ORIGINAL ARTICLE
DOI: 10.15343/0104-7809.202650e19922026I
ISSN: 1980-3990

Evidence of content validity and reliability of the Brazilian version of the PAPA Scale

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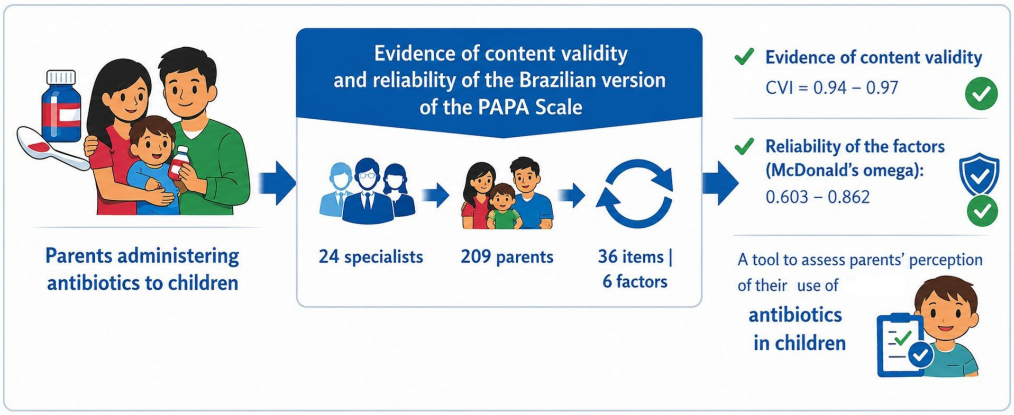
Highlights

- *The Brazilian version of the PAPA Scale presented evidence of content validity.*
- *The instrument demonstrated satisfactory internal consistency across its factors.*
- *The PAPA-Br assesses parental perception of antibiotic use in children.*

Graphical Abstract



Source: Generated by ChatGPT (free version) on June 12, 2026.

Abstract

Inappropriate antibiotic use in children constitutes a global challenge for patient safety, being influenced by caregivers' perceptions, knowledge, and behaviors. The objective of the present study was to assess the content validity and reliability of the Brazilian version of the Parental Perception on Antibiotics Scale (PAPA Scale). This is a methodological study to obtain evidence of content validity and reliability of the Brazilian version of the PAPA Scale. In the content validity stage, 24 healthcare judges assessed the items regarding clarity of language, practical pertinence, and theoretical relevance. After the suggested adjustments, the scale was applied to 209 parents of children who used antibiotics at home. Content validity was analyzed using the Content Validity Coefficient. Reliability was assessed through internal consistency, using Cronbach's alpha and McDonald's omega, and through temporal stability, using the test-retest method via weighted Kappa and Intraclass Correlation Coefficient (ICC). The total content validity coefficients were 0.94 for clarity of language, 0.97 for practical pertinence, and 0.97 for theoretical relevance. Internal consistency indices by factor ranged from 0.597 to 0.864 for alpha and 0.603 to 0.862 for omega. Temporal stability presented ICC values between 0.337 and 0.648, indicating weak to moderate reliability. The Brazilian version of the PAPA Scale, comprising 36 items distributed across six factors, presented evidence of content validity and reliability, demonstrating potential for use in assessing parental perception of antibiotic use in children at home.

Keywords: Validation Study. Pediatrics. Anti-Bacterial Agents. Patient Safety. Perception.

Associate Editor: Edison Barbieri
Reviewer: Fernando Rodrigues Peixoto Quaresma
Mundo Saúde. 2026,50:e19922026
O Mundo da Saúde, São Paulo, SP, Brasil.
https://revistamundodasaude.emnuvens.com.br

Received: 17 march 2026.
Accepted: 22 june 2026.
Published: 15 july 2026.

INTRODUCTION

The pediatric population is frequently treated with antibiotics, which are among the most commonly prescribed medications in this age group[1]. However, inappropriate use of these drugs remains common and may occur both through prescription for illnesses of non-bacterial etiology and through the use of broad-spectrum antibiotics when not clinically necessary[2].

Inappropriate antibiotic prescription in children constitutes a recurrent problem across different care contexts. Studies indicate a high frequency of use of these medications in hospitalized pediatric patients[2]. A study conducted in Paraguay found that approximately one-third of pediatric patients used antibiotics during treatment[3]. After hospital discharge, antibiotic treatment often needs to be maintained at home, which reinforces the importance of family participation in the appropriate management of therapy and in the safe continuity of care[4].

Improving the quality of antibiotic prescriptions for the pediatric population is essential, also requiring educational actions aimed at guiding and raising public awareness regarding the safe use of these medications[5]. The harms arising from inappropriate antibiotic use are diverse and extend beyond bacterial resistance. Inappropriate administration may result in underdosing, overdosing, inadequate dosing intervals, and low adherence to the prescribed therapeutic regimen – factors that may compromise treatment efficacy and negatively impact individual and collective health[6].

In this context, patient safety – especially related to the medication system – has become a growing concern in health services[7]. Since medications constitute the most widely used therapeutic form, medication errors represent frequent adverse events[8]. In pediatric care, these risks become even more relevant due to the particularities of medication administration in this population and the dependence on caregivers for the correct execution of treatment[9].

Given this scenario, the need for educational strategies to prevent medication-related risks and adverse events in home care stands out[4]. The promotion of patient safety at home has been recognized as a relevant practice worldwide[10]. In this regard, understanding parents' perceptions, knowledge, and behaviors regarding antibiotic use in children may contribute to the planning of educational interventions and to the promotion of safe use of these medications.

Standardized instruments may assist in assessing these perceptions. The Parental Perception on Antibiotics Scale (PAPA Scale) was originally developed in English, in Australia, in 2013, with the aim of assessing parents' knowledge, beliefs, and behaviors related to antibiotic use in children[11]. Subsequently, the instrument was translated and validated into other languages, such as Arabic[12] and Persian[13].

In Brazil, the translation and cross-cultural adaptation resulted in the Escala da Percepção Parental sobre Antibióticos (PAPA-Br)[14], carried out through a process that followed the stages recommended in the literature[15]. However, after the translation and cross-cultural adaptation process, it becomes necessary to assess the psychometric properties of the adapted version in order to verify its validity and reliability for use in the Brazilian context. Furthermore, validated instruments that systematically assess parental perception of antibiotic use in children remain scarce in the country.

Given this, the present study aimed to assess the content validity and reliability of the Brazilian version of the Parental Perception on Antibiotics Scale (PAPA Scale).

METHOD

This is a methodological study to assess the psychometric properties of the PAPA-Br scale, including content validity, internal consistency, and temporal stability. The present study corresponds to the subsequent stage of assessment of content validity and reliability evidence for the PAPA-Br, conducted after the completion of the previously published translation and cross-cultural adaptation process. There was no overlap of participants, data, or stages between the studies. The process was carried out with authorization from the author of the original scale.

In the first stage, regarding content validation, a committee of healthcare judges assessed the clarity of language, practical pertinence, and theoretical relevance of the scale items[16]. Professionals were identified through non-probabilistic snowball sampling, with the first participant selected from a

pediatric patient safety research group.

After analyzing the professionals' profiles, in July 2022, an invitation letter was sent via email to 27 specialists with experience in instrument construction and validation in the fields of health, child health, and/or pediatric patient safety, aiming to reach a sample size recommended in the literature, ranging from six to 20 judges[17]. Subsequently, the Informed Consent Form (ICF), the participant characterization instrument, and the scale's content validation form were sent – also via email – to the 24 professionals who agreed to participate.

Judges assessed each item of the scale, assigning scores ranging from 1 (very little) to 5 (very much) to determine the degree of relevance of each item. Furthermore, they were able to suggest modifications and improvements to the instrument.

After judges assessment and the implementation of modifications, the study proceeded to the second stage, with the application of the instrument to the target population, composed of parents of children who used antibiotics at home.

Sample recruitment took place between September and November 2022, at two early childhood and elementary education schools in Fortaleza, Ceará, in the Northeast region of Brazil. Additionally, to broaden the sample reach, a snowball sampling strategy was used, with the indication of other parents who could participate in the study.

The following inclusion criteria were adopted for sample selection: being the father or mother of a child under 12 years of age who used antibiotics at home in the six months prior to data collection, regardless of the presence of chronic conditions or the child's clinical history; possessing a smartphone with internet access; and expressing agreement to participate in the study by confirming the ICF. Participants who initially expressed interest but did not answer calls after three attempts made on consecutive days were considered lost to follow-up and discontinued from the study's data collection flow.

To define the sample size, the recommendation of five participants per instrument item was adopted. Considering the scale's 36 items (K=36) multiplied by 5 ($n=5 \times K$)[18], this resulted in 180 participants. Approximately 15% was added to this value to compensate for possible losses and non-responses, resulting in a final sample of 209 parents. For the test-retest stage, a percentage of 30% of the total sample was defined, in accordance with the literature recommendation[19], resulting in 63 participants.

Two instruments were used for data collection: 1) a sociodemographic characterization form for parents, containing variables such as sex, relationship to the child, age, race/color, marital status, number of children under their care, educational attainment, current occupation, type of housing, family income, and receipt of government assistance, in addition to clinical information about the child (age at antibiotic use, type of antibiotic used, and reason/illness that led to its use); and 2) the PA-PA-Br scale, comprising 36 items distributed across six factors: 1 – Knowledge and beliefs (10 items); 2 – Behaviors (6 items); 3 – Sources of information (7 items); 4 – Adherence (5 items); 5 – Awareness of antibiotic resistance (5 items); and 6 – Parental perception of physicians' prescribing behavior (3 items). The scale uses a Likert format with five response options, ranging from 1 (Strongly disagree) to 5 (Strongly agree)[14].

After the study presentation, the contact details of parents interested in participating were recorded. Subsequently, via messaging application, a Google Forms link containing the ICF for confirmation of participation was sent, along with a question about the best day and time for the telephone interview. At the end of the interview, participants were informed that they might receive a new call after 30 days for a new interview (test-retest). The 30-day interval was considered adequate in previous instrument reliability assessment studies[13,19].

Telephone interviews were conducted by the principal investigator and by a previously trained member of the research team. Data collection consisted of the synchronous application of the scale, in which the researchers read each item to the participant and recorded the chosen response option in real time. To ensure standardization of data collection, both followed a structured script containing the information and guidance to be provided to participants, as well as uniform procedures for conducting interviews and applying instruments, seeking to minimize possible interviewer interference.

To define interview conduction strategies and estimate the time required for instrument application, a pilot test was conducted with three mothers who did not participate in the final sample. Interviews had a mean duration of 25 minutes, and participants did not suggest changes to the instruments.

Data were processed using the Statistical Package for the Social Sciences (SPSS), version 20, using measures of central tendency and dispersion for descriptive analysis. Content validity was analyzed using the Content Validity Coefficient (CVC), calculated according to the proposal by Hernández-Nieto. The CVC of each item (CVCi) was initially obtained from the mean of the scores assigned by the specialists divided by the maximum scale value. Next, the calculation of evaluator bias error was applied, obtaining the corrected coefficient

(CVCc). The total coefficient (CVCT) was calculated for each assessed criterion, considering a minimum adequacy value of 0.80 as the criterion[16].

Reliability was assessed through internal consistency, using Cronbach's alpha and McDonald's omega coefficient for the total sample (n=209). The coefficients were estimated based on the original coding of the scale items, as proposed in the original version of the instrument.

Temporal stability was analyzed using the test-retest method in the selected subsample (n=63), with a 30-day interval, using Spearman's correlation coefficient, considering the ordinal nature of the data from the Likert scale. At the individual item level, the weighted Kappa coefficient (kw) was used, with quadratic weights. At the factor level, stability was assessed using the Intraclass Correlation Coefficient (ICC), calculated based on continuous scores obtained from the sum of items in each dimension. For the calculation of the ICC, a two-way mixed-effects model was adopted, with absolute agreement and single measures. Interpretation of the magnitude of the ICC followed the criteria proposed by Koo and Li[20], considering values below 0.50 as weak reliability, between 0.50 and 0.75 as moderate, between 0.75 and 0.90 as good, and above 0.90 as excellent. A significance level of 5% and a 95% confidence interval (95% CI) were adopted.

Study approved by the Research Ethics Committee under Opinion No. 5,159,630 and identifier CAAE 52881221.2.0000.5054, conducted in full compliance with the ethical principles established by Resolutions No. 466/2012 and No. 510/2016 of the National Health Council.

RESULTS

For the content validity assessment, the committee of judges comprised 24 health professionals: 16 nurses, three physicians, three pharmacists, one dentist, and one psychologist. The majority were female (79.2%), with a mean age of 37.08 ± 8.49 years. Regarding academic degree, 50% held a master's degree, and 66.7% worked in clinical practice. Professional experience ranged from 4 to 32 years.

During the assessment, specialists suggested adjustments to the instrument, including replacing the term "parental" with "parents" in the title – a suggestion presented by four of the 24 judges (16.7%). Furthermore, one judge (4.2%) suggested including the term "partially" in response options 2 and 4 of the Likert scale, resulting in "partially disagree" and "partially agree", respectively, and another judge (4.2%) recommended changing Factor 5 from "Awareness of antibiotic resistance" to "Consciousness of antibiotic resistance". The suggestions were analyzed by the research team and incorporated into the final version of the PAPA-Br for contributing to greater clarity and semantic adequacy of the instrument.

The results of the content validity coefficient, calculated based on the initial version submitted for specialist assessment, indicated high values for all assessed criteria. Clarity of language presented a CVCT of 0.94, while practical pertinence and theoretical relevance obtained a CVCT of 0.97. Since all items presented CVCc values above 0.80, there was no need for a new round of specialist assessment (Table 1).

Regarding the sociodemographic characteristics of the target population, a predominance of females was observed (90.9%), with a mean age of 33.3 ± 7.5 years. The majority had one child (58.4%), self-identified as Brown (mixed race) (61.7%), and were married or in a stable union (68.4%). Regarding educational attainment, 56.9% had completed or were currently enrolled in higher education. The majority resided in their own home (77.0%) and had a family income above three minimum wages (36.8%).

The overall internal consistency of the scale presented a Cronbach's alpha of 0.801. For individual factors, coefficients ranged from 0.597 to 0.864, while McDonald's omega coefficients ranged from 0.603 to 0.862 (Table 2). The highest internal consistency indices were observed for the Knowledge and beliefs factor (α=0.864; ω=0.862), while the Behaviors factor presented the lowest values (α=0.597; ω=0.603). Overall, the omega coefficients presented values similar to those obtained by Cronbach's alpha. Item exclusion did not result in a substantial increase in the alpha coefficient for any of the factors.

Table 1 - Distribution of CVCc* indices of the PAPA-Br† by assessment criterion, according to judges' assessment (n=24). Fortaleza – CE, 2022.

	CVCc*		
Items	**CL**	**PP**	**RT**
Title: Parental Perception on Antibiotics Scale	0.8	0.9	0.9
Legend: 1- Strongly disagree; 2- Partially disagree; 3- Neither agree nor disagree; 4- Partially agree; 5- Strongly agree	0.9	1.0	1.0
Factor 1. Knowledge and beliefs	**0.9**	**1.0**	**1.0**
1. Antibiotics are needed for the common cold.	1.0	1.0	1.0
2. Antibiotics are needed for a sore throat.	1.0	1.0	1.0
3. Antibiotics treat viral infections.	1.0	1.0	1.0
4. Antibiotics can cure ALL types of infections (viral, bacterial, and fungal).	1.0	1.0	1.0
5. When I seek medical care for my child with a common cold, I expect a prescription for medication, including antibiotics.	1.0	1.0	1.0
6. Antibiotics are useful for treating common colds in children.	1.0	1.0	1.0
7. Children with common colds recover faster when they take antibiotics.	1.0	1.0	1.0
8. Previously, antibiotics cured my child's cold symptoms.	1.0	1.0	1.0
9. My child will be sick for longer if they do not take antibiotics for a cough, cold, or other flu symptoms.	1.0	1.0	1.0
10. If my child has a cold or cough, it is better for them to take an antibiotic to get better.	1.0	1.0	1.0
Factor 2. Behaviors	**1.0**	**1.0**	**1.0**
11. Antibiotics should be sold without a prescription.	1.0	1.0	1.0
12. Previously, I stopped giving antibiotics to my child because my friends and/or family members advised me to.	1.0	1.0	1.0
13. I buy antibiotics for my child at the pharmacy without a prescription.	1.0	1.0	1.0
14. I usually keep antibiotics at home to use them when needed.	1.0	1.0	1.0
15. Previously, I gave my child an antibiotic without a prescription when they had a high fever for a few days.	1.0	1.0	1.0
16. Previously, I switched physicians when they did not prescribe antibiotics for my child.	1.0	1.0	1.0
Factor 3. Sources of information	**1.0**	**1.0**	**1.0**
17. I get my health-related information from pharmacy professionals.	0.9	1.0	1.0
18. I get my health-related information from nurses and/or other health professionals.	1.0	1.0	1.0
19. I get my health-related information from books and/or scientific literature.	0.9	1.0	1.0
20. I get my health-related information from family members and/or friends.	1.0	1.0	1.0
21. I get my health-related information from the Internet.	1.0	1.0	1.0
22. I get my health-related information from the media: TV, radio, or newspapers.	1.0	1.0	1.0
23. I get my health-related information from my own previous experience.	0.9	1.0	1.0
Factor 4. Adherence	**0.9**	**1.0**	**1.0**
24. It is not important to strictly follow antibiotic doses and schedules.	1.0	1.0	1.0
25. Missing one or two doses of antibiotics does not make much difference in treatment.	1.0	1.0	1.0
26. If my child improves, I can reduce the antibiotic dose.	1.0	1.0	1.0
27. If my child's health condition is mild, I give the antibiotic according to what I believe is appropriate for their condition.	1.0	1.0	1.0
28. Previously, I stopped giving my child antibiotics because they felt better.	0.9	1.0	1.0
Factor 5. Awareness of antibiotic resistance	**0.9**	**1.0**	**1.0**
29. Antibiotics treat bacterial infections.	1.0	1.0	1.0
30. Generally, antibiotics are safe.	0.9	1.0	1.0
31. Antibiotics can be harmful to health.	1.0	1.0	1.0
32. Some microorganisms (bacteria) are becoming harder to treat with antibiotics.	0.9	1.0	1.0
33. Some microorganisms (bacteria) can become resistant to antibiotics if taken in the wrong doses.	0.9	1.0	1.0
Factor 6. Parental perception of physicians' prescribing behavior	**0.9**	**1.0**	**1.0**
34. I think physicians prescribe too many antibiotics.	1.0	1.0	1.0
35. Physicians do not adequately inform parents about their children's health condition.	1.0	1.0	1.0
36. Physicians are not well informed about the judicious use of antibiotics.	0.9	0.9	0.9
CVCT‡	**0.94**	**0.97**	**0.97**

*CVCc = Content validity coefficient for each item; †PAPA-Br = Parental Perception on Antibiotics Scale, Brazilian version; ‡CVCT = Total content validity coefficient of the criterion; CL = Clarity of language; PP = Practical pertinence; TR = Theoretical relevance.

Table 2 - Distribution of Cronbach's alpha coefficient if item deleted, alpha, and McDonald's omega for the factors of the PAPA-Br scale (n=209). Fortaleza, Ceará, 2022.

Items	α if item deleted	α of the factor	ω of the factor
Factor 1. Knowledge and beliefs		**0.864**	**0.862**
Item 1	0.860		
Item 2	0.856		
Item 3	0.860		
Item 4	0.865		
Item 5	0.848		
Item 6	0.845		
Item 7	0.839		
Item 8	0.849		
Item 9	0.842		
Item 10	0.844		
Factor 2. Behaviors		**0.597**	**0.603**
Item 11	0.542		
Item 12	0.599		
Item 13	0.506		
Item 14	0.537		
Item 15	0.481		
Item 16	0.617		
Factor 3. Sources of information		**0.711**	**0.712**
Item 17	0.716		
Item 18	0.700		
Item 19	0.702		
Item 20	0.671		
Item 21	0.634		
Item 22	0.673		
Item 23	0.645		
Factor 4. Adherence		**0.680**	**0.648**
Item 24	0.686		
Item 25	0.657		
Item 26	0.638		
Item 27	0.540		
Item 28	0.600		
Factor 5. Awareness of antibiotic resistance		**0.680**	**0.685**
Item 29	0.636		
Item 30	0.661		
Item 31	0.690		
Item 32	0.563		
Item 33	0.582		
Factor 6. Parental perception of physicians' prescribing behavior		**0.721**	**0.723**
Item 34	0.672		
Item 35	0.617		
Item 36	0.607		

Legend: α: Cronbach's alpha; ω: McDonald's omega; α if item deleted: estimated alpha coefficient after removal of each item from the respective factor.

Temporal stability was assessed using the test-retest method. As shown in Table 3, statistically significant Spearman correlation was observed for all items ($p<0.05$), with magnitudes ranging from weak to moderate. Weighted Kappa coefficients (kw) indicated agreement ranging from slight to almost perfect among items, with a predominance of values classified as fair to substantial. The highest coefficients were observed for items 14 (k_w=0.851) and 15 (k_w=0.845).

Table 3 - Spearman correlation coefficients and weighted Kappa agreement for the assessment of temporal stability (test-retest) of the PAPA-Br scale items (n=63). Fortaleza, CE, Brazil, 2022.

Item	ρ	p-value*	(k_w)	95% CI (k_w)
Factor 1. Knowledge and beliefs				
Item 1	0.361	0.004	0.274	0.04 – 0.50
Item 2	0.377	0.002	0.364	0.16 – 0.56
Item 3	0.661	<0.001	0.632	0.47 – 0.78
Item 4	0.510	<0.001	0.500	0.32 – 0.67
Item 5	0.300	0.017	0.360	0.07 – 0.64
Item 6	0.343	0.006	0.336	0.11 – 0.56
Item 7	0.355	0.004	0.336	0.10 – 0.56
Item 8	0.361	0.004	0.328	0.09 – 0.56
Item 9	0.467	<0.001	0.428	0.17 – 0.68
Item 10	0.456	<0.001	0.420	0.17 – 0.66
Factor 2. Behaviors				
Item 11	0.474	<0.001	0.410	0.15 – 0.66
Item 12	0.310	0.014	0.266	0.00 – 0.52
Item 13	0.719	<0.001	0.701	0.51 – 0.89
Item 14	0.812	<0.001	0.851	0.69 – 0.99
Item 15	0.800	<0.001	0.845	0.72 – 0.96
Item 16	0.468	<0.001	0.306	0.08 – 0.69
Factor 3. Sources of information				
Item 17	0.470	<0.001	0.423	0.20 – 0.64
Item 18	0.275	0.029	0.100	0.08 – 0.28
Item 19	0.456	<0.001	0.464	0.24 – 0.68
Item 20	0.414	<0.001	0.396	0.18 – 0.60
Item 21	0.657	<0.001	0.650	0.47 – 0.82
Item 22	0.382	0.002	0.298	0.06 – 0.52
Item 23	0.611	<0.001	0.624	0.43 – 0.81
Factor 4. Adherence				
Item 24	0.402	<0.001	0.116	0.11 – 0.34
Item 25	0.366	0.003	0.100	0.08 – 0.28
Item 26	0.405	<0.001	0.740	0.37 – 0.99
Item 27	0.399	<0.001	0.446	0.08 – 0.80
Item 28	0.619	<0.001	0.573	0.30 – 0.83
Factor 5. Awareness of antibiotic resistance				
Item 29	0.337	0.007	0.289	0.10 – 0.56
Item 30	0.666	<0.001	0.740	0.59 – 0.88
Item 31	0.668	<0.001	0.737	0.60 – 0.87
Item 32	0.521	<0.001	0.635	0.40 – 0.86
Item 33	0.357	0.004	0.569	0.10 – 0.99
Factor 6. Parental perception of physicians' prescribing behavior				
Item 34	0.352	0.005	0.332	0.06 – 0.59
Item 35	0.435	<0.001	0.444	0.20 – 0.68
Item 36	0.330	0.008	0.329	0.07 – 0.58

Legend: ρ: Spearman correlation coefficient; p-value*: Statistical significance level of the Spearman test; kw: weighted Kappa coefficient (quadratic weights); 95% CI k_w: 95% confidence interval for the weighted Kappa.

The temporal stability of factors (Table 4), assessed using the ICC, indicated moderate reliability for the Knowledge and beliefs (ICC=0.605; 95% CI: 0.42–0.74), Behaviors (ICC=0.648; 95% CI: 0.47–0.77), Sources of information (ICC=0.550; 95% CI: 0.35–0.70), and Adherence (ICC=0.516; 95% CI: 0.31–0.67) factors. The Awareness of antibiotic resistance (ICC=0.392; 95% CI: 0.16–0.58) and Parental perception of physicians' prescribing behavior (ICC=0.337; 95% CI: 0.09–0.53) factors presented weak reliability, according to the interpretation criteria adopted.

Table 4 - Intraclass Correlation Coefficient (ICC) for the assessment of temporal stability (test-retest) of the PAPA-Br scale factors (n=63). Fortaleza, Ceará, Brazil, 2022.

Factor	ICC	95% CI
Knowledge and beliefs	0.605	0.42–0.74
Behaviors	0.648	0.47–0.77
Sources of information	0.550	0.35–0.70
Adherence	0.516	0.31–0.67
Awareness of antibiotic resistance	0.392	0.16–0.58
Parental perception of physicians' prescribing behavior	0.337	0.09–0.53

Legend: ICC: Intraclass Correlation Coefficient; 95% CI: 95% Confidence Interval.

The scores of each PAPA-Br factor must be assessed individually. Lower scores on factors 1, 2, and 4 indicate better parental perception of antibiotic use. For factor 5, higher scores are ideal, indicating better awareness of the actions, effects, and resistance of antibiotics. Factors 3 and 6 are used to understand how parents obtain health-related information and their perceptions of physicians' prescribing behavior and the information provided, respectively.

Overall, the results demonstrate that the Brazilian version of the scale presented adequate global psychometric properties, with evidence of content validity, internal consistency, and temporal stability. Although some factors presented reliability indicators below the desirable level, the instrument proved adequate for application in the studied population.

DISCUSSION

The assessment of the psychometric properties of the PAPA-Br was conducted through the analysis of content validity and reliability of the instrument. The validation process involved the participation of a committee of healthcare specialists – a strategy frequently used in methodological instrument validation studies, since the diversity of professional backgrounds allows for a broader analysis of the pertinence and adequacy of items to the cultural context in which the instrument will be applied.

The committee of judges in this study comprised healthcare professionals from different fields. The presence of specialists with different backgrounds contributes to broadening the analysis of the instrument and favoring its adequacy to the target population. A similar strategy was used in the study in which the PAPA Scale was translated and validated into Persian, with the participation of specialists from different healthcare fields[13]. Similarly, the cross-cultural adaptation study of the Parent Attitudes About Childhood Vaccine (PACV) instrument into Brazilian Portuguese also used a multiprofessional committee during the validation process[21]. The heterogeneity of specialists is considered an important aspect for ensuring greater methodological rigor and quality in the instrument validation process[21,22,23].

Agreement among specialists was assessed using the CVC – a method widely used in methodological studies to verify the adequacy of an instrument's items. In the present study, the values obtained for clarity of language, practical pertinence, and theoretical relevance indicated a high level of agreement among judges and evidenced the content validity of the scale. Similar findings were observed in the validation study of the PAPA Scale for the Persian language, in which the Content Validity Index (CVI) reached a value of 0.99 for all instrument items[13]. High content validity values were also observed in validation studies of instruments related to patient safety and medication administration in pediatrics[24].

During the assessment process, specialists suggested adjustments to the wording of some items, aiming to improve the clarity and comprehension of the instrument. Among the changes made, the replacement of the term "parental" with "parents" in the scale title stands out, seeking to use language

more accessible to the Brazilian context. A similar suggestion was observed in the cross-cultural adaptation study of the PACV instrument into Brazilian Portuguese[21].

Another modification concerns the Likert scale response options, in which the terms "partially disagree" and "partially agree" were added, aiming to improve the interpretation of intermediate responses. This modification is strategic, as it helps reduce the so-called "central tendency bias," in which respondents avoid extreme positions when not fully certain. By offering clear intermediate gradations, the instrument becomes more sensitive in capturing parents' actual perception of ambivalent behaviors in antibiotic use[25,26,27]. The use of Likert-type scales is widely disseminated in healthcare to measure perceptions, attitudes, and behaviors, being considered an appropriate method for assessing subjective constructs in scientific research[25]. However, it is necessary to ensure that response categories are clear and culturally appropriate, since inadequately structured scales may compromise the validity and reliability of the results obtained[26].

Regarding reliability, variable internal consistency was observed among the PAPA-Br factors. Despite this variability, results were similar between the alpha and omega coefficients, suggesting stability of the reliability estimates across the scale's different dimensions. Regarding the overall alpha of the Brazilian version, similar values were observed in studies that used the PAPA Scale in different cultural contexts. In the original study conducted in Saudi Arabia, Cronbach's alpha was 0.87[11], while the Persian version of the instrument found a value of 0.85[13]. In a study conducted in China using an adapted 32-item version of the scale, the alpha coefficient was 0.78[28]. These results demonstrate that the instrument presents satisfactory internal consistency across different cultural contexts.

The inclusion of McDonald's omega coefficient complements the internal consistency assessment, since this indicator is less dependent on the tau-equivalence assumption required by Cronbach's alpha. The proximity between alpha and omega values observed across the different factors suggests stability of the reliability estimates and reinforces the results found for the internal consistency of the scale.

The temporal stability of the instrument was assessed using the test-retest method. Although all items presented statistically significant Spearman correlations, the magnitude of these correlations ranged from weak to moderate. Weighted Kappa coefficients also presented considerable ranges, varying from slight to almost perfect agreement. These findings reinforce the importance of interpreting temporal stability not only by statistical significance but also by the magnitude of agreement coefficients. A similar procedure was adopted in the study in which instrument reapplication occurred after four weeks, evidencing adequate reproducibility of the scale[13]. The assessment of temporal stability is considered a fundamental aspect in validation studies, as it allows verification of whether the instrument produces consistent results when applied at different time points[20].

The temporal stability of factor scores was assessed using the ICC. Four factors presented moderate reliability, while the Awareness of antibiotic resistance and Parental perception of physicians' prescribing behavior factors presented weak reliability. These results suggest that certain dimensions of the scale may be more subject to temporal variations, possibly because they reflect perceptions influenced by recent experiences, access to information, or interactions with healthcare professionals. Nonetheless, the observed results indicate acceptable temporal stability for part of the assessed dimensions.

Although factor analysis constitutes an important stage in investigating the psychometric properties of instruments, the present research focused on obtaining evidence of content validity and reliability of the Brazilian version of the PAPA Scale. Thus, the results should be interpreted within this specific scope of psychometric assessment.

Regarding the sociodemographic characteristics of participants, a predominance of mothers among respondents was observed – a result similar to that found in the original PAPA Scale study, in which the majority of participants were also female[12]. Similar findings were reported in another study that investigated parents' knowledge, attitude, and practices regarding antibiotic use in children, in which mothers represented the majority of participants[29]. This result may be related to the fact that, in many cultures, women still assume greater responsibility for their children's health care.

Regarding parents' age, the mean found in this study was similar to that observed in international research investigating antibiotic use in children. A study conducted in rural communities in Peru identified a median age of 30 years among caregivers, corroborating the young adult profile observed in this research[30].

Inappropriate antibiotic use represents an important public health problem, since it is directly related to the development of bacterial resistance. Studies indicate that the lack of knowledge regarding the appropriate use of these medications is one of the main factors associated with self-medication and the indiscriminate use of antibiotics[1,11]. In this context,

the PAPA-Br may contribute to identifying parents' self-reported knowledge, beliefs, perceptions, and behaviors related to antibiotic use in children. This information may support the planning of educational strategies aimed at promoting the rational use of these medications in the home environment.

As a study limitation, conducting the research in only one Brazilian city stands out, which may limit the generalization of results to other regions of the country. Additionally, data collection through telephone interviews may have favored the occurrence of social desirability bias, especially in questions related to self-medication, treatment discontinuation, or non-adherence to professional guidance, since participants may have provided responses considered more socially acceptable. Recruitment in two educational institutions, combined with snowball sampling and the requirement of smartphone access with internet, may have favored the participation of individuals with higher educational attainment and digital inclusion. Another limitation relates to the absence of systematic recording of the number of individuals initially approached, refusals, and non-responses during the recruitment stage, which made detailed and retrospective description of the participant flow impossible.

The non-performance of confirmatory factor analysis (CFA) of the Brazilian version of the scale also stands out. Although the instrument presented satisfactory evidence of content validity, internal consistency, and temporal stability, the assessment of factor structure through CFA – using appropriate estimators for ordinal data and fit indicators such as CFI, TLI, RMSEA, and SRMR – is recommended to provide additional evidence of construct validity. Thus, the results presented here should be interpreted as initial evidence of content validity and reliability of the PAPA-Br. It is recommended that future studies, with larger and more diverse samples, conduct confirmatory factor analyses to investigate the adequacy of the instrument's dimensional structure in the Brazilian population.

Despite these limitations, the study contributes to the healthcare field by providing initial evidence of content validity and reliability of the PAPA-Br for use in the Brazilian context. The availability of the Brazilian version of the scale, considered a low-cost technology, may favor the development of research and educational interventions aimed at the rational use of antibiotics in the pediatric population, in addition to supporting healthcare professionals in assessing parents' knowledge, beliefs, perceptions, and behaviors related to the use of these medications.

CONCLUSION

The PAPA-Br presented satisfactory evidence of content validity and reliability, considering the internal consistency and temporal stability assessed in this study. The results support the use of the scale for assessing parents' perception of antibiotic use by their children in the Brazilian context. Although this investigation represents an initial validation stage, the instrument proved easy to apply and understand, potentially contributing to nursing and public health in the country by allowing professionals to identify parents' knowledge, beliefs, behaviors, and perceptions regarding antibiotic use in the home environment. Thus, the scale may be considered a supporting instrument for the development of other educational technologies aimed at the safe use of these medications in pediatrics. Nevertheless, additional studies are recommended, including confirmatory factor analyses and other evidence of validity, to further investigate the psychometric properties of the Brazilian version of the instrument.

CRediT author statement

Conceptualization: Lima, GA; Lima, FET; Oliveira, BSB; Medina, LAC; Fontenele, MGM; Alumran, A; Magalhães, FJ. Methodology: Lima, GA; Lima, FET; Medina, LAC. Validation: Lima, GA; Lima, FET; Oliveira, BSB; Medina, LAC; Fontenele, MGM; Alumran, A; Magalhães, FJ. Statistical analysis: Lima, GA; Oliveira, BSB. Formal analysis: Lima, GA; Oliveira, BSB. Investigation: Lima, GA; Lima, FET; Medina, LAC. Resources: Lima, GA; Lima, FET. Writing-original draft preparation: Lima, GA; Oliveira, BSB; Medina, LAC. Writing-review and editing: Lima, GA; Lima, FET; Oliveira, BSB; Medina, LAC; Fontenele, MGM; Alumran, A; Magalhães, FJ. Visualization: Lima, GA; Lima, FET; Oliveira, BSB; Medina, LAC; Fontenele, MGM; Alumran, A; Magalhães, FJ. Supervision: Lima, FET. Project administration: Lima, GA; Lima, FET.

All authors have read and agreed to the published version of the manuscript.

Funding

This study was supported by the Coordination for the Improvement of Higher Education Personnel – Brazil (CAPES) – Financing Code 001.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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How to cite this article: Lima, G.A., Lima, F.E.T., Oliveira, B.S.B., Medina, L.A.C., Fontenele, M.G.M., Alumran, A., Magalhães, F.J. (2026). Evidence of content validity and reliability of the Brazilian version of the PAPA Scale. O Mundo Da Saúde, 50. https://doi.org/10.15343/0104-7809.202650e19922026I. Mundo Saúde. 2026,50:e19922026.