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Validity Evidence for the 70-Item Brazilian Version of the Ritvo Autism Diagnostic Scale-Revised (RADS-R-BR-70)

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Abstract

Purpose

This study examined validity evidence for the 70-item Brazilian version of the Ritvo Autism Diagnostic Scale-Revised (RADS-R-BR-70) in Brazilian late adolescents and adults.

Methods

The sample included 1,051 participants aged 17–68 years, 819 with an autism diagnosis and 232 without. Participants completed a structured clinical interview and standardized measures. Analyses included confirmatory factor analysis, internal consistency estimates, multidimensional item response theory, and ROC curve analysis.

Results

The original 80-item model showed inadequate fit. After removing 10 items, the final four-factor model showed acceptable fit (CFI = .908; TLI = .905; RMSEA = .061; SRMR = .077). Social Relatedness, Sensory-Motor, and Circumscribed Interests showed satisfactory internal consistency, whereas Language performed less consistently. An alternative hierarchical two-factor model also showed competitive fit and discriminative performance. ROC analyses indicated good discriminative accuracy for the RADS-R-BR-70 (AUC = .858–.936).

Conclusion

The RADS-R-BR-70 showed promising initial validity evidence and potential usefulness as a screening tool for Brazilian late adolescents and adults. It should not be used as a stand-alone diagnostic instrument.

Introduction

Autism is a neurodevelopmental condition characterized by persistent differences in social communication and interaction, as well as by restricted and repetitive patterns of behavior, interests, and sensory experiences. International estimates suggest a prevalence of approximately 1% of the population (Zeidan et al., 2022), although this percentage varies according to methodological differences, diagnostic criteria, and access to services. In the adult population, epidemiological literature remains less consolidated than that focused on childhood, although population-based studies indicate a relevant prevalence in this age group, such as the estimate of 1 in 45 adults in the United States reported by Dietz et al. (2020).

In Brazil, epidemiological research on autism in adults has historically been scarce; however, preliminary results from the 2022 Census indicated that 2.4 million people in the country reported having an ASD diagnosis, corresponding to 1.2% of the population, with higher frequency among men (1.5%) than among women (0.9%) (IBGE, 2025). These data reinforce the relevance of studies focused on the identification and assessment of autism across different developmental stages.

The Mapa Autismo Brasil adds important information regarding the diagnostic and care profile of this population by gathering 23,632 valid responses through an online, voluntary, and non-probabilistic survey, with participation from all Brazilian states (Mapa Autismo Brasil, 2026). In the sample, 72.1% of participants were between 0 and 17 years old, and 27.9% were adults, indicating a greater concentration of diagnostic identification in younger age groups. Convergently, the median age at diagnosis was 4 years, whereas the mean was 11 years, suggesting an asymmetric distribution and the presence of diagnoses made at later ages. In addition, 69.6% of diagnoses were recorded between 2020 and 2024, pointing to a recent increase in the recognition of autism in the country. The same report also describes a diagnostic pathway strongly concentrated in specialized and private services: 55.3% of diagnoses occurred in private care, 23.1% through health insurance, and 20.4% in the Brazilian Unified Health System. Diagnostic confirmation was performed predominantly by neurologists or pediatric neurologists (67.1%) and psychiatrists (22.9%) (Mapa Autismo Brasil, 2026).

This scenario should be interpreted in light of the considerable heterogeneity of the clinical presentation of autism and the high frequency of comorbidities and phenomenological overlap with other psychiatric conditions, factors that impose significant diagnostic challenges (Baghdadli et al., 2017; Ramos et al., 2012). In Mapa Autismo Brasil itself, high frequencies were observed for attention-deficit/hyperactivity disorder (51.5%), anxiety disorder (41.1%), sleep disorders (27.9%), gastrointestinal disturbances (23.2%), and depressive disorder (17.4%), in addition to intellectual disability (16.4%) and developmental language disorder (19.3%) (Mapa Autismo Brasil, 2026). Although these data are self-reported and derived from a non-probabilistic sample, they reinforce the clinical complexity associated with autism and the need for screening and assessment instruments capable of operating in contexts of high phenotypic and diagnostic heterogeneity.

Part of these difficulties stems from the fact that classification systems and diagnostic models have historically been organized around more typical presentations of autism in childhood, which may limit clinical sensitivity to subtler, masked, or later-identified presentations across the lifespan (Ramos et al., 2012). Access to diagnosis also depends on social, economic, and contextual factors, including income, ethnicity, culture, level of support needs, and availability of specialized services (Daniels & Mandell, 2014). These findings are compatible with literature indicating that the scarcity of specialized public services and the limited training of mental health professionals regarding ASD may delay diagnosis and shift a significant portion of demand to the private sector (Atherton et al., 2022; Camm-Crosbie et al., 2019). At the same time, they reinforce evidence that greater availability of screening and diagnostic services tends to increase the number of autistic people identified (Janvier et al., 2016).

In adults, the diagnostic process for autism spectrum disorder (ASD) generally involves clinical interview, observation, retrospective investigation of development, self-report, informant report, and careful analysis of differential diagnosis. In this context, standardized instruments may contribute to the identification of autistic characteristics and to the organization of clinical hypotheses, especially in individuals with preserved intelligence and subtler presentations. In a systematic review of screening and diagnostic instruments for autistic adults without intellectual disability, Baghdadli et al. (2017) observed that the Autism-Spectrum Quotient (AQ), the AQ-S, the RAADS-R, and the RAADS-14 were, among the available measures, those with the most consistent psychometric evidence.

The Ritvo Autism Asperger Diagnostic Scale-Revised (RAADS-R) (Ritvo et al., 2011) is an 80-item scale grouped into four dimensions: (1) Social Relatedness, (2) Language, (3) Sensory-Motor, and (4) Circumscribed Interests. The RAADS-R is recommended by the National Institute for Health and Care Excellence (NICE, 2012) as an instrument for adult assessment, and its international validation study reported sensitivity = 97%, specificity = 100%, and test–retest reliability r = .987. The RAADS-R is one of the most widely translated scales across continents (Hartwig et al., 2026), with validation or adaptation studies reported in Sweden (Andersen et al., 2011), France (Picot et al., 2021), and Germany (Rausch et al., 2025). Japanese versions have also been referenced (Matsumoto et al., 2009), and a Danish validation study protocol has been published (Parvaiz et al., 2022). Furthermore, a screening version, the RAADS-14 Screen, was developed in Sweden (Eriksson et al., 2013).

Although the original instrument is internationally known as the RAADS-R, the Brazilian cross-cultural adaptation adopted the name Ritvo Autism Diagnostic Scale—Brazilian Version (RADS-R-BR). This terminology was chosen to align the instrument with contemporary nosological changes following the DSM-5-TR (American Psychiatric Association, 2022) and to address ethical, cultural, and political concerns regarding the continued use of the term “Asperger,” as discussed in the Brazilian adaptation study (Hartwig et al., 2026). Therefore, throughout the present study, RADS-R-BR refers to the Brazilian adaptation of the RAADS-R, and RADS-R-BR-70 refers to the 70-item version examined here.

Despite this dissemination, recent literature has shown mixed results regarding the psychometric performance of the RAADS-R. In the French validation, Picot et al. (2021) found good reliability and diagnostic validity but observed that a bifactor solution showed better fit than the original four-factor structure. In a clinical study in the United Kingdom, Jones et al. (2021) reported that RAADS-R scores were not associated with the final diagnostic outcome, suggesting low utility as a prioritization tool in diagnostic waiting lists. Similarly, Brugha et al. (2020) and Sizoo et al. (2015) reported limitations in the performance of self-report questionnaires for identifying autism in adult psychiatric or mental health service populations. More recently, Sturm et al. (2024) highlighted concerns regarding item functioning, structural stability, and equivalence of interpretation across different respondent groups. In contrast, Rausch et al. (2025) reported sensitivity of 92.5%, specificity of 93.6%, and an AUC of .976 in the German validation, suggesting excellent discriminative performance in that context. Taken together, these findings indicate that, although the RAADS-R remains widely used, its structure and accuracy may vary according to the clinical context, sample composition, and dimensional model adopted.

In the Brazilian context, the need for culturally adapted and empirically robust instruments is reinforced both by the recent increase in diagnostic identification and by persistent inequalities in access to diagnosis and specialized services. Therefore, investigating the internal structure, item functioning, reliability, and discriminative performance of the 70-item Brazilian version of the RADS-R-BR (RADS-R-BR-70) may contribute to the refinement of a measure widely used internationally and to the improvement of autism assessment in Brazilian late adolescents and adults.

Method

Participants

Participants were recruited through an online questionnaire, to which they voluntarily responded. The sample consisted of 1,051 participants aged 17 to 68 years, including 819 participants with an autism diagnosis and 232 participants without an autism diagnosis. Diagnostic status in the autism group was based on previous clinical diagnosis reported during the structured clinical interview and confirmed by information regarding professional assessment and diagnostic history. In the group with an autism diagnosis, ages ranged from 17 to 68 years (M = 31.65; SD = 8.97), whereas in the group without a diagnosis, ages ranged from 18 to 68 years (M = 37.38; SD = 10.77).

In the ASD group, there was a predominance of participants assigned female at birth (80.83%) and of female gender (70.70%), with a higher frequency of single participants (47.86%), participants with incomplete higher education (24.29%) or complete higher education (22.34%), and a greater concentration in the income range of up to one minimum wage (24.42%). In the non-ASD group, participants assigned female at birth (78.88%) and of female gender (77.15%) also predominated, with a higher frequency of married participants (39.66%), participants with complete lato sensu graduate education (35.34%), and income above six minimum wages (33.19%). In both groups, participation of non-binary and transgender individuals was also observed, although in smaller proportions.

Participants completed a structured clinical interview, the socioeconomic questionnaire (Associação Brasileira de Empresas de Pesquisa [ABEP], 2015), and the RADS-R-BR (Hartwig et al., 2026).

[Insert Table 1 here]

Instruments

Structured clinical interview

The structured interview was developed by the authors of the present study and aimed to collect information regarding diagnosis, clinical history, and social support. The interview contains 14 multiple-choice questions distributed across the following topics: personal information, education, monthly

family income, information on the diagnosis received, clinical and pharmacological intervention, household information, and interest in the data from this research.

Socioeconomic questionnaire

The socioeconomic questionnaire (ABEP, 2015) was used. This instrument consists of 14 questions and, in the present study, aimed to identify the socioeconomic status of the participants. The questionnaire was developed using statistical techniques that, as is known, are always based on group-level data and currently presents probability of correct classification; it is commonly used in research in Brazil.

Ritvo Autism Diagnostic Scale-Revised - Brazilian version

This study used the Brazilian version of the Ritvo Autism Diagnostic Scale-Revised (RADS-R-BR), translated and cross-culturally adapted into Brazilian Portuguese by Hartwig et al. (2026). The cross-cultural adaptation process, including translation, semantic evaluation, and cultural justification for the Brazilian nomenclature, has been described in detail elsewhere (Hartwig et al., 2026). The present study focuses on the psychometric evaluation of the Brazilian version, including the internal structure, item functioning, reliability, and discriminative performance of the reduced 70-item solution.

Procedure and ethics

Data were collected remotely during the COVID-19 pandemic. After providing informed consent, participants completed the structured clinical interview, the socioeconomic questionnaire, and the RADS-R-BR. For participants under 18 years of age, consent and assent procedures followed the requirements approved by the Research Ethics Committee. The study was approved by the competent Research Ethics Committee under approval number 4.127.900, and all procedures followed national ethical guidelines for research involving human participants.

Data analysis

Data were analyzed using the R language (R Core Team, 2022). Initially, Confirmatory Factor Analysis (CFA) was conducted to test the factorial structure of the RADS-R-BR based on the model originally proposed by Ritvo et al. (2011). Considering that the instrument items are answered on a four-point Likert scale, estimation was conducted using the Weighted Least Squares (WLS) method, which is appropriate for ordinal variables (DiStefano & Morgan, 2014; Li, 2016).

Model fit was examined using multiple fit indices, namely: chi-square (χ^2), chi-square/degrees of freedom ratio (χ^2/df), Comparative Fit Index (CFI), Tucker–Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR). The following criteria were adopted as indicators of satisfactory fit: $\chi^2/df < 5$, CFI and TLI > .90, RMSEA ≤ .08, with the upper limit of the confidence interval below .10, and SRMR ≤ .08. For item retention, factor loadings with

magnitude equal to or greater than |.30| were considered the minimum criterion (Brown, 2015; Byrne, 2010; Tabachnick & Fidell, 2007; Hair et al., 2009).

After defining the final factorial structure, the internal consistency of the factors was investigated using Cronbach's alpha (α), McDonald's omega (ω), and Composite Reliability (CR), adopting values equal to or greater than .70 as indicators of satisfactory reliability (Bland & Altman, 1997; Hayes & Coutts, 2020). Additionally, modification indices were inspected in order to identify possible residual covariances between items that could contribute to improving model fit.

Next, individual item parameters were analyzed according to the Item Response Theory (IRT) paradigm, based on a confirmatory multidimensional model derived from Samejima's Graded Response Model (1969). Item discrimination (*a*) and difficulty (*b*) parameters were examined. For interpretation of the discrimination parameter, the criterion proposed by Pasquali (2020) was adopted: very low (0.01–0.34), low (0.35–0.64), moderate (0.65–1.34), high (1.35–1.69), and very high (> 1.70). For the difficulty parameters, the range between − 3 and + 3 was considered, in which higher values indicate a greater level of the latent trait required to endorse higher response categories (Pasquali & Primi, 2003).

Furthermore, ROC curve analysis was performed to investigate the discriminative capacity of the RADS-R-BR factors in differentiating participants with and without an autism diagnosis and to estimate cutoff points with potential screening utility. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were examined. Cutoff points were defined using Youden's index, which identifies the value with the best balance between sensitivity and specificity (Flach, 2016; Kawamura, 2002).

Results

Confirmatory factor analysis of the extended RADS-R-BR version

To investigate validity evidence based on the internal structure of the measure, confirmatory factor analysis (CFA) was conducted using the WLS estimator. The initial 80-item model showed inadequate fit, with items Q11 (0.254), Q43 (0.202), and Q48 (0.278) presenting factor loadings below the minimum criterion for item saturation on their respective latent factors. The fit indices for the successive CFA models are presented in Table 2.

[Insert Table 2 here]

After removing these items, a reduced 77-item model was tested and showed slightly better fit. However, items Q1 (0.277), Q53 (0.289), and Q34 (0.299) still presented low factor loadings, resulting in a 74-item model. Although this model presented significant and sufficient factor loadings, the global fit indices remained inadequate. Finally, items Q23 (-0.289), Q37 (-0.286), Q62 (-0.271), and Q77 (-0.263) were removed, resulting in the final 70-item model.

The final 70-item model showed satisfactory values for all fit indices adopted in this study (CFI = 0.908; TLI = 0.905; SRMR = 0.077; RMSEA = 0.061, 90% CI = 0.060–0.063). In addition, all retained items showed factor loadings equal to or above the minimum criterion of |0.30|. Internal consistency estimates were satisfactory for Social Relatedness, Sensory-Motor, and Circumscribed Interests, whereas the Language factor showed comparatively weaker reliability. The final factor loadings and reliability estimates are presented in Table 3.

[Insert Table 3 here]

Factor loadings and internal consistency

In the final model, the Social Relatedness factor concentrated the largest number of items, with factor loadings ranging from 0.301 to 0.680 in absolute value. The Language factor comprised seven items, with loadings ranging from 0.382 to 0.704 in absolute value. The Sensory-Motor factor presented loadings between 0.340 and 0.675 in absolute value, whereas the Circumscribed Interests factor included loadings ranging from 0.334 to 0.672. Although some items remained with lower saturations, all met the minimum retention criterion established for this study.

Regarding internal consistency, the Social Relatedness factor presented α = 0.767, ω = 0.786, and composite reliability (CR) = 0.895. The Sensory-Motor factor presented α = 0.828, ω = 0.816, and CR = 0.866. The Circumscribed Interests factor presented α = 0.831, ω = 0.799, and CR = 0.840. In contrast, the Language factor showed the most modest indices, with α = 0.543, ω = 0.617, and CR = 0.739, suggesting greater relative psychometric fragility in this dimension. Modification indices indicated residual covariances between Q8–Q13, Q12–Q80, Q22–Q54, Q61–Q69, and Q79–Q80, suggesting shared content beyond the variance explained by the latent factors.

Item parameters in the multidimensional IRT model

Subsequently, the multidimensional IRT model was investigated. The model showed borderline fit [M2(2199) = 8397.995, p < .001, CFI = 0.834, TLI = 0.828, RMSEA = 0.058, 95% CI = 0.057–0.060] and good reliability estimates for the latent dimensions (SR = 0.904, Lan = 0.821, SM = 0.861, CI = 0.874). All items showed monotonicity, with ordered difficulty parameters, indicating that higher levels of the latent trait were required for respondents to endorse higher response categories.

Regarding discrimination, all items showed at least moderate discrimination, except Q6 (0.632), Q14 (0.567), Q31 (0.633), and Q80 (0.519) from Social Relatedness; Q2 (0.506) from Language; Q49 (0.639) and Q74 (0.639) from Sensory-Motor; and Q40 (0.624) from Circumscribed Interests. Although these values were below the moderate threshold, most were close to the cutoff point, and item removal was not justified on the basis of IRT parameters alone. However, item Q80 showed both low discrimination and residual covariance in the CFA, suggesting that it may require closer examination in future revisions of the instrument.

The items with the lowest difficulty were Q47 ("I feel very comfortable dating or being in social situations with others"; Social Relatedness), Q26 ("I like to talk with several people, for example, around a dinner table, at school, or at work"; Social Relatedness), and Q42 ("When I feel overwhelmed by my senses, I need to isolate myself to shut them down"; Sensory-Motor), indicating lower levels of the latent trait required for endorsement of higher response categories. Conversely, the items with the highest difficulty were Q31 ("I have never wanted or needed to have what other people call an intimate relationship"; Social Relatedness), Q38 ("I do not connect with characters in movies and cannot feel what they feel"; Social Relatedness), and Q35 ("The phrase I carry you in my heart makes me uncomfortable"; Language). Complete item-level parameter estimates from the multidimensional IRT model are available in Supplementary Table S1.

ROC curve analysis

The discriminative accuracy of the four RADS-R-BR-70 factors was evaluated using ROC curves. All factors showed significant and high discriminative performance, with AUC values ranging from 0.858 for Language to 0.936 for Sensory-Motor. The Social Relatedness factor showed AUC = 0.915, with an optimal cutoff of 2.274, sensitivity = 0.957, and specificity = 0.815. The Language factor showed AUC = 0.858, with a cutoff of 2.071, sensitivity = 0.765, and specificity = 0.810. The Sensory-Motor factor showed the highest AUC (0.936), with a cutoff of 2.472, sensitivity = 0.932, and specificity = 0.858. The Circumscribed Interests factor showed AUC = 0.914, with a cutoff of 2.250, sensitivity = 0.968, and specificity = 0.767.

Overall, the four-factor solution showed good discriminative capacity for differentiating participants with and without an autism diagnosis. Sensitivity ranged from 0.765 to 0.968, whereas specificity ranged from 0.767 to 0.858. The ROC curves corresponding to the four RADS-R-BR-70 factors are presented in Fig. 1A–D, and the summary of cutoff estimates is shown in Table 4. Complete cutoff performance estimates for each factor are provided in Supplementary Tables S2–S5.

[Insert Fig. 1 here]

[Insert Table 4 here]

Bifactorial model

After analyzing validity evidence for the four-factor model, the proposed bifactorial structure was examined by combining Social Relatedness and Language into a broader social-communication dimension and Sensory-Motor and Circumscribed Interests into a broader restricted/repetitive and sensory-behavioral dimension. Two models were tested: a bifactorial model and a hierarchical bifactorial model, in which general factors explained the variability of the corresponding instrument factors.

The bifactorial model showed borderline fit, with TLI below the cutoff adopted in this study (TLI = 0.889), and a significant correlation between the general factors ($r = 0.790$, $p < .001$). The hierarchical bifactorial model showed slightly better fit, with TLI above the established cutoff (TLI = 0.904). General Factor 1

significantly predicted Social Relatedness (β = 0.937, p < .001) and Language (β = 0.889, p < .001), whereas General Factor 2 significantly predicted Sensory-Motor (β = 0.833, p < .001) and Circumscribed Interests (β = 0.965, p < .001). The general factors also showed strong internal consistency (αF1 = 0.807, αF2 = 0.896; ωF1 = 0.845, ωF2 = 0.882; CR_F1 = 0.912, CR_F2 = 0.910), with a correlation between factors of 0.881 (p < .001). Fit indices for the bifactorial models are presented in Table 5.

[Insert Table 5 here]

Cutoff points for the bifactorial model

ROC analyses were also conducted for the two general factors of the hierarchical bifactorial model. General Factor 1 showed AUC = 0.921 (95% CI = 0.893–0.945, p < .001), with an optimal cutoff of 2.224, sensitivity = 0.954, specificity = 0.832, NPV = 0.835, and PPV = 0.953. General Factor 2 showed AUC = 0.937 (95% CI = 0.915–0.958, p < .001), with an optimal cutoff of 2.453, sensitivity = 0.948, specificity = 0.836, NPV = 0.819, and PPV = 0.953.

These findings indicate strong discriminative accuracy for both general factors, with slightly higher AUC and specificity for General Factor 2 and slightly higher sensitivity for General Factor 1. The ROC curves corresponding to the two general factors are presented in Fig. 1E–F, and the Complete cutoff performance estimates for the hierarchical bifactorial model are available in Supplementary Tables S6–S7.

Discussion

The present study examined validity evidence for the RADS-R-BR-70, a reduced 70-item Brazilian version of the Ritvo Autism Diagnostic Scale-Revised, in a sample of Brazilian late adolescents and adults. The findings support the psychometric adequacy of the reduced version. Compared with the original 80-item model, the 70-item solution showed better fit indices, adequate factor loadings for all retained items, satisfactory reliability for most dimensions, and good discriminative accuracy. These results suggest that the original structure of the RAADS-R was not fully reproduced in this Brazilian sample, whereas a more parsimonious four-factor model provided a better representation of the data.

The findings are consistent with the international literature, which indicates that the RAADS-R may not perform uniformly across different clinical and cultural contexts. Previous validation studies have reported mixed findings regarding its internal structure and discriminative performance. Picot et al. (2021), for example, found that a bifactor solution showed better fit than the original four-factor model in the French version, whereas Sturm et al. (2024) raised concerns about structural stability, item functioning, and equivalence of interpretation across respondent groups. In contrast, Rausch et al. (2025) reported strong discriminative performance for the German version. These findings suggest that the structure and accuracy of the RAADS-R may vary as a function of clinical context, sample composition, and the dimensional model adopted (Brugha et al., 2020; Jones et al., 2021; Sizoo et al., 2015; Sturm et al., 2024).

In this Brazilian version, 10 items with low or negative factor loadings were excluded, suggesting that they did not adequately represent their intended latent dimensions in this sample. In addition to item exclusion, the Brazilian adaptation also involved a relevant modification of the response categories. In the original RAADS-R format, the response options require participants to differentiate whether a given characteristic is present only currently, only in childhood, or in both periods (Ritvo et al., 2011). Although this logic preserves the diagnostic concern with developmental history, it may introduce greater retrospective burden and interpretive ambiguity in adults, especially when individuals need to reconstruct experiences that occurred before the age of 16. This issue is compatible with recent critiques of the functioning of the RAADS-R temporal categories and with evidence that retrospective judgments may be less stable in adult clinical assessments (Hus et al., 2011; Ozonoff, 2019; Sturm et al., 2024). Convergently, the RADS-R-BR Screen study showed that replacing this temporal format with frequency/intensity-based categories favored greater psychometric stability in the Brazilian context, with better model fit, greater interpretive clarity, and more consistent factorial organization (Hartwig & Uehara, in press). Thus, in the RADS-R-BR-70, the use of the categories 1 = Not true; 2 = Sometimes true; 3 = Often true; 4 = Almost always true may have contributed to reducing dependence on less stable retrospective memories and to making responses more directly anchored in the perceived frequency of autistic experiences.

Although all retained items showed monotonicity and the overall model remained interpretable, some items showed relatively low discrimination, with values close to the threshold for moderate discrimination. This finding deserves attention especially in the case of item Q80 (“I tend to point out other people’s mistakes”), from the Social Relatedness factor, which showed a factor loading close to the minimum retention criterion, low discrimination in the IRT analysis, and residual covariance with other items in the same domain. It is understood that the item may share semantic or situational content with items related to socially embarrassing situations, reducing its specificity in differentiating levels of the latent trait. Thus, the findings point to the need to reevaluate this item in future studies, especially through textual refinement, differential item functioning analyses, and investigation of its interpretive equivalence across subgroups.

Among the four factors, Language showed the weakest psychometric performance. Its internal consistency was lower than that of the other factors, and it also showed the lowest AUC. This result suggests that language-related items were less homogeneous and less discriminative in the present sample. A likely explanation is that these items are particularly sensitive to pragmatic, affective, and cultural meanings. In Brazilian Portuguese, figurative expressions involving affection and intimacy may be widely recognized as conventional forms of communication, even by individuals who experience ambiguity or pragmatic inference as challenging. For example, an expression such as “eu te carrego no coração” may evoke culturally shared meanings associated with emotional warmth, attachment, longing, or relational bonding, rather than functioning only as an indicator of discomfort with figurative language.

This finding reinforces the need to evaluate autistic communication more broadly. In individuals without intellectual disability, language differences may not appear primarily as explicit difficulties in verbal

comprehension, but rather as pragmatic alterations, management of ambiguity, interpretation of implicit meanings, and fatigue associated with continuous sociocommunicative monitoring (Baghdadli et al., 2017; Camm-Crosbie et al., 2019). In addition, autistic adults may develop compensatory and social camouflaging strategies, which affect both the observable expression of traits and how they interpret and endorse self-report items (Cook et al., 2021; Hull et al., 2019; Lai et al., 2017; Livingston & Happé, 2017). Thus, the weaker performance of the Language factor suggests the need for more refined indicators of adult autistic communication, especially to capture inference, figurative language, and communicative effort.

In contrast, the Social Relatedness factor showed more robust psychometric performance, comprising the largest number of items, with acceptable internal consistency and high discriminative accuracy. This finding supports the relevance of social reciprocity and social motivation in autism screening in adults, in line with the sociocommunicative domains described in contemporary diagnostic criteria (American Psychiatric Association, 2022). However, this factor should not be interpreted as a simple measure of social incapacity or lack of interest in others. In adulthood, social functioning may be shaped by camouflaging, anxiety, accumulated experiences of exclusion, and adaptation to specific social environments (Camm-Crosbie et al., 2019; Cook et al., 2021; Hull et al., 2019; Lai et al., 2017). Thus, scores in this domain should be understood dimensionally and contextually, avoiding reductionist interpretations of sociability or interpersonal interest.

The Sensory-Motor factor showed particularly strong performance, indicating that sensory and motor experiences constitute a robust and clinically meaningful dimension of autistic self-report in Brazilian adults. Sensory differences are currently recognized as part of the diagnostic phenotype of autism, including hyper- or hyporeactivity to sensory input and unusual interest in sensory aspects of the environment (American Psychiatric Association, 2022). This finding is also consistent with evidence that sensory differences in autistic people involve multiple modalities and may affect social participation, emotional regulation, attention, fatigue, and adaptive functioning (Marco et al., 2011; Robertson & Baron-Cohen, 2017). In adulthood, sensory overload, environmental intolerance, shutdown, avoidance, fatigue, and adaptive strategies may become highly salient aspects of everyday functioning. These experiences may also be more accessible to self-report than socially mediated difficulties, which are often filtered through compensation or camouflaging. The strong performance of this factor therefore supports the importance of preserving sensory-perceptual and motor indicators in autism screening in adults.

The Circumscribed Interests factor also showed satisfactory reliability and discriminative accuracy. This suggests that restricted interests, cognitive focus, and repetitive patterns of engagement remain relevant indicators in adult self-report, in line with the diagnostic domain of restricted and repetitive patterns of behavior, interests, or activities (American Psychiatric Association, 2022). At the same time, the adult expression of circumscribed interests may differ from childhood descriptions of restricted and repetitive behaviors. These characteristics may appear as professional specialization, intense intellectual investment, structured routines, or highly specific domains of expertise. For this reason, interpretation of this factor should avoid reducing circumscribed interests to externally unusual or

stereotyped behaviors, considering how these patterns may be embedded in socially adaptive or contextually reinforced activities.

The ROC analyses also support the potential usefulness of the RADS-R-BR-70 as a screening instrument. The four factors showed good discriminative accuracy, with AUC values ranging from .858 to .936. The data indicate that the scale may contribute to the identification of autistic traits and to the organization of clinical hypotheses in Brazilian adolescents and adults. However, good discriminative performance should not be interpreted as diagnostic sufficiency. Screening instruments can support referral decisions and clinical reasoning, but they do not replace a comprehensive diagnostic assessment, which should include clinical interview, developmental history, behavioral observation, informant report when available, and careful analysis of differential diagnosis (Baghdadli et al., 2017; Lord et al., 1994; Lord et al., 2012; National Institute for Health and Care Excellence, 2012). This distinction is important in adult autism assessment, in which differential diagnosis often involves anxiety disorders, ADHD, depression, trauma-related conditions, personality disorders, and other psychiatric presentations (Baghdadli et al., 2017; Brugha et al., 2020; Ramos et al., 2012; Sizoo et al., 2015).

This caution is reinforced by previous studies showing that the performance of RAADS-R scores varies across validation samples and clinical contexts. Although some studies have reported good diagnostic validity, others have found more limited clinical utility, particularly in adult populations receiving psychiatric or mental health services (Brugha et al., 2020; Jones et al., 2021; Picot et al., 2021; Sizoo et al., 2015). Such variability suggests that the performance of autism self-report measures also depends on the comparison group, the clinical complexity of the sample, and the assessment context. In this sense, the RADS-R-BR-70 should be understood as a screening and hypothesis-generating instrument, rather than as an autonomous diagnostic measure.

The hierarchical two-factor model also showed competitive fit, internal consistency, and discriminative performance. By grouping Social Relatedness and Language into a broader social-communicative dimension, and Sensory-Motor and Circumscribed Interests into a broader restricted/repetitive and sensory-behavioral dimension, this model aligns with contemporary diagnostic formulations of autism (American Psychiatric Association, 2022). Even so, the four-factor model was retained as the main solution because it remains closer to the original RAADS-R structure and allows for more differentiated clinical interpretation (Ritvo et al., 2011). The hierarchical model may be useful when a broader summary interpretation is desired, whereas the four-factor model preserves clinically meaningful distinctions among social relatedness, language, sensory-motor experiences, and circumscribed interests.

The residual covariances observed between some item pairs suggest that certain items share content beyond that explained by the latent factors. This may reflect semantic overlap or common affective meaning. In cross-cultural adaptation, translation may increase the perceived similarity between items or alter the pragmatic and emotional resonance of content. Therefore, the data suggest that future refinements of the RADS-R-BR should examine whether some items are semantically redundant or culturally overdetermined, especially when they evoke similar social, sensory, or emotional situations.

In addition, some limitations should be considered. First, measurement invariance and differential item functioning analyses were not conducted; therefore, it remains uncertain whether the structure of the RADS-R-BR-70 and the performance of its items are equivalent across groups defined by sex, gender, age, education, income, or other sociodemographic characteristics. This is a relevant issue considering the predominance of participants assigned female at birth and of female gender, as well as the inclusion of nonbinary and transgender participants. Second, the study did not systematically examine psychiatric comorbidities or non-autistic clinical groups. This limits interpretation of specificity in more complex diagnostic contexts, especially because anxiety, depression, ADHD, trauma-related conditions, and personality disorders may influence responses to items. Third, data collection was remote, cross-sectional, and based on self-report, which may have favored participants with greater digital access, greater familiarity with autism-related information, and greater engagement with online networks.

Future studies should replicate these findings in independent and more diverse samples, including participants recruited through public health services and non-autistic clinical groups with conditions that may phenomenologically overlap with autism. Additional research should also test measurement invariance, investigate differential item functioning, and examine whether cutoffs require adjustment across clinical or sociodemographic groups. Particular attention should be devoted to the Language factor, both because it showed weaker psychometric performance and because adult autistic communication may require indicators that more precisely capture pragmatic inference and figurative language.

Thus, the findings provide promising initial validity evidence for the RADS-R-BR-70. The reduced four-factor solution appears more parsimonious and psychometrically adequate than the original 80-item model, while the hierarchical two-factor structure offers a broader alternative framework for interpretation. The scale may contribute to screening and to the formulation of clinical hypotheses in Brazilian late adolescents and adults, provided that its scores are interpreted within a comprehensive assessment process and not as a definitive diagnostic result.

Conclusion

The present study provided favorable initial evidence of validity based on internal structure and clinical applicability of the 70-item Brazilian version of the Ritvo Autism Diagnostic Scale-Revised (RADS-R-BR-70) for screening autistic traits in Brazilian late adolescents and adults. The 70-item version showed better psychometric fit than the original 80-item model, resulting in a more parsimonious, stable, and data-appropriate structure for the sample investigated.

The exclusion of 10 items suggests that part of the original content may show lower psychometric adherence in the Brazilian context, especially items associated with normative sociability, positive interpersonal self-perception, and aspects dependent on more unstable cultural, pragmatic, or metacognitive parameters. These findings reinforce the importance of cross-cultural adaptation

processes that also consider the experiential equivalence of items, that is, how different cultural groups understand, experience, and respond to specific content.

The results indicated satisfactory performance for the Social Relatedness, Sensory-Motor, and Circumscribed Interests factors, whereas the Language factor showed relative fragility, with lower internal consistency and lower discriminative capacity. This finding is particularly relevant because it suggests that language assessment in autistic adults requires greater conceptual and methodological refinement. In adulthood, language differences may manifest less as explicit difficulties in verbal comprehension and more as pragmatic difficulties, management of ambiguity, inference of implicit meanings, interpretation of emotional subtext, social use of language, sociocommunicative exhaustion, and camouflaging strategies. Therefore, future studies should focus more specifically on developing and refining items capable of capturing these adult manifestations of autistic language, especially in self-report instruments.

Even so, the ROC analyses demonstrated good accuracy of the RADS-R-BR-70 factors in differentiating participants with and without an autism diagnosis, supporting its use as a multidimensional screening instrument. In this sense, the scale may contribute to the organization of diagnostic hypotheses, the qualification of referrals, and the expansion of access to assessment for autistic late adolescents and adults, especially in contexts where there is growing demand for standardized and culturally adapted instruments, such as Brazil. However, its results should be interpreted by factor and integrated into a comprehensive clinical assessment, including clinical interview, developmental history, behavioral observation, informant report when available, and differential diagnosis analysis.

Future studies should investigate the stability of the structure in independent samples, test invariance across groups, examine differential item functioning, and evaluate its performance in subgroups defined by sex, gender, age, education, comorbidities, and non-autistic clinical conditions that may phenomenologically overlap with ASD. In addition, further research should examine whether the Language factor requires textual reformulations, new indicators, or dimensional models that are more sensitive to adult forms of linguistic, pragmatic, and sociocommunicative expression in autism.

Finally, the RADS-R-BR-70 represents a relevant advance for the assessment of autistic traits in late adolescents and adults in Brazil, offering a more parsimonious and empirically supported version of the scale. Its findings contribute to the psychometric refinement of the RADS-R-BR and provide a basis for future clinical applications and research focused on autism assessment in adolescence and adulthood.

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Tables

Table 1. Demographic profile of the sample

Characteristic	Category	ASD n	ASD %	Non-ASD n	Non-ASD %
Sex assigned at birth	Female	662	80.83	183	78.88
	Intersex	1	0.12	0	0.00
	Male	156	19.05	49	21.12
Gender	Female	579	70.70	179	77.15
	Male	140	17.09	47	20.26
	Non-binary	84	10.26	5	2.16
	Other	8	0.98	0	0.00
	Transgender	8	0.98	1	0.43
Marital status	Married	195	28.81	92	39.66
	Divorced	41	5.01	8	3.45
	Stable relationship	187	22.83	45	19.40
	Single	392	47.86	86	37.07
	Widowed	4	0.49	1	0.43
Education	Complete elementary education	2	0.24	0	0.00
	Complete secondary education	72	8.79	13	5.60
	Incomplete secondary education	2	0.24	0	0.00
	Complete higher education	183	22.34	49	21.12
	Incomplete higher education	199	24.29	27	11.64
	Complete lato sensu graduate	191	23.32	82	35.34
	Incomplete lato sensu graduate	46	5.62	18	7.76
	Complete stricto sensu graduate	82	10.01	33	14.22
	Incomplete stricto sensu graduate	42	5.13	10	4.31
Monthly income	Above 6 minimum wages	109	13.31	77	33.19
	Up to 1 minimum wage	200	24.42	20	8.62

Characteristic	Category	ASD n	ASD %	Non-ASD n	Non-ASD %
Sex assigned at birth	Female	662	80.83	183	78.88
	Intersex	1	0.12	0	0.00
	Male	156	19.05	49	21.12
	From 1 to 2 minimum wages	177	21.61	33	14.22
	From 2 to 3 minimum wages	125	15.26	34	14.66
	From 3 to 4 minimum wages	97	11.84	26	11.21
	From 4 to 5 minimum wages	64	7.81	21	9.05
	From 5 to 6 minimum wages	47	5.74	21	9.05

Table 2. Fit indices for CFA models

Model	χ^2(df)	χ^2/df	CFI	TLI	SRMR	RMSEA (90% CI)
80 items	19245.304 (3074)	6.261	0.826	0.821	0.091	0.080 (0.079–0.081)
77 items	16182.649 (2843)	5.692	0.849	0.845	0.087	0.076 (0.075–0.077)
74 items	13370.381 (2621)	5.101	0.872	0.868	0.084	0.071 (0.070–0.072)
70 items	9548.692 (2334)	4.091	0.908	0.905	0.077	0.061 (0.060–0.063)

Table 3. Factor loadings and internal consistency of the final model

Item	Factor	Loading	Item	Factor	Loading
Q3	Social Relatedness	0.466	Q35	Language	0.525
Q5	Social Relatedness	0.532	Q58	Language	-0.414
Q6	Social Relatedness	-0.330	Q66	Language	0.583
Q8	Social Relatedness	0.412	Q10	Sensory-Motor	0.487
Q12	Social Relatedness	0.509	Q16	Sensory-Motor	0.380
Q14	Social Relatedness	0.323	Q19	Sensory-Motor	0.440
Q17	Social Relatedness	0.494	Q29	Sensory-Motor	0.643
Q18	Social Relatedness	-0.452	Q33	Sensory-Motor	-0.340
Q20	Social Relatedness	0.449	Q36	Sensory-Motor	0.675
Q21	Social Relatedness	0.547	Q42	Sensory-Motor	0.629
Q22	Social Relatedness	0.396	Q46	Sensory-Motor	0.515
Q25	Social Relatedness	0.680	Q49	Sensory-Motor	0.403
Q26	Social Relatedness	-0.356	Q51	Sensory-Motor	0.496
Q28	Social Relatedness	0.649	Q57	Sensory-Motor	0.610
Q31	Social Relatedness	0.357	Q59	Sensory-Motor	0.424
Q38	Social Relatedness	0.374	Q65	Sensory-Motor	0.514
Q39	Social Relatedness	0.434	Q67	Sensory-Motor	0.656
Q44	Social Relatedness	0.608	Q71	Sensory-Motor	0.548
Q45	Social Relatedness	0.665	Q73	Sensory-Motor	0.584
Q47	Social Relatedness	-0.354	Q74	Sensory-Motor	0.431
Q54	Social Relatedness	0.470	Q4	Sensory-Motor	0.441
Q55	Social Relatedness	0.469	Q9	Circumscribed Interests	0.490
Q60	Social Relatedness	0.523	Q13	Circumscribed Interests	0.543
Q61	Social Relatedness	0.424	Q24	Circumscribed Interests	0.604
Q64	Social Relatedness	0.497	Q30	Circumscribed Interests	0.672
Q68	Social Relatedness	-0.511	Q32	Circumscribed Interests	0.457
Q69	Social Relatedness	0.395	Q40	Circumscribed Interests	0.334
Q72	Social Relatedness	-0.306	Q41	Circumscribed Interests	0.413

Item	Factor	Loading	Item	Factor	Loading
Q76	Social Relatedness	0.546	Q50	Circumscribed Interests	0.543
Q79	Social Relatedness	0.504	Q52	Circumscribed Interests	0.517
Q80	Social Relatedness	0.301	Q56	Circumscribed Interests	0.656
Q2	Language	0.382	Q63	Circumscribed Interests	0.609
Q7	Language	0.678	Q70	Circumscribed Interests	0.400
Q15	Language	0.444	Q75	Circumscribed Interests	0.650
Q27	Language	0.704	Q78	Circumscribed Interests	0.387

Reliability indices

Index	Social Relatedness	Language	Sensory-Motor	Circumscribed Interests
α	0.767	0.543	0.828	0.831
ω	0.786	0.617	0.816	0.799
CC	0.895	0.739	0.866	0.840

Table 4. Summary of ROC curve results

Factor	Score	Specificity	Sensitivity	NPV	PPV
1. Social Relatedness	2.274	0.815	0.957	0.844	0.948
2. Language	2.071	0.810	0.765	0.493	0.935
3. Sensory-Motor	2.472	0.858	0.932	0.780	0.959
4. Circumscribed Interests	2.250	0.767	0.968	0.873	0.936

Table 5. Fit indices for bifactorial CFA models

Model	χ^2(df)	χ^2/df	CFI	TLI	SRMR	RMSEA (90% CI)	r
B	9990.716 (2339)	4.271	0.902	0.889	0.078	0.063 (0.062–0.065)	0.790
H	9566.467 (2335)	4.097	0.908	0.904	0.077	0.062 (0.060–0.063)	0.881

Note. B = bifactorial model; H = hierarchical bifactorial model.

Table 6. Summary of ROC curve results for the bifactorial model

Factor	Score	Specificity	Sensitivity	NPV	PPV
General Factor 1	2.224	0.832	0.954	0.835	0.953
General Factor 2	2.453	0.836	0.948	0.819	0.953

Figures

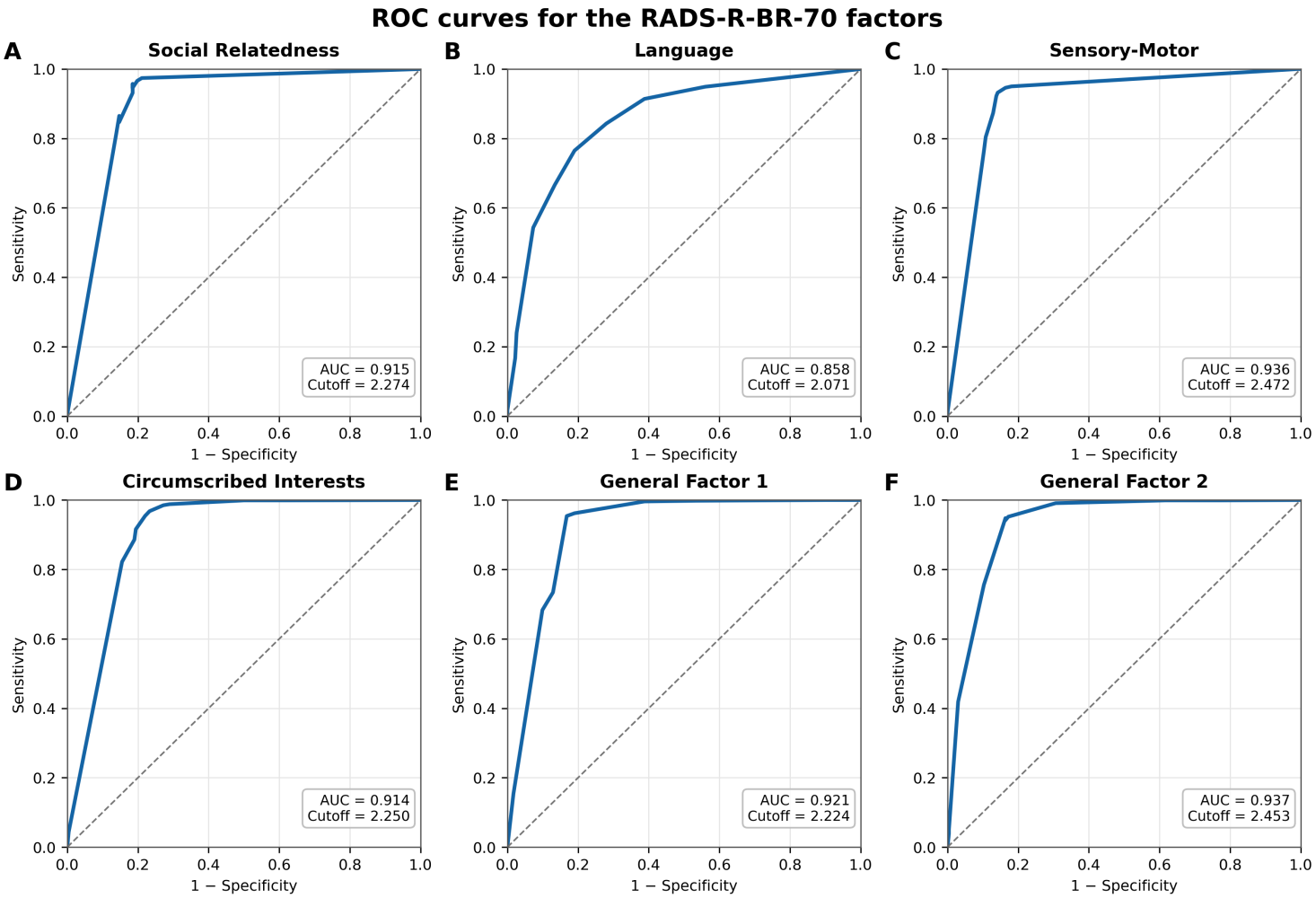


Figure 1

ROC curves for the RADS-R-BR-70 factors and hierarchical bifactorial model. Panels A-D show the four RADS-R-BR-70 factors: Social Relatedness, Language, Sensory-Motor, and Circumscribed Interests. Panels E-F show General Factor 1 and General Factor 2 of the bifactorial RADS-R-BR-70 model.

Supplementary Files

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