevention (CDC) indicate that approximately 1 in 31 children up to eight years of age in the United States has been identified with ASD (Shaw et al., 2025).

In Brazil, there are no studies that reliably estimate the prevalence of ASD (Lin et al., 2024; Sukiennik et al., 2022). For this reason, the Federal Government included the assessment of this condition in the 2022 national census conducted by the *Instituto Brasileiro de Geografia e Estatística* (IBGE). Following the release of IBGE data, the Demographic Census indicated that approximately 2.4 million people in Brazil have an ASD diagnosis. According to these data, prevalence was higher among males than females, and the highest prevalence by age group was observed among children aged 5 to 9 years (Brasil, 2025).

Autism spectrum disorder originates in the first years of life and is therefore classified as a neurodevelopmental disorder, as this is the period when the neurological system is formed. A large proportion of children begin to present evident signs between 12 and 24 months of age. However, prodromal signs (symptoms or signs that precede the development of a disease or disorder) usually manifest in the first months and are described as motor delays; atypicalities in visual attention; reports of parental concerns since birth; delays in pointing behaviors, babbling, and response to name; and impairment in eye contact (Estes et al., 2019). Although signs of ASD emerge early, studies indicate that in Brazil and in other developing countries, diagnosis usually occurs only around five years of age (Yates & Le Couteur, 2016; Zanon et al., 2017; Zwaigenbaum & Penner, 2018).

Delayed diagnosis is a problem for both caregivers and the individual, as it causes stress and family burden (Gomes et al., 2015) and may deprive individuals of early interventions that have the potential to modify brain connections during periods of greater neuroplasticity. These interventions may promote better long-term outcomes (Kolb & Gibb, 2011).

Diagnosis of ASD is essentially clinical, based on observations of the patient's behavioral characteristics, the collection of data on the subject's life history, reports from caregivers and people close to them, and the use of instruments (Zwaigenbaum & Penner, 2018). Most evaluation guidelines for ASD interventions recommend that the process be carried out by a multidisciplinary team (Brazil, 2013; National Collaborating Centre for Mental Health [NCCMH], 2012), using a range of strategies, methods, and techniques (Zwaigenbaum & Penner, 2018). Regarding the instruments used, they must have satisfactory psychometric properties (American Educational Research Association [AERA], American Psychological Association [APA], & National Council on Measurement in Education [NCME], 2014), as they may improve the clinician's decision-making regarding diagnosis (Kaufman, 2022).

In assessment, instruments are available both for screening signs and symptoms and for conducting a more comprehensive evaluation. Screening instruments generally involve self- and other-report measures and aim to identify early signs and indicate an increased risk of ASD, thereby suggesting the need for a more detailed evaluation (Seize & Borsa, 2017). Assessment instruments, in contrast, aim to support diagnostic confirmation and generally require professional training for administration. They are typically based on interviews with parents or caregivers and/or direct observation of the individual's behavior (Joseph et al., 2016).

However, in Brazil, there is a lack of instruments with satisfactory psychometric properties that can be used by professionals to assist in the diagnosis of ASD. Systematic reviews have highlighted this gap. Backes et al. (2014) reported the absence of internationally established diagnostic tools adapted to the Brazilian context. A review conducted by Seize and Borsa (2017) also identified a scarcity of screening instruments for ASD in children up to 36 months of age. Silva and Elias (2020) identified eight instruments with some evidence of validity; however, none was a specific diagnostic instrument for ASD assessment with robust psychometric properties.

In the national context, two screening instruments are more widely known and marketed. The first is the Assessment Protocol for Children with Suspected Autism Spectrum Disorders (PROTEA-R) (Bosa & Salles, 2018), intended to assess children from 24 to 60 months of age through clinical observation of play. The second is the Social Responsiveness Scale (SRS-2), a self- and other-report instrument translated and adapted for Brazil by Borges (2020). It has satisfactory evidence of validity and is used for ASD screening in children from two and a half years of age, as well as adolescents and adults. Another instrument widely used in the national context is the revised version of the Modified Checklist for Autism in Toddlers with Follow-Up (M-CHAT-R/F). This instrument is completed by parents and caregivers of children between 16 and 30 months of age (Losapio et al., 2022). However, it should be emphasized that these are screening instruments and not assessment instruments.

Internationally, some diagnostic instruments are widely used in clinical practice, such as the Autism Diagnostic Observation Schedule, Second Edition (ADOS-2) (Lord et al., 2012), and the Autism Diagnostic Interview Revised (ADI-R) (Le Couteur et al., 2003). These instruments are often used in the Brazilian context without authorization, despite existing studies of translation and cross-cultural adaptation, psychometric investigations, and the need for authorization from the publisher responsible for their copyright. For the use of the ADOS-2, for example, training and certification from the publisher are required. The ADI-R, in turn, has only one study of translation and cross-cultural adaptation for Brazil, with some evidence of validity using a small sample (Becker et al., 2012).

Another instrument widely used internationally is the Childhood Autism Rating Scale–Second Edition (CARS-2) (Schopler et al., 2010). It is a scale translated and adapted for several countries and widely used to assess suspected ASD cases. One of the advantages of this instrument is that it allows the integration of data from multiple sources of information, including reports from parents, teachers, school and professional reports, and clinical observation (Sanchez & Constantino, 2020). In addition, the CARS-2 is one of the instruments recommended by the CDC for the diagnosis of ASD (CDC, 2020). The first version of the instrument, the CARS, was adapted and validated for Brazil by Pereira et al. (2008), but there are no reports of subsequent studies of interpretation norms or guidelines for the use of the instrument.

The current version of the instrument, the CARS-2, consists of two assessment forms: the Standard Version (CARS2-ST) and the High-Functioning Version (CARS2-HF), and the Questionnaire for Parents or Caregivers (CARS2-QPC). The first form is used to assess individuals from two to six years of age and/or with an IQ lower than 80 or who do not have fluent oral language skills. The second form is intended for individuals aged six years or older with an estimated IQ of 80 or more and fluent verbal language skills. The instrument provides information on the intensity and duration of ASD symptoms from two years of age to adulthood. In addition, its results allow the planning of interventions and may be used in clinical settings, schools, and to guide standardized intervention guidelines in the home setting (Schopler et al., 2010).

It should be emphasized that, although the standard version (CARS2-ST) of the CARS-2 was revised in 2010 and the high-functioning version (CARS2-HF) was developed in the same year, studies have highlighted the current applicability of this instrument. Some researchers have demonstrated that the CARS-2 shows good correspondence with the diagnostic criteria of the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5) (APA, 2014). Dawkins et al. (2016) reported adequate diagnostic sensitivity (.84) for the CARS2-ST and for the CARS2-HF (1.0) using DSM-5 criteria for ASD. The authors therefore indicated the effectiveness of using both the CARS-2 assessment booklets to identify individuals with the disorder. Moulton et al. (2019) also reported the usefulness of the CARS-2 in the diagnosis of ASD using DSM-5 criteria, as the factor structure analysis conducted in the study identified central domains consistent with the ASD criteria described in the DSM-5.

In recent years, there has been increasing concern about the effectiveness and safety of assessment instruments. These concerns seek to establish consensus on the minimum properties required for an instrument to be recognized by the scientific community and to ensure its appropriate use (AERA et al., 2014). Discussions on translation and cross-cultural adaptation of instruments have been encouraged, following guidelines such as those of the International Test Commission (ITC, 2017). The Brazilian study by Borsa et al. (2012) is widely used, as it provides a systematic set of steps for the translation and cross-cultural adaptation of instruments. In addition, instruments must be supported by studies demonstrating their psychometric quality, such as evidence of validity and reliability. This evidence is fundamental to ensure that test results accurately reflect what the instrument is intended to measure and to ensure the consistency and replicability of results over time and in different situations. (AERA et al., 2014; ITC, 2017).

Considering the scarcity of instruments for ASD assessment in Brazil and the importance of cross-cultural adaptation of instruments widely used internationally and supported by satisfactory psychometric properties, this article aimed to translate, cross-culturally adapt, and investigate evidence of content validity of the CARS-2 (Schopler et al., 2010). The American Educational Research Association (AERA), the American Psychological Association (APA), and the National Council on Measurement in Education (NCME) define content validity as the correspondence between the test content and the construct it intends to assess (AERA, APA & NCME, 2014). This requires consideration of item wording, format, and presentation. For a test to demonstrate evidence of content validity, its items must assess aspects relevant to the construct (Roebianto et al., 2023), in this case ASD.

In the cross-cultural adaptation process, this type of validity may include evaluation by expert judges and by the instrument's target audience, and may involve both qualitative and quantitative procedures. Content validity is fundamental in cross-cultural adaptation, as it aims to associate theoretical concepts with observable and measurable indicators, using operational terms that are meaningful within the target culture. It also makes it possible to verify whether the items represent the essential aspects of the construct to be assessed, and necessary to support subsequent studies examining other forms of validity and reliability (Alexandre & Coluci, 2011).

Method

Authorization from Western Psychological Services (WPS), the publisher holding the copyright for the CARS-2, was requested and granted to the researchers. The adaptation and translation procedures were based on the guidelines proposed by Borsa et al. (2012) and the ITC (2017) to ensure the adequacy of the process. The steps were: 1) translation of the instrument into the target language; 2) synthesis of the translated versions; 3) evaluation of the synthesis by experts; 4) evaluation by the target audience and by people with ASD; 5) back-translation; and 6) evaluation of the back-translated version by the publisher WPS.

The first step, which consisted of the initial translation from the English version to Brazilian Portuguese, was conducted by two hired translators. The CARS-2 items were sent online to them in a spreadsheet, with space for the translation of the instructions and items. The two translators performed the translation independently to minimize possible biases in culture, language, and practical and theoretical understanding (Borsa et al., 2012), as one of the translators had knowledge regarding the field of Psychology and the other did not.

In the second step, the authors synthesized the translated versions of the assessment forms (CARS2-ST and CARS2-HF) and of the parent questionnaire (CARS2-QPC), comparing them according to semantic, idiomatic, linguistic, contextual, and conceptual divergences, in accordance with the ITC (2017). The semantic analysis considered the meaning of words and items, going beyond grammar. The idiomatic analysis evaluated the fidelity of the translation, especially in items with complex terms. The conceptual analysis verified the cultural applicability of the item in the Brazilian context. Finally, the linguistic and contextual aspects of equivalence ensured that, in addition to a correct translation, the expressions and words assessed the same construct in different cultures.

The third step consisted of the evaluation of the translated version by experts. For this purpose, nine judges were selected by convenience and invited by email or telephone. All judges had extensive experience in psychological assessment or in the field of ASD. Regarding academic degree, seven held doctoral degrees and two held master's degrees in Psychology, with a mean of 15.66 years of experience ($SD = 9.38$), ranging from 4 to 35 years.

Considering the length of the forms, as well as the importance of a thorough analysis of the terms describing the items and response options, each judge was invited to evaluate only one of the three forms. Each form, sent via Google Forms, contained the original and Portuguese items, spaces for the judge's identification data, and instructions for item evaluation based on criteria of semantic, idiomatic, experiential, and conceptual equivalence. The evaluation options for each item were scored from 0 to 3, indicating that the translation was "not adequate," "slightly adequate," "adequate," or "very adequate" for each equivalence criterion. There was also space for comments. The judges' considerations were compiled for analysis by the authors.

The fourth step involved evaluation of the CARS-2 by the target audience. Focus groups were conducted with healthcare providers to evaluate the CARS2-ST and the CARS2-HF, and with parents or caregivers of people with ASD to evaluate the CARS2-QPC. This stage included the participation of people with ASD and mothers of people with ASD. This decision was made in light of the rise of the neurodiversity movement and the recommendation in the literature regarding the importance of involving the autistic community in the research process to ensure that the issues addressed were relevant and meaningful to them. (Poulsen et al., 2022).

Five paired interviews and four individual interviews were conducted, either online or in person. Each interview lasted approximately two hours, and notes were taken for subsequent analysis. Seven professionals were contacted (four for the CARS2-HF and three for the CARS2-ST). Of these, six worked directly with autistic individuals in clinical settings, including four

psychologists, one speech-language pathologist, and one occupational therapist. The other judge worked in research and supervision of clinical cases of suspected ASD or intervention with autistic individuals.

Regarding the judges with ASD, two participants were university students, while the other two were the president and vice-president of an association for autistic individuals. All of them received the diagnosis later in life. Finally, five mothers of children or adolescents with ASD were invited to respond to the CARS2-QPC. To reduce linguistic biases, participants from four regions of the country were selected (Northeast, Southeast, South, and Central-West). Among these mothers, four had completed higher education and one had completed high school education. Of those with higher education, one was a psychopedagogue who worked as a lecturer and instructor of courses related to ASD, two were psychologists, and one was a pharmacist.

Each participant was instructed to evaluate the clarity of the items. If they found terms, words, or phrases that were not easily understandable, they could propose adjustments or synonyms to facilitate understanding of the text. The suggestions were recorded, discussed by the researchers, and accepted when pertinent.

After implementing the pertinent changes suggested by the target audience, the fifth stage, back-translation, was initiated. The final version of each form, revised and synthesized, was translated back into the original language of the instrument. The back-translation was performed by a hired translator. The CARS2-QPC did not undergo the back-translation process because it is not a measurement instrument, but rather aims to assist in completing the assessment forms. For this reason, it was not tested in terms of psychometric properties. Its vocabulary is relatively simple and raised few doubts or suggestions for adaptation among the target audience. Finally, in the sixth stage, the final versions of each assessment form were evaluated by the international publisher responsible for the instrument, which approved the terminological adequacy of the Brazilian version.

Instruments

Sociodemographic Data Questionnaire

It was developed with the aim of collecting important variables from the participants in each of the stages of the translation and cross-cultural adaptation process. There were questions related to educational level, length and area of professional experience (in the case of professionals), and age at diagnosis (in the case of autistic individuals).

Childhood Autism Rating Scale, second edition (CARS-2)

The CARS2-HF and CARS2-ST assessment forms, as described in the introduction, provide a quantitative classification of signs and symptoms of autism from 2 years of age onwards. The classifications consider frequency, intensity, peculiarity, and duration of behaviors, with scores on a continuum of behavioral problems. Each item is answered on a four-point scale, with half-point intervals (1, 1.5, 2, 2.5, 3, 3.5, 4), to classify the severity of the behavior assessed.

A score of 1 is assigned when the behavior is age-appropriate or when there is no evidence of the symptom and 4 when the behavior is severely atypical. Each form assesses 15 areas. Evidence of criterion validity for the original CARS2-ST and CARS2-HF was satisfactory, with CARS2-ST presenting a sensitivity of .88 and specificity of .86, and the CARS2-HF with a sensitivity of .81 and specificity of .87. Regarding reliability, a high degree of internal consistency was found, with Cronbach's alphas of .93 and .96, respectively, for the CARS2-ST and the CARS2-HF. Interrater reliability values of the items for the CARS2-ST ranged from .43 to .81 (median of .69) and ranged from .53 to .88 (median of .79) for the CARS2-HF, indicating that both assess the same construct. The CARS2-QPC, completed by parents or caregivers, assists the professional in completing the CARS2-ST and the CARS2-HF. It has 38 items in six sections: communication, relationship with others and emotional response, body movement, play, reaction to change, and use of the senses. Each item is rated according to five classification levels: not a problem, mild to moderate problem, severe problem, not a problem now, but it was in the past, and do not know (Schopler et al., 2010).

Ethical Procedures

The study was approved by the Research Ethics Committee of the Federal University of São João del-Rei, under CAAE No. 71652423.6.0000.5151. The privacy of all participants, together with the guarantee of data secrecy and confidentiality, was ensured. All participants were required to accept and agree to the consent form in order to participate. Two email addresses were provided in the consent form for contacting the researchers in case any participant experienced discomfort or required support after participating in the study.

Data Analysis Procedures

In the cross-cultural adaptation stage, data analyses were conducted using qualitative and quantitative approaches. During the translation synthesis stages, the information was entered into an Excel file, and the researchers examined linguistic differences to synthesize and refine the translations into a preliminary version. These discussions were guided by theoretical criteria related to ASD and by considerations of semantic, idiomatic, linguistic, contextual, and conceptual equivalence (Borsa et al., 2012).

In the judges' analysis stage, the items were evaluated by the professionals and received scores ranging from 0 to 3 for translation quality, according to the criteria of semantic, idiomatic, experiential, and conceptual equivalence. A score of 0 indicated low translation quality, and a score of 3 indicated optimal quality. Agreement among the judges' ratings was examined using the Content Validity Coefficient (CVC) for each item of the forms (CARS2-ST, CARS2-HF, and CARS2-QPC), analyzed separately. Agreement values greater than .8 were considered indicative of item adequacy (Borsa et al., 2012). In addition, the judges' comments provided qualitative input on the items and were incorporated by the authors, when pertinent, to modify words, expressions, or phrases.

The evaluation of the forms by the target audience, including professionals, caregivers, and people with ASD, was conducted qualitatively. The comments from each individual or pair were compiled in an Excel document for comparison.

Results

During the first stage, that is, the synthesis of the versions translated from English into Portuguese, the translations were quite similar. The terms in Portuguese were chosen to better correspond to the concept of ASD. For example, in the CARS2-ST, “unaware” was translated as “*indiferente*” (indifferent) instead of “*inconsciente*” (unconscious). The item “Body Use” present in both the CARS2-ST and the CARS2-HF was translated as “*Uso do corpo*” (use of the body) and “*Uso corporal*” (bodily use), with the researchers initially opting for the second translation. The item “Taste, Smell, and Touch Response and Use” was translated as “*Resposta de paladar, olfato e tato e uso de objetos*” (taste, smell, and touch response and use of objects) and “*Uso do/resposta ao paladar, olfato e tato*” (use of/response to taste, smell, and touch), with the researchers opting for the first translation. Also, in relation to the CARS2-HF, the item “Relating to People” was translated as “*Relacionar-se com pessoas*” (relating to people) and “*Relacionamento com pessoas*” (relationship with people), with the second option being chosen. For the item “Thinking/Cognitive Integration Skills”, translated as “*Habilidades de pensamento/integração cognitiva*” (thinking/cognitive integration skills) and “*Habilidades de integração cognitiva/pensamento*” (cognitive integration/thinking skills), the second translation was chosen. Finally, in some items, the researchers opted to combine translations, selecting a phrase from one translator for the first part and a phrase from the other translator for the second part. For items present in both forms (CARS2-ST and CARS2-HF), or that were equivalent, the authors took care to match the translations and adaptations so that the terms were identical. Regarding the CARS2-QPC, for the item “Carries on a conversation with another person that flows back and forth.” translated as “*Mantém uma conversa com outra pessoa que flui para frente e para trás...*” (Maintains a conversation with another person that flows back and forth...) and as “*Mantém uma conversa com outra pessoa que flui para ambos os lados...*” (Maintains a conversation with another person that flows both ways...), the second translation was chosen. In the evaluation stage by the experts, the CVCs of the three forms were all above or close to .80. In the CARS2-HF, the values ranged, by item, between .81 and 1 (semantic), .90 and 1 (idiomatic), .94 and 1 (experiential), and .96 and 1 (conceptual). In the CARS2-ST, the values also ranged, by item, between .89 and 1 (semantic), .89 and 1 (idiomatic), .89 and 1 (experiential), and .87 and 1 (conceptual). Finally, in the CARS2-QPC, only three of the 38 items did not reach the criterion for semantic equivalence (CVC between .67 and .97), six did not present idiomatic equivalence, seven in the experiential aspect (CVC between .66 and 1), and one in the conceptual aspect (CVC between .77 and 1). All of them were reformulated to comply with the suggestions. The items with values below .80 in semantic equivalence were related to the use of varied gestures to communicate, the maintenance of age-appropriate fluent conversations, and the demonstration of skills to converse about the interests

of others. The judges assessed that there were terms that were difficult for caregivers to understand in these items. Regarding the idiomatic aspects, the items with CVCs below .80 used terms considered uncommon in Brazil, according to the judges, such as “*é responsivo a iniciações sociais*” (is responsive to social initiations) and “*automutilação*” (self-mutilation), and were reformulated to “*responde às interações sociais iniciadas por outras pessoas*” (responds to social interactions initiated by other people) and “*autolesão*” (self-injury). In the experiential aspect, the item “*Mantém uma conversa com outra pessoa que flui para ambos os lados*” (Maintains a conversation with another person that flows both ways) was assessed as using uncommon language and was modified to “*mantém uma conversa fluida/natural com outra pessoa*” (maintains a fluent/natural conversation with another person). Finally, in the conceptual aspect, only the item “*cope with changes...*” translated as “*enfrenta mudanças...*” (faces changes...) was reformulated. Additionally, in the evaluation phase by the experts, one of the main alterations was that of the terms “*anormal/anormais*” (abnormal/abnormal) to “*atípico/atípicos*” (atypical/atypical). In addition, guidance was included in both the CARS2-ST and the CARS2-HF forms regarding when to use them, since the first is to be used with individuals from two to six years of age with any level of intellectual development or for those over six years of age who have an Intelligence Quotient (IQ) below 80 or who do not have fluent oral language skills; and the second is used for individuals over six years of age, with an IQ above 80 and fluent verbal language skills. The adjustments also considered the use of words commonly employed in other instruments and in clinical practice. In addition, modifications were made to structure the sentences in a more direct way. One of the adaptations in the CARS2-ST involved replacing “*Ele ou ela*” (He or she) in the items with the use of “*ela*” (she), since the pronoun agreement referred to the word “*criança*” (child). A description was added to one of the items, at the suggestion of a judge, to clarify the meaning of “*pode às vezes encarar o vazio*” (may sometimes stare into space), including, in parentheses, the explanation that this refers to an “*olhar vago, sem direção definida*” (vacant gaze, without a defined direction). Finally, one of the CARS2-ST items addresses the term Savant skills, and as this is no longer frequently used, especially in the Brazilian context, it was decided to add a note to explain it. The alterations made in the CARS2-HF aimed to improve readability and comprehension and to make the sentences more direct. Expressions such as “*indivíduo*” (individual) or “*pessoas*” (people) were introduced so that gender bias would be avoided in the formulation of the items. Other modifications involved the following changes: “*As expressões emocionais são relativamente secas...*” (Emotional expressions are relatively flat...) to “*As expressões emocionais são relativamente apáticas...*” (Emotional expressions are relatively apathetic...); “*início das interações...*” (initiation of interactions...) to “*iniciar as interações*” (to initiate interactions); and “*...interações com os outros são fluidas...*” (...interactions with others are fluent...) to “*...interações com os outros são espontâneas...*” (...interactions with others are spontaneous...). An item related to verbal communication described the abilities of the evaluated person in a conversation, specifying that they should use a sequence of exchanges with “*no mínimo quatro elementos*” (at least four elements). This term was changed to “*quatro elementos/troca de turnos*” (four elements/

taking turns). In an item that evaluates nonverbal communication, the phrase “*As expressões faciais são planas...*” (Facial expressions are flat...) was replaced with “*As expressões faciais são neutras...*” (Facial expressions are neutral...). In the item that evaluates the patient’s intellectual functioning, the expression “*Pontuação de QI na faixa média baixa...*” (IQ score in the low-average range...) was replaced with “*Pontuação de QI na faixa médio inferior...*” (IQ score in the lower-average range...). Finally, in the final item, concerning the evaluator’s general impressions, the terms *leve* (mild), *moderado* (moderate), and *grave* (severe) were replaced with *grau leve* (mild degree), *grau moderado* (moderate degree), and *grau grave* (severe degree).

With regard to the CARS2-QPC, in the evaluation by the experts, the changes also aimed to make the sentences more direct and more consistent with Portuguese. The phrase “*Direciona expressões faciais...*” (directs facial expressions) was changed to “*Manifesta expressões faciais...*” (manifests facial expressions); “*não é verbal*” (is not verbal) to “*não fala*” (does not speak); and “*mostra uma variedade de expressões emocionais...*” (shows a variety of emotional expressions) to “*usa várias expressões emocionais...*” (uses various emotional expressions). All these changes were suggestions by the experts to assist caregivers’ understanding of the items. In the evaluation by the target population of the CARS2-ST and CARS2-HF, in some items, the word “normal” was still present and was replaced with “*esperado para a idade*” (expected for age). Another modification was the replacement of the terms “*bizarros*” (bizarre) or “*estranho*” (strange) with “*não convencionais*” (nonconventional) or “*atípicos*” (atypical). In addition, throughout the instrument, the term “*em conjunto com outros sentidos*” (in conjunction with other senses) was replaced with “*coordenado com outros sentidos*” (coordinated with other senses). Finally, another modification carried out was the replacement of the word “*incapaz*” (incapable) with “*não consegue*” (cannot) and “*é capaz*” (is able to) with “*consegue*” (can). The word “*inadequada*” (inadequate) was also replaced with “*atípico*” (atypical) or “*não convencional*” (nonconventional). Another significant change, suggested by more than one judge, was the replacement of the expressions “*(reage) muito ou muito pouco*” ((reacts) too much or too little) with “*(tem reações) reduzidas ou aumentadas*” (has reduced or increased reactions). In addition, modifications were also made to phrases or words so that the text would follow a more direct and more fluid order.

In the evaluation by the target population, in the item “*Imitação*” (Imitation) of the CARS2-ST, the expression “*Imitação adequada*” (adequate imitation) was changed to “*Imitação adequada para a idade*” (imitation appropriate for age) to make it clearer that the comparison should be made with someone of the equivalent age. In the item “*Resposta Emocional*” (Emotional Response), the expression “*ficar rígida*” (becomes rigid) was replaced with “*apresentar rigidez dos movimentos*” (presents rigidity of movements) and the expression “*entra em um certo humor*” (enters a certain mood) with “*muda para um certo humor*” (changes to a certain mood). The expression “*agressão autodirigida*” (self-directed aggression) was changed to “*autoagressão*” (self-aggression). In the item “*Uso de objetos*” (Use of objects), the expression “*inadequadamente infantil*” (inadequately childish) was replaced with “*não apropriado para a idade*” (not appropriate for age). In the item “*Adaptação à mudança*” (Adaptation to change), an example was added in

parentheses, in one of the descriptions of what would be tantrum behaviors that the child may exhibit when there are changes in routine: “(por exemplo, choros, gritos ou se jogar no chão)” (for example, crying, screaming, or throwing themselves on the floor). In the item “Resposta visual” (Visual response), an example was also included in parentheses to facilitate understanding of “olhar para objetos de um ângulo incomum...” (looking at objects from an unusual angle...), which was “(por exemplo, olhar periférico)” (for example, peripheral looking). The expression “provar objetos” (taste objects) was also changed to “colocar objetos na boca” (puts objects in the mouth) to make the operationalization of the item more precise. In the item “Nível de atividade” (Activity level), in the description “A criança pode (...) ser levemente inquieta ou um pouco ‘preguiçosa’” (The child may (...) be slightly restless or somewhat “lazy”), the term “preguiçosa” (lazy) was replaced with “lenta (parecendo letárgica)” (slow (appearing lethargic)). Finally, in the item “Nível e consistência da resposta intelectual” (Level and consistency of intellectual response), substitutions were made, such as: “a inteligência é normal” (intelligence is normal) to “a inteligência está dentro da média” (intelligence within the average); “inteligência baixa” (low intelligence) to “inteligência abaixo da média” (intelligence below average); and “inteligência muito baixa” (very low intelligence) to “inteligência muito abaixo da média” (intelligence far below average).

Also, in the evaluation of the CARS2-HF by the target population, the expression “compreensão cognitiva de uma pessoa sobre a comunicação” (a person’s cognitive understanding of communication) was changed to “aspectos cognitivos da interpretação de uma pessoa sobre a comunicação” (cognitive aspects of a person’s interpretation of communication). In the item “Compreensão Socioemocional” (Socioemotional Understanding), the expression “para a idade” (for age) was added to the description of “compreensão socioemocional apropriada” (appropriate socioemotional understanding) and the expression “assumir a perspectiva do outro” (takes the other’s perspective) was changed to “considerar a perspectiva de outra pessoa” (considers another person’s perspective). The sentence “tem consciência de outras pessoas da mesma idade e é interessado em interações...” (is aware of other people of the same age and is interested in interactions...) was changed to “percebe e se interessa por interações com outras pessoas da mesma idade...” (perceives and is interested in interactions with other people of the same age...). In the item “Uso de objetos” (Use of objects), substantial changes were made to facilitate the reader’s understanding of the evaluation of the quality of play, especially imaginative play. For example, the expression “Há algum uso de bonecos como agentes...” (There is some use of dolls as agents...) was changed to “Há alguma atribuição de papéis aos bonecos...” (There is some assignment of roles to the dolls...). In the item “Resposta visual” (Visual Response), the definition of “fascínio visual” (visual fascination) was added in the description of one of the response categories. In the item “Habilidades de integração cognitiva/do pensamento” (Cognitive/Thinking Integration Skills), the expression “pensamento atrasado” (delayed thinking) was changed to “pensamento mais lento” (slower thinking). In the item “Nível e consistência da resposta intelectual” (Level and consistency of intellectual response), the expression “Não tão inteligente quanto uma pessoa típica da mesma idade” (Not as intelligent as a typical person of the same age) was changed to “O funcionamento intelectual está abaixo do

esperado em comparação com uma pessoa típica da mesma idade) (Intellectual functioning is below the expected compared to a typical person of the same age). Finally, in the item “*Impressões gerais*” (General impressions), the word “*sintomas*” (symptoms) was replaced at all classification levels (*leve, moderado e grave*) (mild, moderate, and severe) with “*alguns sinais ou características do autismo*” (some signs or characteristics of autism) for better correspondence with current discussions about ASD.

In the CARS2-QPC, in the evaluation by the target population, the expression “*...a pessoa que você está respondendo...*” (...the person you are responding...) was changed to “*...a pessoa sobre quem você está respondendo...*” (...the person about whom you are responding...). The option “*Problema grave*” (serious problem) was changed to “*Problema severo*” (severe problem) to obtain better agreement with the original version. An explanation was added in parentheses to define what it means to maintain a natural/fluid conversation: “*falando quando é sua vez, e esperando o outro falar*” (speaking when it is your turn, and waiting for the other to speak). To exemplify what would be “*responder a interações sociais que são iniciadas por outras pessoas*” (responding to social interactions that are initiated by other people), the explanation “*por exemplo, retribui um sorriso ou um aceno, responde perguntas como ‘qual o seu nome?’*” (for example, returns a smile or a wave, answers questions such as “what is your name?”) was inserted. Throughout the items, other examples were added to make the described behavior more operational. “*Segue o olhar de outra pessoa*” (follows another person’s gaze) was changed to “*Olha para onde a outra pessoa está olhando...*” (looks to where the other person is looking...). In one of the items that assess play, a change was made to reflect habits more common in the Brazilian context. In the expression “*usa uma banana como telefone*” (uses a banana as a telephone), banana was replaced with *controle remoto* (remote control). Examples of modifications in items of the CARS2-ST, the CARS2-HF, and the CARS2-QPC throughout the cross-cultural adaptation process are presented in the APPENDIX.

Finally, it is worth noting that the names of the two CARS-2 assessment forms in Brazil were: *Versão de alto funcionamento: caderno de classificação* (CARS2-HF) (High-functioning version: rating booklet) and *Versão padrão: caderno de classificação* (CARS2-ST) (Standard version: rating booklet). The questionnaire was titled *Questionário para pais ou cuidadores (para ser usado com a CARS2-ST e CARS2-HF)* (Questionnaire for parents or caregivers (to be used with the CARS2-ST and the CARS2-HF)).

Discussion

This study aimed to translate and cross-culturally adapt the Childhood Autism Rating Scale – Second Edition (CARS-2). Changes were made to the three forms to use terminology closer to the Brazilian context, reduce stigmatizing or ableist vocabulary, facilitate readers’ comprehension, and update or explain terms that are no longer widely used in the context of ASD.

There are several reasons for the decision to translate and cross-culturally adapt the CARS-2. First, there has been a significant increase in the number of identified cases of ASD

(Brazil, 2025; Shaw et al., 2025), making it essential to provide instruments that assist professionals in decision-making during the assessment process. There is also a lack of instruments for ASD assessment in the Brazilian context with robust psychometric properties and culture-specific normative interpretation data (Silva & Elias, 2020). For example, the first version of the CARS was translated and cross-culturally adapted for Brazil (Pereira et al., 2008) and had some evidence of validity evaluated; however, no normatization studies were found, and the use of this instrument was not systematized.

In addition, the CARS-2 is scored by the evaluator based on a broad collection of information, which reduces response bias associated with the caregiver report. Although parents are a valuable source of information during the assessment process, in some cases, they may report an excessive number of signs and symptoms, overestimating observed behaviors. In other cases, they may underestimate behaviors by reporting fewer signs and symptoms (Havdahl et al., 2017; Øien et al., 2018). The use of instruments scored by a trained professional, integrating different sources of information, can provide a complementary perspective in the assessment process. Furthermore, the CARS-2 covers a wide age range (two years through adulthood) and includes two different forms that allow specific assessment of ASD in patients with and without suspected ID. Furthermore, studies in the field have indicated the clinical utility of the CARS-2 to assist in the diagnosis of ASD based on DSM-5 criteria (APA, 2014; Dawkins et al., 2016; Moon et al., 2019; Moulton et al., 2019).

The Brazilian adaptation aimed to ensure appropriateness and to modify some descriptive expressions of ASD characteristics based on terminology from current classification manuals: DSM-5-TR (APA, 2023) and ICD-11 (WHO, 2022). Although there were no changes to the core characteristics of ASD in the standard version, the CARS2-ST, the theoretical foundation of the instrument dates back to the publications of Kanner (1943) and Creak (1961) and also encompasses signs and symptoms described in earlier editions of the Diagnostic and Statistical Manual of Mental Disorders (I through IV-TR). Although the core characteristics have remained unchanged, many descriptions of ASD presentation have been updated to align with the current understanding of the spectrum, based on DSM-5-TR and ICD-11.

The CARS2-HF, in turn, was developed in 2010, based on the original CARS, and adapted according to the scientific literature to identify the behavioral characteristics of high-functioning individuals. Examples of changes made to meet this requirement included replacing “*anormal*” (abnormal) with “*atípico*” (atypical), “*é capaz*” (is able to) with “*consegue*” (can), and modifying classifications of intelligence and intelligence quotient, among others. In addition, modifications were made to replace the idea of autism severity understood solely as intensity of deficit with a broader concept of differentiated presentations of signs and characteristics that may affect each individual with the disorder in different ways.

The inclusion of a brief description to guide the professional in choosing one of the CARS-2 assessment forms according to patient characteristics, not present in the original version, was considered important in the Brazilian version of the instrument. This was done

because the CARS2-HF was developed to assess individuals with high-functioning ASD. The term high-functioning ASD, although still used in some articles and instruments, is not included in the diagnostic manuals that currently guide assessment processes (APA, 2023; WHO, 2022). The term high-functioning is often used for individuals diagnosed with ASD without intellectual disability and with preserved language, with an estimated IQ of 70 or higher (Alvares et al., 2020; Schopler et al., 2010). However, some professionals may understand the term high-functioning as referring to an individual with excellent cognitive performance or giftedness. Therefore, the inclusion of descriptions in the CARS2-ST and CARS2-HF aimed to reduce potential confusion in the evaluator's choice of form for each patient. The guidelines were developed based on the original CARS-2 manual.

In addition, replacing the term "abnormal" with "atypical" aimed to reflect a more respectful approach toward people with autism, since the use of the term "abnormal" carries negative and stigmatizing connotations. The term "atypical," in contrast, recognizes that these individuals' behaviors may differ from what is expected, that is, from the average, without a stigmatizing judgment. Throughout the instrument, the expression "normal" was replaced with "typical development" or "typical," and "bizarre" was replaced with "atypical." This latter revision was made because "bizarre" also carries a pejorative connotation, suggesting something strange and rare, whereas the intent is to assess the atypicality or unconventionality of behavior.

The inclusion of autistic individuals to evaluate the instrument was carried out in consideration of the neurodiversity movement and the importance of their perspective in an instrument directed toward them. Due to the rise of the neurodiversity movement, the literature suggests the involvement of autistic individuals and the autistic community in the research process as collaborators, rather than solely as target subjects, to ensure that the issues addressed are relevant and meaningful to them (Poulsen et al., 2022). The neurodiversity movement in ASD emphasizes the natural diversity of neurological and cognitive characteristics in autistic individuals. It advocates for acceptance of neurodivergence, seeking to eliminate or reduce stigma and to value the unique contributions that autistic individuals can offer to society, while also calling for greater understanding and inclusion in all areas of life (Jaarsma et al., 2012).

The replacement of the word "*incapaz*" (incapable) with "*não consegue*" (cannot) and of "*é capaz*" (is capable) with "*consegue*" (can) was made because the former terms could convey a negative idea of limitation, focusing on a permanent lack of ability or competence. This language may reinforce stigma and underestimate individuals' capacities. In contrast, "*não consegue*" (cannot) and "*consegue*" (can) employ more descriptive language, focusing on specific abilities and areas in which there are challenges, while also conveying a sense of transience. The word "*inadequada*" (inadequate) was also replaced with "*atípico*" (atypical) or "*não convencional*" (nonconventional), following the same rationale. Two judges in the target-audience evaluation suggested this change and emphasized that the previous terms were ableist. Ableism refers to a system that discriminates against individuals perceived as having a disability, based on socially constructed views of normality, resulting in stigmatization (Carvalho-Freitas & Santos, 2023). In

the case of ASD, this may occur, for example, in the understanding that autistic characteristics, such as restricted interests in certain topics, are devalued in interpersonal interactions and in social contexts in general. Stigma is usually associated with lower levels of knowledge about autism, greater interest in curing and normalizing autistic individuals, and less contact with individuals with the disorder (Araujo et al., 2024). This stigma generally has a significant impact on the lives of autistic individuals, such as underemployment and reduced quality of life (Bottema-Beutel et al., 2023). In the item that assesses the child's activity level, the expression "*preguiçosa*" (lazy) was replaced with "*lenta (parecendo letárgica)*" (slow (appearing lethargic)) to reduce stigmatizing connotations.

Some changes were made to facilitate item scoring, that is, to improve the operationalization of behavioral observation. In the item assessing use of objects, the expression "*inadequadamente infantil*" (inappropriately childish) was replaced with "*não apropriado para a idade*" (not -appropriate for the age), since the former may carry a connotation of personal judgment, suggesting a subjective evaluation of what is considered appropriate or inappropriate for a given age group. In the item assessing adaptation to change, the word "*infeliz*" (unhappy) was replaced with "*frustrada*" (frustrated) in the description evaluating the behavior of "*ficar com raiva e 'infeliz' quando uma rotina é alterada*" (becomes angry and 'unhappy' when a routine is altered). Observing behaviors associated with frustration is more feasible than inferring an emotional state of unhappiness. In another item assessing adaptation to change, the English term "cope" was initially translated as "*enfrenta*" (confronts), later changed to "*lida bem*" (handles well), and finally, based on suggestions from the target audience, to "*se adapta bem*" (adapts well). The final version, "*se adapta bem a mudanças*" (adapts well to changes), was considered conceptually more accurate, since "cope" translated into Portuguese does not imply active confrontation, as the earlier translation suggested. The expression "*provar objetos*" (tasting objects) was also replaced with "*colocar na boca*" (puts in the mouth), as the former is relatively vague and uncommon in Portuguese and may be interpreted in different ways depending on the context.

The changes made to the CARS-2 were primarily intended to reduce terms with potential stigmatizing connotations, enhance semantic clarity, and adapt examples to the Brazilian sociocultural context. The modifications sought to minimize value-laden interpretations and promote greater descriptive neutrality. Similarly, the reformulation of expressions related to object use and the evaluation of symbolic play aimed to make the criteria clearer for evaluators and more culturally sensitive, as exemplified by replacing the expression "*banana como telefone*" (banana as a telephone) with "*controle remoto*" (remote control). Additionally, broader modifications were made to the CARS2-QPC, including an increase in the number of examples presented. These changes aimed to improve reading fluency and facilitate comprehension of the instrument, considering that the questionnaire was designed for self-administration by caregivers of individuals with ASD, which makes semantic clarity particularly important.

Finally, in the item assessing consistency of intellectual response, the term “*a inteligência é normal*” (intelligence is normal) was modified to “*a inteligência está dentro da média*” (intelligence within the average); “*inteligência baixa*” (low intelligence) to “*inteligência abaixo da média*” (intelligence below average); and “*inteligência muito baixa*” (very low intelligence) to “*inteligência muito abaixo da média*” (intelligence far below average). These changes aimed to ensure descriptions aligned with contemporary terminology and were consistent with the field of psychological assessment, which is responsible for intelligence evaluations. It should be noted that scoring the CARS-2 does not require an intelligence assessment, and the choice of form may be based on the evaluator’s clinical impressions. In addition, the objective was to avoid stigmatization and facilitate consistent interpretation by evaluators.

Final Considerations

This study constitutes an initial stage of the cross-cultural adaptation process of the CARS-2 to the Brazilian context and presents relevant methodological strengths. International guidelines for translation and cross-cultural adaptation were systematically followed, encompassing the stages recommended by the ITC (2017), with attention to conceptual, semantic, and idiomatic equivalence. These procedures provided preliminary evidence of content validity of the CARS-2, fundamental to support subsequent stages of the adaptation process.

However, the results presented at this stage do not allow inference regarding the adequacy of the instrument for clinical or diagnostic use in the Brazilian context, since additional psychometric investigations are still required, including studies of validity based on internal structure and criterion-related validity, reliability, and the development of normative interpretation data. The findings should therefore be interpreted as initial evidence, restricted to the cross-cultural adaptation stage.

Among the study limitations, the non-probabilistic sampling process is highlighted, since participants were recruited by convenience from the authors’ contact network. Although there was an effort to include different regions of the country, the reduced sample size may limit the applicability of the results to other sociocultural contexts. In addition, the higher educational level of participants and the high qualification of expert judges may have influenced the choice of linguistic terms adopted in the final version, reinforcing the need for attention to semantic aspects in more heterogeneous populations in later research phases. Future studies with larger and more diverse samples will be essential to consolidate the cross-cultural adaptation of the CARS-2 in Brazil through the establishment of complementary psychometric evidence.

Validation of instruments to assess ASD is essential due to the scarcity of assessment resources and legal limitations on their use in the Brazilian context. Girianelli et al. (2023) highlighted that, between 2013 and 2019, early identification of autism and other pervasive developmental disorders increased at the Child and Adolescent Psychosocial Care Center of the Brazilian National Health System (*Sistema Único de Saúde – SUS*), but still accounts for only 30% of

diagnoses, with a high prevalence of late diagnoses. The authors also emphasize the need to improve the assessment process in Brazil and to refine guidelines. The CARS-2 may assist professionals in assessment processes, as it is aligned with DSM-5, DSM-5-TR, and ICD-11 criteria, is easy to use, and is applicable across various age ranges. Future studies, already underway, will seek additional evidence of validity, reliability, and normative data for the Brazilian version of the CARS-2. It is expected that the instrument will represent a significant advancement for ASD assessment in the Brazilian context, contributing to more precise diagnostic practices aligned with political, educational, and research demands in the country.

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APPENDIX 1

Table 1.

Examples of modifications in items of CARS2-ST, CARS2-HF, and CARS2-QPC throughout the judges' analysis process, with their Content Validity Coefficients (CVC)

CARS2-ST							
Original Item (in English)	Synthesis of the Translations	Evaluation by Experts	Evaluation by the Target Audience	CVC			
				Semantic	Idiomatic	Experiential	Conceptual
Moderately abnormal use of, and response to, taste, smell, and touch. The child may be moderately preoccupied with touching(...). The child may either react too much or too little.	Uso e resposta moderadamente anormais do paladar, olfato e tato. A criança pode estar moderadamente preocupada em tocar(...). A criança pode reagir muito ou muito pouco. (Moderately abnormal use of and response to taste, smell, and touch. The child may be moderately preoccupied with touching (...). The child may react too much or too little.)	Uso e resposta moderadamente atípicos do paladar, olfato e tato. A criança pode estar moderadamente preocupada em tocar (...). A criança pode reagir muito ou muito pouco. (Moderately atypical use of and response to taste, smell, and touch. The child may be moderately preoccupied with touching (...). The child may react too much or too little.)	Uso e resposta moderadamente atípicos do paladar, olfato e tato. A criança pode, de forma moderada, apresentar comportamento de tocar, (...). A criança pode reagir de forma reduzida ou aumentada aos estímulos . (Moderately atypical use of and response to taste, smell, and touch. The child may, to a moderate degree, present touching behavior , (...). The child may react in a reduced or increased manner to stimuli .)	1	1	1	1
Moderately abnormal emotional response. The child shows definite signs of inappropriate type and/or degree of emotional response. (...) child may grimace, laugh, or become rigid even though no apparent emotion-producing objects or events are present.	Resposta emocional moderadamente anormal. A criança apresenta sinais claros de tipo e/ou grau inadequado de resposta emocional. (...) a criança pode fazer caretas, rir ou ficar rígida, mesmo que não existam aparentes objetos ou eventos que produzam as emoções. (Moderately abnormal emotional response. The child presents clear signs of an inappropriate type and/or degree of emotional response. (...) The child may make grimaces, laugh, or become rigid, even when there are no apparent objects or events that produce the emotions.)	Resposta emocional moderadamente atípica . A criança apresenta sinais claros de inadequação do tipo e/ou intensidade da resposta emocional . (...) a criança pode fazer caretas, rir ou ficar rígida, mesmo que não existam objetos ou eventos que aparentemente desencadeiem essas emoções . (Moderately atypical emotional response. The child presents clear signs of inadequacy in the type and/or intensity of the emotional response . (...) the child may make grimaces, laugh, or become rigid, even when there are no objects or events that apparently trigger these emotions .)	Resposta emocional moderadamente atípica. A criança apresenta sinais claros de inadequação da forma e/ou intensidade da resposta emocional. (...) a criança pode fazer caretas, rir ou apresentar rigidez dos movimentos, mesmo que não existam objetos ou eventos que aparentemente desencadeiem essas emoções. (Moderately atypical emotional response. The child presents clear signs of inadequacy in the form and/or intensity of the emotional response. (...) the child may make grimaces, laugh, or present rigidity of movements, even when there are no objects or events that apparently trigger these emotions.)	.89	.89	.89	1
Mildly abnormal use of, and response to, taste, smell, and touch. The child (...) may smell or taste inedible objects; (...) mild pain that a normal child would express as discomfort.	Uso e resposta levemente anormais do paladar, olfato e tato. A criança pode (...) cheirar ou provar objetos não comestíveis; (...) uma criança normal expressaria como desconforto. (Mildly abnormal use of and response to taste, smell, and touch. The child may (...) smell or taste non-edible objects; (...) a normal child would express as discomfort.)	Uso e resposta levemente atípicos do paladar, olfato e tato. A criança pode (...) cheirar ou provar objetos não comestíveis; (...) uma criança com desenvolvimento típico expressaria como desconforto. (Mildly atypical use of and response to taste, smell, and touch. The child may (...) smell or taste non-edible objects; (...) a child with typical development would express as discomfort.	Uso e resposta levemente atípicos do paladar, olfato e tato. A criança (...) pode cheirar ou colocar objetos não comestíveis na boca ; (...) uma criança com desenvolvimento típico expressaria como desconforto. (Mildly atypical use of and response to taste, smell, and touch. The child (...) may smell or put non-edible objects in their mouth ; (...) a child with typical development would express as discomfort.)	1	1	1	1

(continua)

Table 1.

Examples of modifications in items of CARS2-ST, CARS2-HF, and CARS2-QPC throughout the judges' analysis process, with their Content Validity Coefficients (CVC) (continuação)

Original Item (in English)	Synthesis of the Translations	Evaluation by Experts	Evaluation by the Target Audience	CARS2-HF			
				CVC			
				Semantic	Idiomatic	Experiential	Conceptual
Mildly abnormal emotional response. Emotional expressions are relatively flat (...). Nonverbal expression of emotions (...). Able to describe several emotions in self but limited compared to developmental level (...).	Resposta emocional levemente anormal. As expressões emocionais são relativamente secas (...). A expressão não verbal de emoções (...). Capaz de descrever várias emoções em si mesmo, mas limitado em comparação com o nível de desenvolvimento (...). (Mildly abnormal emotional response. Emotional expressions are relatively flat (...). Nonverbal expression of emotions (...). Able to describe various emotions in self, but limited compared with the developmental level (...).)	Resposta emocional levemente atípica . As expressões emocionais são relativamente apáticas (...). A expressão não verbal de emoções (...). Capaz de descrever várias emoções em si mesmo, mas de forma limitada em comparação com o nível de desenvolvimento (...). (Mildly atypical emotional response. Emotional expressions are relatively apathetic (...). Nonverbal expression of emotions (...). Able to describe various emotions in self, but in a limited manner compared with the developmental level (...).)	Resposta emocional levemente atípica em relação à idade e à situação . As expressões emocionais são relativamente apáticas (...). A expressão não verbal de emoções (por exemplo, gestos com as mãos, movimentos corporais e expressões faciais) (...). Consegue descrever várias emoções em si mesmo, mas de forma limitada em comparação com o nível de desenvolvimento (...). (Mildly atypical emotional response in relation to age and situation. Emotional expressions are relatively apathetic (...). Nonverbal expression of emotions (for example, hand gestures, body movements, and facial expressions) (...). Able to describe various emotions in self, but in a limited manner compared with the developmental level (...).)	.89	.67	1	1
No evidence of difficulty or abnormality in relating to people. Age-appropriate initiation of interactions (...). Interactions with others are fluid (...).	Nenhuma evidência de dificuldade ou anormalidade no relacionamento com as pessoas. Iniciação de interações apropriada à idade (...). As interações com os outros são fluidas (...). (No evidence of difficulty or abnormality in relating to people. Initiation of age-appropriate interactions (...). Interactions with others are fluid (...).)	Nenhuma evidência de dificuldade ou atipicidade no relacionamento com as pessoas. Iniciação de interações apropriada à idade (...). As interações com os outros são espontâneas (...). (No evidence of difficulty or atypicality in relating to people. Initiation of age-appropriate interactions (...). Interactions with others are spontaneous (...).)	Nenhuma evidência de dificuldade ou atipicidade no relacionamento com as pessoas. Inicia interações de maneira apropriada à idade (...). As interações com os outros são espontâneas (...). (No evidence of difficulty or atypicality in relating to people. Initiates interactions in an age-appropriate manner (...). Interactions with others are spontaneous (...).)	1	.78	.67	.78

(continua)

Table 1.

Examples of modifications in items of CARS2-ST, CARS2-HF, and CARS2-QPC throughout the judges' analysis process, with their Content Validity Coefficients (CVC) (continuação)

Original Item (in English)	Synthesis of the Translations	Evaluation by Experts	Evaluation by the Target Audience	CARS2-QPC			
				CVC			
				Semantic	Idiomatic	Experiential	Conceptual
Carries on a conversation with another person that flows back and forth, at a level you would expect for someone of his or her age	Mantém uma conversa com outra pessoa que flui para ambos os lados, em um nível que você esperaria de alguém de sua idade. (Maintains a conversation with another person that flows both ways, at a level that would be expected for someone of their age.)	Mantém uma conversa fluida / natural com outra pessoa , em um nível que você esperaria de alguém de sua idade. (Maintains a fluent / natural conversation with another person , at a level that would be expected for someone of their age.)	Mantém uma conversa fluida e natural com outra pessoa (falando quando é sua vez, e esperando o outro falar), de acordo com o que é esperado para alguém de sua idade. (Maintains a fluent and natural conversation with another person (speaking when it is their turn and waiting for the other to speak), in accordance with what is expected for someone of their age.)	.89	.89	.78	.89
Copes with changes in routine or the environment (for example, moving furniture)	Enfrenta mudanças na rotina ou no ambiente (por exemplo, mover móveis). (Copes with changes in routine or in the environment (for example, moving furniture).)	Lida bem com mudanças na rotina ou no ambiente (por exemplo, mover móveis). (Handles changes in routine or in the environment well (for example, moving furniture).)	Se adapta bem a mudanças na rotina ou no ambiente (por exemplo, mudanças nos móveis ou troca de professora). (Adapts well to changes in routine or in the environment (for example, changes in furniture or a change of teacher).)	1	.89	1	1

Note: The three dots (...) indicate omitted excerpts with the objective of preserving the full content of the items, in accordance with copyright.

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Matheus Silva Prenassi: participated in all stages of the manuscript, from data collection to structuring and writing the article.

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