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Psychometric evidence of the adaptation to the Brazilian context of the Childhood Mania Rating Scale - Parent/Guardian Version (CMRS-P)

Adaptation of CMRS-P: psychometric procedures

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ABSTRACT

AIM: To carry out the process of cross-cultural adaptation of the Child Mania Rating Scale – Parent Version (CMRS-P) for the Brazilian context. **METHOD:** Statistical procedures were carried out, based on the analysis of the validity of the internal structure of the scale, as well as its relationship with external variables. 224 parents/guardians of children/adolescents aged between five and 18 years participated in the study. The data collection form included instruments for assessing (hypo)manic symptoms, irritability, inattention, hyperactivity, emotional symptoms and behavioral problems. Data were collected in person, at a public school and at a Psychosocial Care Center, and online (via Google forms). Exploratory and confirmatory factor analyses, measurement invariance analyses, reliability analyzes were performed, as well as convergent and concurrent validity analyses. **RESULTS:** The one-dimensional model was investigated, showing satisfactory results, similar to those of the original scale. A reduced version was proposed with the ten most robust items from this study. Validity analyzes based on hypotheses indicated higher scores among those subjects with more clinical problems, such as the previous existence of a psychiatric diagnosis. Statistically significant and positive correlations, of low and moderate magnitudes, were observed with the scores of the other instruments used. **FINAL**

CONSIDERATIONS: The results indicated that the adapted versions of the CMRS-P (full scale and reduced form) are promising instruments for use in the country.

KEYWORDS: Screening; (Hypo)Mania; Bipolar Disorders; Validity; Reliability; Children.

Concern about child and adolescent mental health care has been growing, especially considering the epidemiological evidence regarding the increase of mental disorders cases and its associated losses[1–3]. Furthermore, several situations and phenomena associated with this public have been reported in the media, involving self-mutilation/suicidal behavior, depression, anxiety, substance abuse, (cyber)bullying, among others. These events refer to the estimated prevalence of mental disorders that start on childhood/adolescence, which can reach up to 30%[2–4].

Childhood and adolescence bipolar spectrum disorders (CA-BD), for example, are associated with different negative outcomes, such as: school failure/dropout, antisocial and/or suicidal behavior, hospitalizations, engagement in high-risk behaviors, psychoactive substances abuse, significant long-term neurological and cognitive damage, among others[5–8]. It is estimated that the prevalence of CA-BD is up to 3.9%[9], in addition to cases considered subsyndromal, which are estimated at 5.7%[10] and, despite not meeting the diagnostic criteria, present significant functional impairment[11,12]. In this sense, CA-BD is more common than schizophrenia and autism and less common than depressive disorders and Attention Deficit Hyperactivity Disorder – ADHD[13].

The correct identification of CA-BD may be affected by several factors, such as the specificities of childhood and adolescence that blur the boundaries between 'healthy' and 'pathological', the need to rely on other informants, the

presence of comorbidities (which is more a rule than an exception in cases of CA-BD[8,14]), the absence of specific instruments validated for this population, among others. Considering that depression may be the most frequent symptom in CA-BD and that irritability and distractibility may be confused with defiant disorders, conduct disorders or even ADHD[8,14,15], many cases end up being underdiagnosed[16–18] or undiagnosed and treated incorrectly, resulting in iatrogenic outcomes.

In this scenario, the availability of brief, open-access and specific instruments to evaluate CA-BD can greatly contribute to the work of mental health professionals, as well as for children/adolescents and their families[19,20]. Nonetheless, although different tools have already been developed and investigated for the assessment of CA-BD in the international context[18,21,22], their creation or adaptation for the Brazilian context has not yet been identified. Therefore, the aim of the present study is to present the results of the psychometric analyses carried out in the process of cross-cultural adaptation of the Child Mania Rating Scale – Parent Version (CMRS-P)[6,7] for the Brazilian context.

METHOD

The theoretical procedures for the cross-cultural adaptation of the scale were previously published and included the steps recommended by the literature[23]. The present study seeks to report the results of the last stages of the cross-cultural adaptation process: the pilot study and psychometric studies. The project was approved by the Research Ethics Committee and all participants previously signed an Informed Consent Form (Opinion nº. 3.453.369).

For the pilot study, a small group of parents/guardians (N=11) was invited to respond to the pilot version of the scale in order to verify the operational procedures of the research – that is, to investigate understanding of the instructions and items of the scale. After this stage, data collection was carried out to investigate the psychometric characteristics of the adapted version of the CMRS-P.

A total of 224 parents/guardians (over 18 years old) of children/adolescents aged between five and 18 years old participated in the study. After agreeing to the Informed Consent Form, they filled out the questionnaire with the study questions. Data collection was carried out in person and online. The in person collection took place in a public basic education school (elementary and high School) and in a Psychosocial Care Center (CAPS). For the online application, the instruments were inserted into a form on the Google Forms platform and published on the authors' and the university's social networks (email, Facebook, Instagram and Whatsapp).

Instruments

The Child Mania Rating Scale – Parent Version (CMRS-P) stands out for being the first scale to be developed especially for assessing (hypo)manic symptoms children and young people[6]. Despite being based on the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders, there is no harm to the screening of symptoms, considering that the only change from the fourth to the fifth edition of the Manual in relation to bipolar disorders was the addition, in Criterion A, regarding the requirement for increased activity when the

predominant mood is irritability[15]. The scale also includes specific items that reflect the main symptoms of CA-BD[6].

Consists of a list of behaviors that parents are asked to identify how often they occurred with their child in the last month. Designed to be answered in a period of 10 to 15 minutes[6,7], the CMRS-P is a unidimensional instrument composed of 21 items measured by a four-point Likert scale ranging from "never/rarely" to "very often". In the original study, the results indicated good psychometric characteristics: internal consistency (α=.96), temporal stability (one week; r=.96), validity based on external criteria, in addition to diagnostic efficiency analyses[6,7]. A reduced version of the scale, consisting on ten items (CMRS-10) was developed in 2008 and also demonstrated good psychometric results[7]. Although it is not a diagnostic instrument, its relevance for differential diagnoses, measuring symptoms and also during therapeutic monitoring is evident[24,25]. The adapted version for the present study can be found in Supplementary Material.

The Parent Version of the Young Mania Rating Scale (P-YMRS)[26], was developed from the adult version and has a very similar structure. It is a scale composed of 11 items related to the central symptoms of a manic episode, with four response options that reflect an increasing degree of symptom severity[20,27–29]. Regarding psychometric characteristics, the authors report good internal consistency (α= .72), criterion validity and diagnostic efficiency analyses[26]. The Spanish adaptation of the scale also showed good internal consistency[29]. Other studies were also conducted using this scale and verified its criterion validity and diagnostic efficiency parameters[28]. The study of the cross-cultural adaptation of this scale to the Brazilian context demonstrated promising results[30].

The Parent General Behavior Inventory – 10 item Mania Scale (PGBI-10M)[31] is one of the reduced forms derived from the General Behavior Inventory – GBI, a broader scale designed to assess bipolar disorders in adults. The items are based on criteria from the third edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-III) and the Research Diagnostic Criteria (RDC) for BD. The items are measured using a four-point Likert scale ranging from “never or hardly ever” to “very often almost constantly”. It is a unidimensional instrument[31] with good internal consistency (α=.92), correlation with the full version (r=.95), discriminative capacity and diagnostic efficiency in outpatient samples[10,31]. Temporal stability was estimated at r=.64[32]. The scale also performed well in other studies[10,18,32]. In the adaptation study for the Brazilian context, two items recommended by the Judge Committees were added, totaling a version with 12 questions (PGBI-12)[30].

The Strengths and Difficulties Questionnaire (SDQ) aims to assess mental health problems in children and adolescents. It consists of 25 items measured by a three-point Likert scale. It has a five-factor structure: (a) Emotional Symptoms; (b) Conduct Problems; (c) Hyperactivity; (d) Peer Problems; and (e) Pro-Social Behavior. For the total score, the four problem scales are considered (which excludes the Pro-Social Behavior scale)[20,33]. Brazilian studies indicate the internal consistency is around .80 and the temporal stability is estimated at .79[33].

The Swanson, Nolan, and Pelham – Version IV – Questionnaire (SNAP-IV) is a scale designed to evaluate symptoms of Attention Deficit/Hyperactivity Disorder (ADHD) and Oppositional Defiant Disorder (ODD). It has been adapted for Brazil in 2006 and presents a three-dimensional structure (Inattention; Hyperactivity/Impulsivity; Challenge/Opposition), composed of 26 items

measured by a four-point Likert scale[20]. The internal consistency (alpha and omega) of the three factors were ≥ .92[34].

The Affective Reactivity Index (ARI)[35] is a brief scale with a unidimensional structure, which assesses symptoms of irritability in children and adolescents. It is composed of seven items measured by a three-point Likert scale. Only the first six items are considered for the total score. The Brazilian adaptation showed good psychometric results with α = .84[35].

These last two scales are recommended by the Diagnostic and Statistical Manual of Mental Disorders - DSM-5-TR[15] for the evaluation of inattention and irritability symptoms in children, respectively. It should be noted that all used instruments are self-reported and must be answered by parents/guardians.

Data Analysis

The dimensional structure of the scale was investigated by Exploratory Factor Analysis (EFA) using the FACTOR 12.01.02[36] software, and by Confirmatory Factor Analysis (CFA) using the JASP 0.17.2.1 and the Lavaan 0.6-9 package of the R software. In both analyses (EFA and CFA), using a polychoric matrix, the Robust Diagonally Weighted Least Squares (RDWLS)[37] estimator was used. The EFA used the Hull method as a factorial retaining technique[36] and the indices that assess the adequacy of a unidimensional model of the set of items were also observed: Unidimensional Congruence (UniCo), Explained Common Variance (ECV) and Mean of Item Residual Absolute Loadings (MIREAL)[37].

The adequacy of the EFA and CFA models was evaluated using the fit indices: Comparative Fit Index (CFI) and Tucker- Lewis Index (TLI) and residuals: Root Mean Square Error of Approximation (RMSEA) and Standardized Root

Mean Square of Residuals (SRMR)[38] – or Root Mean Square of Residuals (RMSR), in the case of the EFA. To measure the reliability of the scale, the following parameters were used: Cronbach's alpha (α), McDonald's omega (ω) and the composite reliability[39] – based on standardized factor loadings and error variance of the items.

The adopted criteria follow those recommended in literature, such as: RMSEA p-value bellow .06 with the upper limit of the confidence interval being < .10; TLI and CFI values ≥ .95; SRMR values < .10; values of χ^2/df must be ≤ 5, and the factor loadings of the items must be > .30[37,38]. In evaluating the plausibility of a unidimensional model, it was expected to find values of UniCo ≥ .95, ECV ≥ .85 and MIREAL ≤ .30[37,38]. For the reliability parameters (α, ω, and composite reliability) results ≥ .70[37,39] were expected.

Additionally, based on the same procedures and the criteria observed in the CFA, a Multigroup CFA (MGCFA) was performed, with the objective of investigating the configural, metric and scalar invariance of the CMRS-P for i) boys and girls and; ii) children/adolescents up to 12 years old and 13 years old or over. Invariance was evaluated using the CFI difference test (ΔCFI) with the expectation that no significant reductions in CFI indices would be identified (ΔCFI > .01)[40].

To compare means between independent groups, the non-parametric Mann-Whitney test was performed, considering the non-normal distribution of the data. The effect size was evaluated by the *r* resulting from the division of the *z* score by the square root of the sample size[41]. Effect sizes were considered low (r < .30), medium (.3 – .5) or high (r > .5)[41].

The validity based on the relationship with external variables analyses were performed using the SPSS.20 software – as well as the descriptive analyses. Concurrent validity was analyzed with the P-YMRS e PGBI-12 scales, and convergent validity with the SDQ, SNAP-IV and ARI scales. The magnitude interpretation of correlations followed the criteria of Hinkle, Wiersma e Jurss[42]: very high (≥ .9), high (.7 - .89), moderate (.5 – .69), low (.3 - .49) and small (.1 - .29). Considering that the data distribution was not normal, the Spearman correlation (*r*) was used, and the effect size was observed through the coefficient of determination (r^2)[42].

RESULTS

The psychometric analysis step included the participation of 224 parents/guardians, in which 68% of the interviews were online and the others were in the face-to-face format (Table 01). Nine cases were excluded from the sample due to the age of the children being less than five years old.

The sample was mainly represented by mothers (76%) and fathers (10%), mostly from the state of Rio Grande do Sul (93%). The mean age of the respondents was 40 years (SD=9.35), and most of them were aged between 30 and 49 years (71%), and with higher education (59%). Half of the participants (49%) indicated the presence of mental disorders in the family, mainly: depression (26%), anxiety (24%), bipolarity (12%) and chemical dependency (9%).

As for the children/adolescents sample, it consisted on half of each sex (50%), they were mostly white (81%), with a mean age of 11.2 years (SD=4.01) and attending elementary school (66%). Regarding the existence of a previous

psychiatric diagnosis, 20% of the parents/guardians responded affirmatively, with emphasis to cases of Attention Deficit Hyperactivity Disorder - ADHD (8%), depressive disorders (6%), bipolar disorders (3%), oppositional defiant or conduct disorder (2%). Most of them did not use psychotropic medications (85%) or psychoactive substances (90%) and did not present self-mutilation or suicidal behavior (86%). Four children/adolescents (1.8%) had already been admitted to hospitals for psychiatric reasons (Table 01).

Table 01: Sociodemographic and clinical data of study participants

	Boys (%)	**Girls (%)**
Respondent		
Mother	84 (75.7)	87 (77.7)
Father	16 (14.4)	05 (4.5)
Others	11 (9.9)	20 (18.0)
Age in years (M; SD) (N=218)	40.25 (9.00)	39.81 (9.72)
Respondent's education		
Elementary School	11 (9.9)	12 (10.7)
High school	23 (20.7)	26 (23.2)
Technical education	10 (9.0)	09 (8.0)
University education	67 (60.4)	65 (58.0)
Mental disorder in the family (N=223)		
Yes	63 (57.3)	47 (42.0)
No	45 (40.9)	60 (53.6)
Do not know	02 (1.8)	05 (4.5)
Bipolar disorder in the family (N=223)	13 (11.7)	14 (12,5)
Age in years (M; SD) (N=222)	11.08 (3.84)	11.38 (4.19)
Children (≤ 12 years)	73 (65.8)	66 (58.9)
Adolescents (≥ 13 years)	38 (34.2)	46 (41.1)
Sex (N=223)		
Male	111 (49.8)	-
Female	-	112 (50.2)
Skin color/ethnicity		
Brown	17 (15.3)	11 (9.8)
Black	06 (5.4)	05 (4.5)
White	87 (78.4)	94 (83.9)
Prefer not to say	01 (.9)	02 (1.8)
Education		
Child Education	10 (9.0)	16 (14.3)
Elementary School	84 (75.6)	62 (55.4)
High school	16 (14.4)	32 (28.6)
Technical or university education	01 (.9)	02 (1.8)
Diagnosis of a mental disorder	26 (23.4)	19 (17.0)
Bipolar disorder diagnosis	01 (.9)	05 (4.5)
Depression Diagnosis	06 (5.4)	08 (7.1)

ADHD Diagnosis	15 (13.5)	04 (3.6)
Use of psychiatric medication	19 (17.1)	13 (11.6)
History of psychiatric hospitalization	03 (2.7)	01 (.9)
Use of psychoactive substances (N=220)	10 (9.2)	10 (9.1)
History of suicidal behavior	14 (12.6)	14 (12.5)
Data collect		
Presential	32 (28.8)	39 (34.8)
Online	79 (71.2)	73 (65.2)

Validity Based on the Internal Structure

In the EFA, the results of the Bartlett's sphericity tests (χ^2 = 2477.2; df = 210; p < .01) and KMO (.839) suggested the factorability of the data matrix[37]. The Hull method in accordance with the CFI[43] criteria, indicated a unidimensional model with explained variance of 42.16% and mean factor loading of .60, ranging between .41 (item 01) and .83 (item 08). The model fit indices [χ^2/df = 1.204; RMSEA = .030 (IC90%: .000 – .056); TLI = .976; CFI = .978; RMSR = .111] were psychometrically adequate. The UniCo (.954) and MIREAL (.243) indices corroborated a unidimensional model and the ECV (.835) demonstrated a borderline, although acceptable, result.

In the unidimensional CFA, the factor loading mean was .673, ranging between .457 (item 05) and .882 (item 08). The fit indices were good [χ^2/df = 3.244; CFI = .949; TLI = .944], except for the residual indices [RMSEA = .101; SRMR = .125], which were higher than expected. Important covariances (modification indices) among some pairs of items were identified (ranging from .406 to .725). Once these variables have been inserted into the model, the results indicated better indices [χ^2/df = 1.781; CFI = .983; TLI = .980; RMSEA = .059 (IC90%: .049 - .070); SRMR = .10], as shown in Table 02. The mean factor loading in this respecified model was .649, with a minimum factor loading of .476 (item 05) and a maximum of .836 (item 19). The internal consistency and

reliability indices showed satisfactory results (α = .884; ω = .860; composite reliability = .841).

Table 02: Psychometric Characteristics of Items and Models of the Adapted CMRS-P Scale, According to Confirmatory Factor Analysis (CFA)

Item	Model (λ)	*M-respecified. (λ)
1. Elated mood	.516	.482
2. Irritable mood	.663	.557
3. Grandiosity	.514	.540
4. Delusional grandiosity	.645	.678
5. Decreased need for sleep	.457	.476
6. Too Much energy	.513	.460
7. Pressured speech	.719	.614
8. Racing thoughts	.882	.762
9. Flight of ideas	.801	.689
10. Rushing around	.669	.671
11. Distractibility	.629	.661
12. Overproductive	.612	.600
13. Hypersexuality	.599	.633
14. Disinhibited	.740	.777
15. Poor judgment	.634	.670
16. Rage attacks	.759	.696
17. Overly jocular	.731	.766
18. Rapid mood swings	.673	.603
19. Delusions	.790	.836
20. Auditory hallucinations	.841	.801
21. Visual hallucinations	.747	.648
Average factor loadings	.673	.649
χ^2/df	3.244	1.781
CFI	.949	.983
TLI	.944	.980
RMSEA (IC90%)	.101 (.092 – .110)	.059 (.049 – .070)
SRMR	.125	.100
Composite reliability	.904	.841
α	.884	.884
ω	.964	.860

Subtitle: * Respecified Model, considering correlations between items; χ^2 = chi-square; *df* = degrees of freedom; CFI = *Comparative Fit Index*; TLI = *Tucker-Lewis Index*; SRMR = *Standardized Root Mean Square Residual*; RMSEA = *Root Mean Square Error of Approximation*.

After performing these analyses, a recently published study was identified[44], in which the author reanalyzes the dimensional structure and psychometric characteristics of the North American CMRS-P through one clinical sample and one sample collected online, totaling more than a thousand people. The

participants were aged between 5 and 18 years[44] – the same age group as the present study. The author identified a four-factor model represented by the following dimensions: Hyperactivity (six items: items 06-11); Elated Mood (nine items: 01, 03-05, 12-15 e 17); Irritability (three items: 02, 16 e 18); Psychosis (three items: 19-21)[44]. Despite the restricted sample size for multidimensional analyses[38], data from the Brazilian version were also reanalyzed to investigate the four-factor structure.

According to Table 03, it was possible to observe an excellent fit of the model [$\chi 2/df = .895$; $p = .841$; CFI = 1.00; TLI = 1.01; RMSEA = .000 (.000 - .018); SRMR = .083], including good factor loadings (ranging between .357 and .823) and reliability estimates (α and $\omega > .70$) (Table 03). The correlations between the factors varied between .515 (Hyperactivity and Psychosis) and .788 (Hyperactivity and Elated Mood).

Table 03: Confirmatory Factor Analysis (CFA) Results for the Four-Factor Model

Items	F1	F2	F3	F4
1. Elated mood	-	.376	-	-
2. Irritable mood	-	-	.737	-
3. Grandiosity	-	.536	-	-
4. Delusional grandiosity	-	.557	-	-
5. Decreased need for sleep	-	.382	-	-
6. Too much energy	.475	-	-	-
7. Pressured speech	.711	-	-	-
8. Racing thoughts	.793	-	-	-
9. Flight of ideas	.729	-	-	-
10. Rushing around	.634	-	-	-
11. Distractibility	.571	-	-	-
12. Overproductive	-	.555	-	-
13. Hypersexuality	-	.357	-	-
14. Disinhibited	-	.595	-	-
15. Poor judgment	-	.386	-	-
16. Rage attacks	-	-	.804	-
17. Overly jocular	-	.638	-	-
18. Rapid mood swings	-	-	.803	-
19. Delusions	-	-	-	.823

20. Auditory hallucinations	-	-	-	.776
21. Visual hallucinations	-	-	-	.618
Correlations between factors				
F1 + F2		.788		
F1 + F3		.603		
F1 + F4		.515		
F2 + F3		.598		
F2 + F4		.567		
F3 + F4		.620		
Model fit indices				
χ^2/df		163.942/183		
p-value		.841		
CFI		1.000		
TLI		1.012		
RMSEA		.000 (.000 – .018)		
SRMR		.083		
Reliability estimates		**α**		**ω**
F1 – Hyperactivity		.819		.807
F2 – Elated Mood		.746		.680
F3 – Irritability		.821		.826
F4 – Psychosis		.777		.801
Full Scale		.888		.870

Subtitle: F1 = Hyperactivity; F2 = Elated Mood; F3 = Irritability; F4 = Psychosis; χ^2 = chi-square; *df* = degrees of freedom; CFI = *Comparative Fit Index*; TLI = *Tucker-Lewis Index*; SRMR = *Standardized Root Mean Square Residual*; RMSEA = *Root Mean Square Error of Approximation*; α = Cronbach's alpha; ω = McDonald's omega.

Reduced Version of the Scale

Initially, the unidimensional CFA was performed with the ten items recommended by the authors of the original scale[7] for a reduced version of the CMRS-P. In this model, the mean factor loading was .638, varying between .435 (item 01) and .949 (item 08). Considering two pairs of covariance (items 1-12 and 2-16), the model presented good results (χ^2/df = 1.957; CFI = .984; TLI = .978; RMSEA = .066; SRMR = .100) (Table 04).

On the other hand, seeking a reduced version with more robust psychometric parameters, the ten most representative items based on factor loadings, item discrimination, item-total correlation and the alpha value if the item was deleted were selected for the sample of the present study. The unidimensional model presented better results (χ^2/df = 1.781; CFI = .994; TLI =

.993; RMSEA = .045; SRMR = .079) with the modification indices, which did not indicate any important respecification. The factor loading mean was .701, varying between .579 (item 18) and .940 (item 08). Thus, items 04, 07, 08, 09, 10, 11, 14, 15, 17 and 18 formed the reduced, adapted version of the scale. For this version, satisfactory reliability indices were found (α, ω and composite reliability ≥ .82). The correlation between the two reduced versions (the one developed in this study and the North American one[7]) were > .92, as can be seen in Table 04.

Table 04: Results of Confirmatory Factor Analysis (CFA) for two Reduced Versions

Item	*North American proposal (λ)	**Proposal of this study (λ)
1. Elated mood	.335	-
2. Irritable mood	.533	-
3. Grandiosity	-	-
4. Delusional grandiosity	.722	.602
5. Decreased need for sleep	.501	-
6. Too Much energy	-	-
7. Pressured speech	-	.771
8. Racing thoughts	.949	.940
9. Flight of ideas	.829	.860
10. Rushing around	-	.648
11. Distractibility	-	.607
12. Overproductive	.514	-
13. Hypersexuality	.592	-
14. Disinhibited	-	.689
15. Poor judgment	-	.585
16. Rage attacks	.624	-
17. Overly jocular	-	.726
18. Rapid mood swings	-	.579
19. Delusions	-	-
20. Auditory hallucinations	.777	-
21. Visual hallucinations	-	-
Average factor loadings	.638	.701
χ^2/df	1.957	1.781
CFI	.984	.994
TLI	.978	.993
RMSEA (IC90%)	.066 (.042 – .089)	.045 (.010 – .071)
SRMR	.100	.079
Composite reliability	.756	.858
α	.778	.829
ω	.783	.876
Correlation with the original scale (CMRS-P with 21 items)	.921	.926

Subtitle: * Based on the original proposal of the instrument's authors and considering two covariances: items 1-12 (r_s = .562) and items 2-16 (r_s = .623); ** From the ten most representative items for the sample of the present study; χ^2 = chi-square; *df* = degrees of freedom; CFI = *Comparative Fit Index*; TLI = *Tucker-Lewis Index*; SRMR = *Standardized Root Mean Square Residual*; RMSEA = *Root Mean Square Error of Approximation;* α = Cronbach's alpha; ω = McDonald's omega. The Spearman correlation between the scores of the two reduced versions (North American and the one in this study) is .785.

Full Scale Hypothesis-Based Validity

The MGCFA did not indicate metric or scalar invariance of the adapted version of the CMRS-P, as originally proposed by the instrument's authors, with regard to sex and age (children up to 12 years old and adolescents aged 13 years or over), assessed by the CFI difference test (ΔCFI > .01). The absence of invariance regarding age was more prominent, with CFI variations greater than .07.

In the respecified model considering the correlations between the items, as previously mentioned, the presence of invariance regarding sex is observed, but the absence of invariance regarding age remains. The same happens for the two reduced scale proposals (North American and Brazilian versions): invariance is observed regarding sex (ΔCFI < .01), but it is absent regarding age (ΔCFI > .02).

Although exploratory, the results of the Mann-Whitney test indicated that the differences in the crude CMRS-P (full version) scores between white and non-white individuals (U = 3238.0; z = -1.714; p = .087) were not statistically significant (p > .05). Conversely, the difference in the scores of those with and without family members with mental disorders (U = 4966.0; z = -2.597; p < .01), previous diagnosis (U = 1788.0; *z* = -5.773; *p* < .01), previous diagnosis of CA-BD (U = 56.5; *z* = -3.822; *p* < .01) or history of self-mutilation/suicidal behavior (U = 1291.0; *z* = -4.537; *p* < .01) were statistically significant, with higher scores in the clinical group and a low (previous diagnosis of CA-BD) and moderate (existence

of previous psychiatric diagnosis and history of self-mutilation/suicidal behavior) ($r^2 \leq .29$) effect size (Table 05).

Table 05: Differences in Mean Scores on the Adapted CMRS-P Scale

	N	M	SD	*Md*	*Rank*	*U*	*Z*	*p*	*r*
Skin color/ethnicity									
White	181	9.03	8.55	6.00	108.89	3238.0	-1.714	.087	-.11
Not white	43	10.58	7.68	9.00	127.70				
Mental disorders in the family									
Yes	110	11.16	9.84	8.50	123.35	4966.0	-2.597	.009	-.17
No	113	7.45	6.19	6.00	100.95				
Any previous diagnosis									
Yes	45	17.02	10.92	15.00	162.27	1788.0	-5.773	.000	-.39
No	179	7.39	6.33	6.00	99.99				
Previous diagnosis of CA-BD									
Yes	06	30.67	10.98	31.00	212.08	56.5	-3.822	.000	-.26
No	218	8.74	7.53	7.00	109.76				
Suicidal behavior									
Yes	28	18.75	12.31	20.00	164.39	1291.0	-4.537	.000	-.30
No	196	7.98	6.71	6.00	105.09				

Subtitle: N = sample size; M = mean; Md = median; SD = standard deviation; Z = z-score; *p* = statistical significance; *r* = effect size; CA-BD = child and adolescent bipolar spectrum disorders.

Validity Based on the Relationship with External Variables

Convergent validity was investigated through correlations between the scores from the four dimensions of the CMRS-P and its reduced version (developed in this study) and the SDQ, SNAP-IV and ARI scores. All correlations were statistically significant ($p < .01$).

Table 06: Evidence of Validity Based on the Relationship with External Variables of the Adapted Version of CMRS-P, the Four Dimensions and the Reduced Version

	Full scale	F1	F2	F3	F4	RV*
P-YMRS	.710	.597	.543	.608	.540	.675
PGBI-12	.736	.612	.581	.618	.498	.709
IRA	.429	.310	.171	.681	.369	.442
SDQ – Problem Scale	.604	.508	.383	.599	.466	.591
SDQ – Emotional Symptoms	.444	.345	.266	.486	.376	.429
SDQ – Conduct Problems	.475	.389	.293	.561	.401	.447
SDQ – Hyperactivity-Inattention	.547	.518	.329	.441	.403	.584
SDQ – Peer Problems	.356	.270	.270	.378	.259	.306
SNAP – Inattention	.443	.426	.173	.450	.353	.479
SNAP – Hyperactive/Impulsive	.558	.599	.348	.377	.418	.607
SNAP – Oppositional Defiant	.380	.292	.136	.612	.380	.391

Subtitle: F1 = Hyperactivity; F2 = Elated Mood; F3 = Irritability; F4 = Psychosis; RV* = Brazilian Reduced Version; P-YMRS = *Parent Version of Young Mania Rating Scale*; PGBI-12 = *Parent General Behavior Inventory – Mania Scale*; IRA = *Affective Reactivity Index*; SDQ = Strengths and Difficulties Questionnaire; SNAP = *Swanson, Nolan, and Pelham – Version IV – Questionnaire*. All correlations (*Spearman*) presented a value of $p < .01$.

The CMRS-P scores showed moderate correlations with the SDQ Problems Scale (.604), with the SDQ Hyperactivity subscale (.547) and the SNAP-IV Hyperactivity subscale (.558). The other correlations had low magnitudes (< .49).

The Hyperactivity factor (F1) of the CMRS-P followed the same pattern as the full scale, indicating moderate correlations (≥ .5) with the Problems Scale and the Hyperactivity subscale of the SDQ and the Hyperactivity subscale of the SNAP-IV. The Elated Mood factor (F2) showed low and small magnitudes of correlation (≤ .49) with the analyzed variables.

The Irritability factor (F3) demonstrated moderate correlations (≥ .5) with the Problems Scale of the SDQ, the Conduct Problems subscale (.561) of the SDQ, the ARI scale (.681) and with the Defiance/Oppositional subscale of the SNAP-IV (.612). The last factor, Psychosis (F4), showed a small correlation with the

Peer Problems subscale (.259) of the SDQ; the others indicated low magnitude associations (.3 - .49).

The reduced version (developed in this study) showed moderate correlations with the Problems Scale (.591) and the Hyperactivity subscale (.584) of the SDQ, in addition to the Hyperactivity/Impulsivity subscale (.607) of the SNAP-IV. Correlations with the other tested variables indicated low magnitude correlations (.3 - .49).

For concurrent validity, associations with the P-YMRS and PGBI-12 scales were considered. The full scale score (CMRS-P) showed high correlations with both of the scales; when the four factors were evaluated, the correlations were also important, varying between moderate and high. On the other hand, the reduced version (developed in this study) showed a high correlation with the PGBI-12 and moderate correlate ion with the P-YMRS.

DISCUSSION

Regarding the proposed cross-cultural adaptation of the CRMS-P to the Brazilian context, the obtained data presented good psychometric results. The EFA corroborated the unidimensional structure of the scale, with good psychometric parameters close to those reported in North American studies[6,7]. The unidimensional CFA also demonstrated acceptable psychometric characteristics according to the criteria adopted in this study. Nonetheless, it was necessary to insert covariances between pairs of items into the model, which investigate symptoms that are closely associated or with expected correlations, such as mood elation and increased productivity – criterion A of the DSM-5-TR[15]

for (hypo)manic episodes. The internal consistency and reliability indices showed good results, also close to those published in the original studies[6,7].

Conversely, the four-factor CFA recently reported in the literature[44], presented better indicators in the present study, with the scale being formed by the same dimensions[44]. In Vincent's study, the factor loadings of the items varied between .43 and .93 in the Hyperactivity factor, between .25 and .76 in the Elated Mood factor, between .69 and .84 in the Irritability factor and between .34 and .89 in the Psychosis factor. That is quite close to the present study. The internal consistency (α) identified by the author[44] in the four dimensions of the scale varied between .72 (Psychosis) and .87 (Hyperactivity), quite similar to the indices of the present study, including the relationship between the factors (ranging between .26 and .73)[44]. The fit indices of the four-factor model could not be compared, as the author did not disclose these data.

The reduced version of the CMRS-P scale proposed in the present study provided good psychometric evidence. Thus, this reduced scale may contribute to screening when the time factor is relevant. Its contribution to use in research also stands out.

The MGCFA did not indicate metric or scalar invariance of the full scale regarding sex and age. Even in the respecified model or in the two reduced versions (proposed in literature[7] and in this study), invariance regarding sex is observed, but not regarding age. In all tested models, item 04 (delusions of grandiosity), for example, presented a factorial load three times higher in adolescents than in children. This fact may have occurred because the symptom investigated is more easily observed by parents/guardians in adolescents than in children – even due to the specificities of cognitive and emotional development.

In the hypothesis-based validity study, the mean differences were in the expected direction. Although exploratory, the data provide evidence of discriminative validity, since higher scores were observed in those with clinical history/outcomes as in North American studies[6,7,44].

In the convergent and concurrent validity analyses, statistically significant associations were observed in the expected direction and magnitude with scales that assess similar and related constructs. These results were expected because the phenomena assessed by the instruments are closely associated (hypomania, irritability, inattention, impulsivity, hyperactivity, emotional symptoms, behavior and relationship problems)[15,45–47]. It was not possible to compare these results with North American studies, considering that they used analyzes with diagnostic interviews[6,7,44].

Among the limitations of this study, we highlight the convenience sample, compromising the generalization of the data; the majority of participants lived in a single state in the country and had a high level of education. Furthermore, it is important to highlight the non-use of a gold standard instrument to verify diagnostic accuracy (cutoff point, specificity, sensitivity). It is recommended the use of the same cutoff points established in the original North American study, which suggests a score ≥ 20 points (full form) or ≥ 10 (reduced version) to screen cases of CA-BD[7]. This suggestion is based on the fact that the scale items reflect the symptoms/criteria indicated by the DSM-5-TR[15] for the clinical diagnosis of CA-BD. Furthermore, the version adapted for the Brazilian context maintained the same number of items and the same investigation proposal as the original scale. It is suggested to investigate the four-factor structure in larger samples[38].

It is recommended that new studies investigate the psychometric performance of the adapted versions (full scale and reduced version) in clinical samples. Additionally, more specific analyses on the differential functioning of the items between different groups could investigate the invariance of the scale, ensuring that the scales will evaluate different groups in the same way and with the same quality[38].

FINAL CONSIDERATIONS

The theoretical procedures have already been published in literature[23] and the present study presented the results found in the psychometric procedures of the cross-cultural adaptation of the CMRS-P scale for the Brazilian context. In addition to good technical results in theoretical procedures[23], the adapted version demonstrated good psychometric characteristics.

It is worth noting that scales to assess (hypo)mania are recommended for screening or during clinical mental health follow-ups[6,7,19,48]. The diagnosis of CA-BD must be established after a thorough and longitudinal evaluation process involving different aspects and informants.

Considering the high prevalence of mental disorders among children and adolescents, the lack of instruments to assess (hypo)manic symptoms in Brazilian children and adolescents, and the impacts and losses associated with CA-BD, it is believed that the Brazilian version of CMRS-P and the reduced version developed in this study can contribute to health and education professionals in Brazil, assisting in the correct and early identification of cases, as well as avoiding mistaken– if not iatrogenic – diagnoses and treatments.

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Supplementary Material

Escala de Classificação de Mania Infantil – Versão para Pais/Responsáveis (CMRS-P)

Instruções: As questões abaixo se referem ao humor e comportamento do/a seu/sua filho/a no **último mês**. Para respondê-las, faça um 'X' em um quadrado para cada item. Marque em "Raro ou nunca" se o comportamento não causou problemas. Entretanto, se o humor ou comportamento tenha causado dificuldades, estando além do que é normal, marque em "Às vezes", "Frequentemente" ou "Muito Frequentemente", conforme a quantidade de vezes que eles ocorreram no **último mês**.

	Raro ou Nunca	Às vezes	Frequente-mente	Muito frequente-mente
1. No último mês, seu/sua filho/a teve momentos que se sentiu muito feliz por horas ou dias seguidos (a maior parte do tempo), extremamente animado/a e empolgado/a, como se sentisse "ganhador/a na loteria", com uma alegria exagerada				
2. No último mês, seu/sua filho/a sentiu-se irritado/a, ranzinza, rabugento/a ou furioso/a por horas ou dias seguidos				
3. No último mês, seu/sua filho/a pensou que poderia ser ou fazer qualquer coisa (por exemplo, ser um/uma grande líder, o melhor jogador/a de futebol ou cantor/a, milionário/a, príncipe/princesa), fora de um contexto de brincadeira				
4. No último mês, seu/sua filho/a teve problemas por acreditar que tinha habilidades que na verdade não tinha, ou superpoderes, agindo de acordo com isso				
5. No último mês, seu/sua filho/a precisou dormir menos que o normal, não se sentindo cansado/a no dia seguinte				
6. No último mês, seu/sua filho/a teve momentos de muita energia				
7. No último mês, seu/sua filho/a teve momentos em que falava muito, ou muito alto, ou muito rápido				
8. No último mês, seu/sua filho/a teve momentos de pensamentos acelerados, parecendo que sua fala não conseguia acompanhar seus pensamentos (fala atropelada; como se vomitasse palavras)				
9. No último mês, seu/sua filho/a falou tão rápido que pulava de um assunto para outro				
10. No último mês, seu/sua filho/a correu por aí fazendo coisas sem parar (estava "a mil por hora")				
11. No último mês, seu/sua filho/a teve dificuldade para manter-se atento/a, sendo facilmente distraído/a pelo que estava acontecendo ao seu redor				

12. No último mês, seu/sua filho/a fez muito mais coisas do que o normal, estava mais produtivo/a ou altamente criativo/a (fazendo muitas coisas novas)				
13. No último mês, seu/sua filho/a comportou-se de uma forma sexualmente inadequada (por exemplo, falou palavras obscenas/palavrão, exibiu ou brincou com as próprias partes íntimas, se masturbou, buscou por conteúdos sexuais na internet, imitou sexo com animais ou tocou outras pessoas sexualmente)				
14. No último mês, seu/sua filho/a falou ou agiu com estranhos de forma inadequada, sendo mais extrovertido/a do que o normal (mais expansivo, descontraído, desinibido)				
15. No último mês, seu/sua filho/a fez coisas incomuns para ele/a que foram tolas ou arriscadas (por exemplo, pulou de alturas, fez compras com dinheiro dos outros ou doou coisas importantes sem permissão)				
16. No último mês, seu/sua filho/a teve ataques de fúria ou crises de birra intensas e prolongadas?				
17. No último mês, seu/sua filho/a fez mais piadas ou brincadeiras do que o normal, riu alto demais ou agiu de maneira boba, fora do comum?				
18. No último mês, seu/sua filho/a teve mudanças rápidas de humor?				
19. No último mês, seu/sua filho/a teve algum pensamento estranho (bizarro, fora do contexto que ele/a estava) ou de desconfiança?				
20. No último mês, seu/sua filho/a ouviu vozes ou barulhos que ninguém mais podia ouvir?				
21. No último mês, seu/sua filho/a viu coisas que ninguém mais podia ver?				