

# Translation and adaptation for the cross-cultural validation of the Family Impact of Assistive Technology Scale for Augmentative and Alternative Communication (FIATS-AAC)

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## ABSTRACT

**Purpose:** to present data from the theoretical validation and face validation of the Family Impact of Assistive Technology Scale for Augmentative and Alternative Communication for the Brazilian context.

**Methods:** an initial translation, a reconciled translation, a content assessment by experts, a back-translation, and face validation. Researchers, bilingual translators, and judges specialized in alternative and augmented communication, participated in the study.

**Results:** the analysis of the translations and back-translations showed high reliability in most items, with some discrepancies adjusted according to the experience of professionals in the area. The face validation included the participation of parents/caregivers of children/adolescents who use alternative and augmented communication, resulting in adjustments to the items that generated questions.

**Conclusion:** the study concludes that the research objectives were achieved, contributing to the continuity of the validation process of the scale's psychometric properties, thus, providing a tool that assesses the impact of using alternative communication resources from the family's perspective.

**Keywords:** Communication Aids for Disabled; Evaluation of Research Programs and Tools; Validation Study



## INTRODUCTION

Augmented and alternative communication (AAC) systems, aim to promote and facilitate interaction between people with complex communication needs and their partners. These tools play an essential role in expanding opportunities for social engagement, allowing interaction with peers and many other interlocutors. Hence, implementing AAC may be a determining factor for effective communication, greater social connection, linguistic development, intellectual and cognitive progress, and the simplification of routine activities<sup>1</sup>.

Individuals with complex communication needs may resort to alternative means other than speech to establish verbal interactions, as spoken language may not be comprehensive or effective in all situations to which they belong. Thus, AAC can provide a channel to improve how they convey their needs and emotions, paving the way for purposeful and efficient communication. Collaborative communication between all interlocutors must be established to achieve this goal. This principle implies that everyone adopts AAC, helping construct an environment that fosters inclusion and readiness and welcomes communicative manifestations. This is due to the importance of interlocutors in the process of modeling, contextualizing, and developing reference points for children<sup>2,3</sup>.

However, AAC effectiveness depends largely on the family's and other communication partners' understanding of the purpose and functioning of these resources and systems<sup>4</sup>. A study conducted by researchers in the field<sup>5</sup> demonstrated that the increase in the quality of communicative interaction resulted from the ability of communication partners to offer physical and/or verbal stimuli to the child – which again highlights how indispensable it is for interlocutors to know AAC comprehensively.

The family's essential role as interlocutors in child development highlights the relevance of the parents' and/or caregivers' involvement in this process<sup>5</sup>. From this perspective, parents must have the necessary knowledge to help children with the basic skills for effective communication in all their usual contexts. As highlighted by authors<sup>2,6</sup>, this task is not just about acquiring information but also requires dedicated support to address the complexities inherent to educating children and adolescents with complex communication needs.

Therefore, it is crucial to seek strategies to empower and support families in this process. This involves

providing them with tools and knowledge to play a more effective role in promoting their children's communication, as recommended<sup>5</sup>.

Families of children with complex communication needs commonly have to change their dynamics and daily routines. These changes often require new strategies to deal with the unique demands of these situations. It is essential to recognize the relevance of parental variables in this context to understand these families' needs<sup>7</sup>.

This implies that understanding how parents and caregivers of children with complex communication needs cope with daily changes and demands can provide important insights into these children's needs and the most effective strategies to support these families. Authors<sup>7</sup> highlight that parental factors such as stress levels and social support can directly impact such families' well-being and quality of life.

Thus, important data can help understand and support the families' needs from their children's birth. This includes developing effective support policies and programs sensitive to individual differences, and ensuring that essential resources are available to these families. The main objective of these policies and programs is to minimize the impacts on all family members<sup>8,9</sup>.

In this sense, to develop effective work with families, it is essential to understand them, recognize their intrinsic importance for the development of children, and appreciate the significant role played by each parent in this process and in parental responsibilities. Therefore, investigations with the families of children with disabilities should not only assess the parents/guardians' physical and emotional aspects but also include practical and concrete support and assistance available to these families<sup>7</sup>.

The search for resources to guide AAC implementation and monitoring at home showed that several Brazilian studies describe the use of various assessment instruments and protocols. For instance, a study<sup>10</sup> detailed the systematization of AAC implementation procedures in a general intensive care unit, while others<sup>11,12</sup> present guidelines on assisted assessment and AAC, respectively.

Furthermore, researchers<sup>13,14</sup> used assessment instruments focused on language and social skills in children with intellectual disabilities and cerebral palsy, respectively, as part of their investigations. The Questionnaire on Information Needs in Language and Alternative Communication (QNILCA-F, in Portuguese)

also stands out as a tool to assess families' information needs concerning AAC<sup>15</sup>.

An important resource is the Neurofunctional Assessment Protocol for Alternative and Augmented Communication, which measures muscle tone and functioning in children and adolescents with motor difficulties<sup>16</sup>. Another relevant study developed and validated a language assessment instrument from the perspective of AAC<sup>17</sup>. This instrument covers a series of items that assess communication skills at different levels, encompassing language comprehension and production skills and communication strategies and resources employed by AAC users<sup>17</sup>.

However, no instruments have yet been found in the Brazilian context addressing the impact of implementing AAC resources from the perspective of family members or guardians.

The Family Impact of Assistive Technology Scale for Augmentative and Alternative Communication (FIATS-AAC), based on the principles of the International Classification of Functioning (ICF), was developed by a team of researchers and professionals linked to the Holland Bloorview Kids Rehabilitation Hospital and the University of Toronto, in Canada<sup>18</sup>. Its purpose is to understand how dynamics work both in the family and the child's life in areas directly affected by the successful implementation of AAC. In addition, the scale outlines a comprehensive overview of the impact of incorporating AAC systems into the family's daily life. It is important to emphasize that family involvement in the process of implementing AAC resources plays a prominent role because family members are the primary interlocutors. They have an intimate understanding of the child's settings and, therefore, can contribute significantly to the selection of vocabulary to be used in AAC, according to their experiences from daily routines.

The assessment instrument has a questionnaire intended for guardians to assess the contextual and functional elements that involve both the child (behavior, satisfaction, performance of activities, education, face-to-face communication, self-confidence, and social versatility) and the family (caregiver relief, energy, family roles, finances, safety, and supervision), which influence the daily routine of children who use alternative means of communication. This instrument is intended for children and adolescents, ranging from 3 to 18 years old. The questionnaire comprises 13 dimensions – seven referring to the child and the other six to family members –, with 89 assessment items. The

dimensions measured and assessed are classified and graded with a seven-level Likert scale (ranging from 7, "totally agree", to 1, "totally disagree"). The overall assessment is the sum of the mean scores of the 13 categories, ranging from 13 to 91. The higher the score, the higher the level of functioning and adaptation of the AAC system in the family.

Furthermore, simplified versions derived from FIATS-AAC – the FIATS-AAC38, reduced to 38 items, and Face-to-Face (F2FC), reduced to 8 items – have already been validated. Both were developed to serve as functional indicators in large-scale services and research, where it would not be feasible to apply the full 89-item version.

The development of FIATS-AAC involved the participation of more than 300 parents of children or adolescents with complex communication needs, as detailed in the FIATS-AAC Instrument Manual, version 2.0<sup>19</sup>. The contribution of interlocutors is an extremely important factor, as authors have highlighted<sup>20</sup> that such involvement allows the target audience of the intervention to establish adequate communication, relying on their interlocutors' knowledge of the AAC resource implemented and their objectives based on pre-established needs.

Psychometric evaluation studies of the scale<sup>21,22</sup> point to adequate internal validity and reliability of both the FIATS-AAC and its derivatives, the FIATS-AAC38 and F2FC. The scale and its simplified versions have undergone validation processes and are available in several languages, including the Turkish<sup>23</sup>, Italian<sup>24</sup>, and Norwegian versions<sup>25,26</sup>, highlighting this instrument's contribution to AAC.

Access to a standardized and reliable instrument is important for professionals who use AAC in their practice, as it can guide action and identify areas that require attention in the family. This enables more effective interventions targeted to the family's real needs, as indicated in the FIATS-AAC. In addition, the use of internationally recognized instruments promotes a common vocabulary among professionals and researchers, allowing the comparison of results and the search for best practices<sup>27,28</sup>.

The validity and legitimacy of the translated content are necessary, following psychometric principles, and requiring theoretical and empirical methods to ensure the validity and reliability of the instrument in diverse cultural contexts<sup>29</sup>. This process requires both theoretical and empirical procedures to guarantee that the instrument is valid and reliable in different cultural

contexts. Cross-cultural translation must consider linguistic, cultural, and conceptual differences to ensure understanding and applicability<sup>30</sup>.

Reliable assessment results depend on addressing these aspects, considering the cultural diversity between the country of origin and the one where the instrument will be used<sup>27,28</sup>. Moreover, it is important to consider not only the items already included in the scale but also possible specific needs of the target population that may not be covered in the original instrument<sup>30</sup>.

The initial procedure in the cross-cultural validation of an instrument is its cultural adaptation, involving translation and adaptation to the target culture, maintaining conceptual, semantic, idiomatic, and cultural equivalence<sup>29</sup>. Authors<sup>31,32</sup> propose widely accepted guidelines for this process, including independent translations and comparisons to create a consensus version. Face validity, which assesses whether the instrument appears appropriate and relevant to the target population, is an integral part of this process<sup>31</sup>.

The guidelines suggested by some authors<sup>28,31-33</sup> can guide the adaptation and validation process. These steps involve initial translation, reconciled translation, expert evaluation, back-translation, and pre-testing, ensuring that the instrument is valid and reliable in different cultural contexts<sup>31</sup>.

To begin the face validation process, it is essential to understand that this is an ongoing procedure, which can be conducted in parallel with other cross-cultural adaptation stages, such as content and construct validity<sup>31,34</sup>. Conducting an initial study with a limited sample of the target population plays a key role in assessing the comprehension and clarity of the items and the application instructions. This approach helps identify potential issues related to cultural adaptation and improves item design<sup>32,33</sup>.

Thus, preliminary studies with the target population are essential for the cross-cultural validation process, as they help identify and correct possible complications in the adaptation of the instrument, ensuring that it is understandable and acceptable to the target audience.

Therefore, this article aimed to present data from the theoretical validation<sup>33</sup> and face validation<sup>31,33</sup> of the FIATS-AAC to the Brazilian context.

## METHODS

The research was approved by the Research Ethics Committee of the Universidade Federal de São Carlos (REC-UFSCar), SP, Brazil, under protocol number CAEE: 40037420.2.0000.5504 and REC evaluation report number: 5.121.479. Participants were duly informed about the research objectives and gave their consent by signing two copies of an informed consent form. The research group was duly authorized by the institution that holds the copyright and the authors responsible for the original FIATS-AAC scale to conduct this study. The full use of the instrument in full compliance with the established guidelines was consented to, following all guidelines agreed upon for the process.

This study is part of a cross-sectional methodological investigation, with a quantitative approach. The research is based on the literature regarding good practices for translating and validating instruments to ensure reliability and cultural equivalence. The translation, cultural adaptation<sup>33</sup>, and verification of psychometric properties require methodological rigor to achieve this purpose and guarantee semantic, content, technical, criterion, and cultural adequacy<sup>31-33</sup>.

## Theoretical Validation

### *Participants*

In this study stage, a member of the research group, proficient in English and familiar with the research topic, participated with a bilingual translator whose native language is Brazilian Portuguese, responsible for the initial translation phase. Three experts in the field were also involved, selected according to their curricular profiles registered in the Lattes Platform to appraise its content. A second bilingual translator, whose native language is English, contributed to the back-translation.

### *Materials*

The materials used in the study were the 89-item FIATS-AAC and its reduced versions – the 38-item FIATS-AAC38 and the 8-item F2FC.

The Reconciled Translation Protocol was also used to document both the elements of agreement and disagreement identified in the translated versions and the decisions for the final draft. A Protocol for the Assessment of Semantic, Idiomatic, Experiential, and Conceptual Equivalence was developed and shared. It

was presented to the judges to collect their agreement or disagreement with the translated suggestion in relation to the original scale content, also allowing them to suggest changes if they diverged from the proposed translation.

### *Procedures*

The following procedures were conducted according to the approach outlined by authors in the field<sup>33</sup>. These steps refer to the initial and reconciled translation into Brazilian Portuguese, back-translation of the instrument, and equivalence analysis of the instrument items regarding their content.

#### **a) Initial translation:**

The FIATS-AAC was originally developed in English by Canadian researchers. Therefore, the initial translation was the first step to begin the adaptation and use of this instrument in Brazil. This process was conducted by a research group member together with a linguist, both working independently. The previously contacted linguist received the FIATS-AAC by email for the translation and then returned the translated instrument to be incorporated into the research.

All 89 instrument items were translated at this stage for their subsequent analysis during the reconciled translation stage. It was noted that both the reduced FIATS-AAC38 and the F2FC versions were derived from the full scale with 89 items. Therefore, only the FIATS-AAC needed to be translated.

#### **b) Reconciled translation:**

The reconciled translation phase was conducted after the two translations from the previous stage. The research group members who were proficient in English and familiar with the instrument's topic analyzed the translations of all items to identify points of convergence and divergence between them. This analysis used the Reconciled Translation Protocol, developed specifically for this study.

#### **c) Content evaluation by experts:**

At this stage, three expert judges in the field were selected as participants, referred to as J1, J2, and J3, as their achievements recorded on the Lattes Platform backed their competencies. These three experts mastered English and had teaching and research functions at Brazilian public universities, two of them in

the state of São Paulo and one in Rio Grande do Norte, all with more than 20 years of experience in AAC.

An informed consent form was developed and shared with the experts, providing a brief contextualization of the scale and its purpose and an invitation to analyze the translated instrument items. After accepting to participate, the experts were provided with a Semantic, Idiomatic, Experiential, and Conceptual Equivalence Assessment Protocol, containing the options chosen for the reconciled translation.

This protocol also included fields to collect information from the experts, such as name, age, education, main area of expertise, length of experience in AAC, and English language proficiency. The protocol was enriched with readable definitions for each form of equivalence to be assessed, along with seven guidelines on how to complete the comparison table. This document was shared via email with the three experts, who in turn reviewed the items and sent their agreements, disagreements, and suggestions via email. Subsequently, all items were reexamined and adjusted according to the experts' guidelines.

#### **d) Back-translation:**

After the experts had assessed the content and the items adapted, the scale translated into Portuguese was sent to an independent translator whose native language is English and who had no prior knowledge of the scale content. He translated the instrument back into English, making it possible to examine any discrepancies that might have arisen during the back-translation into the original language.

After the back-translation was completed, the scale was sent back to the researchers by email, now in an English version. The research team compared the terms in the back-translation that were different from the original text and, in collaboration with the linguist, defined the necessary adaptations to ensure the best correspondence between the versions.

### **Face Validation**

An initial study applied the first FIATS-AAC-Br version for the face validation process<sup>31,33</sup>.

### *Participants*

Families were selected as recommended by professionals in the field, linked to ISAAC-Brazil, the Brazilian chapter of the International Society for Augmentative and Alternative Communication (ISAAC). Some

participants were also identified through contacts established on the Instagram social network.

This stage involved the participation of five family members who represent the target population of the scale. They included four mothers and one father of

children with complex communication needs who use alternative communication systems, identified as P1 to P5, and their children, identified as C1 to C5. Chart 1 presents the data collected through the participant characterization guide.

**Chart 1.** Characterization of the participants

Participant	P1	P2	P3	P4	P5
Relationship	Mother	Mother	Mother	Mother	Father
Education attainment	Postgraduate degree	High school graduate	Bachelor's degree	High school graduate	High school graduate
Occupation	Educator specialized in school inclusion	Stay-at-home mother	Accountant	Stay-at-home mother	Unemployed
Child	C1	C2	C3	C4	C5
Age	11 years and 7 months	9 years and 10 months	7 years and 4 months	12 years and 11 months	7 years and 11 months
Sex	Male	Male	Male	Male	Male
Education level	5th grade	3rd grade	1st grade	7th grade	2nd grade
Diagnosis or disability condition (if any)	Cerebral palsy	Cerebral palsy and syndrome to be defined	ASD	ASD	ASD
Type of AAC system/ resource currently used	PODD with Snap™ + Core First® (iPad) and printed boards	PODD in the tablet and book	Snap Core First	PECS and Video Modeling	System of figures on printed boards
Time of use	Paper boards for 5 years and iPad for 1 year	1 year	1 year and 6 months	11 years	About 5 years

Captions: ASD – autism spectrum disorder; PODD - Dynamic Boards with Pragmatic Organization; PECS - Picture Exchange Communication System; AAC - Alternative and Augmented Communication

### *Materials and instruments*

This study developed a specific participant characterization guide to collect sociodemographic information from the responding participants and their children (Chart 1).

The initial complete FIATS-AAC-Br version translated into Brazilian Portuguese was used to assess participants and verify the semantic adequacy and understanding of the items.

This study also developed a semantic analysis guide to help the researcher observe points where participants might have difficulty understanding the items.

### *Procedures*

Participants were contacted via telephone, email, and social media. After they had given their consent by agreeing to the terms of the research, they were sent

the participant characterization guide by email. Next, an appointment was scheduled to apply the FIATS-AAC-Br translated version via video call interviews in Google Meet. This schedule was arranged according to each participant's availability and preference. The parents/guardians were also asked about the clarity and understanding of the items during the application of the scale.

The interviews were recorded, and the semantic analysis guide was used to assess semantic equivalence, comprehension of instructions, and clarity of terms. This included checking the equivalence of expressions, their conformity with reality, and the quality of writing<sup>33</sup>.

The data from the semantic analysis script were organized and described in detail and submitted to comparative semantic analysis. Items that participants did not understand as expected were submitted again

to the three judges who had previously participated in content analysis in the first phase of the study.

After being reviewed by the judges, the language of the instrument was adjusted according to their new suggestions. Then, a second version of the scale was created and sent to the authors of the original version in Canada.

The judges' recommendations were sent to the creators of FIATS-AAC to review the translated version of the scale and ensure conceptual and cultural equivalence with the original version. They responded with their initial observations, requesting some modifications to the translated version.

The same linguist who had translated the initial instrument version was again contacted to continue with these modifications, presenting to her the considerations regarding the items. In collaboration with another research team member, adjustments were made to these items and, later, they were forwarded to the second translator, whose native language is the original language of the scale. This second translator performed the blind back-translation of the items, after the necessary modifications.

After reviewing the items with the latest modifications, the new versions were submitted to the authors of the original scale. With their approval, an updated version of the FIATS-AAC-Br was achieved, thus, concluding the face validation phase.

## RESULTS

### Initial and reconciled translations

The first stage consisted of the initial translation, conducted by a research group member and the linguist who had been previously contacted. Then, a reconciled translation was carried out to identify the convergences and divergences between the two translations. This process followed a detailed protocol described in the procedures. It played a fundamental role in the clear and visual compilation of the two translations, highlighting the divergences. Its analysis was based on the analysis of the original English items in the FIATS-AAC, the translation by the research group member (Translation 1), and the translation by the linguist (Translation 2).

After careful analysis based on the protocol, the linguist's translation was prioritized due to her greater familiarity with English. Translation 1 was retained only in items 10, 13, 16, 18, 29, 42, 61, 67, and 78. However, adjustments were made to items 12, 28, 30, 45, 69, and

81 to reflect terms more widely used by professionals working with AAC.

### Content evaluation by experts

After the conciliated translation, experts conducted the content evaluation stage. These three judges received the Semantic, Idiomatic, Experiential, and Conceptual Equivalence Assessment Protocol. Two of them had a high English proficiency level, while one had reasonable comprehension skills. Moreover, all judges had more than 20 years of experience in AAC.

The judges' agreement was analyzed based on their email feedback on the instrument translation. This analysis aimed to identify on which items they had agreed or disagreed regarding the four equivalence dimensions. In cases of disagreement, these items were considered for possible adjustments based on the judges' suggestions. The agreement index<sup>35</sup> was calculated according to the following formula:

$$\text{Agreement index} = \frac{\text{Agreements}}{\text{Agreements} + \text{Disagreements}} \times 100$$

This procedure made it possible to identify which items had high reliability (indices above 90%) and acceptable reliability (ranging from 66% to 79%). Values below these parameters indicated the need to readjust the items, considering the suggestions provided by the judges. Thus, a new chart was created to analyze the suggestions, this time focusing exclusively on the items that received disagreements and their respective observations.

After analyzing the 89 FIATS-AAC items, it was found that 63 of them achieved high reliability, reaching a rate of 100%, and 13 items had acceptable reliability, at 66.6%. However, 13 items had low reliability, with rates ranging from 0% to 33.3%. Of the 26 items that had disagreements, 13 were identified as discordant in semantic equivalence, eight in semantic and experiential equivalence, four only in experiential equivalence, and one in semantic and idiomatic equivalence.

Based on the judges' suggestions, the project team agreed to make the following changes:

- **Item 9:** Replace "If my son gets lost, he can (...)" with "If my son got lost, he could (...)".
- **Item 11:** Replace "(...) tell me about how the day was" with "(...) tell me about how your day was".
- **Item 13:** Replace "For me, it is difficult to do anything else (...)" with "It is difficult for me to do anything else (...)".

- **Item 20:** Replace “My family has to renounce many other luxuries (...)” with “My family has to give up many other luxuries (...)”.
- **Item 53:** Replace “My child can spend a lot of time (...)” with “My child manages to spend a lot of time (...)”.
- **Item 60:** Replace “(...) with the requirements of caring for my child” with “(...) with the demands of caring for my child”.
- **Item 65:** Replace “I wish I had more breaks (...)” with “I wish I had more free time (...)”.
- **Item 69:** Replace “(...) participate in games” with “(...) play games”.
- **Item 76:** Replace “My child can use (...)” with “My child manages to use (...)”.
- **Item 85:** Replace “(...) can be happy (...)” with “(...) can feel happy (...)”.

Contact was maintained with all judges throughout this process to clarify questions about their comments and confirm the suggestions they made in the protocol. It is important to emphasize that none of the expert judges suggested the removal or addition of items, which reinforces the relevance of presenting the instrument as proposed.

### Back-translation

Following the steps above and the adaptations of the items after content assessment, an updated FIATS-AAC version was submitted to a bilingual translator whose native language is English to back-translate the instrument and return it to the research group by email. The comparison between the original and back-translated items can be seen in Chart 2.

**Chart 2.** Comparison between original and back-translated items

Original version	Back-translated version
<b>PLEASE READ:</b> This questionnaire will help us to learn a bit about you, your child, and your family life as it relates to your child’s face-to-face communication. Please complete the questionnaire by saying how much you agree with each statement. For instance, the first item says: ‘ <i>My child needs help from others when communicating.</i> ’ If you strongly agree with this statement because your child always needs help from others when communicating, circle ‘7’. If you strongly disagree because your child never needs help, then circle ‘1’. Circle one of the other numbers if you agree or disagree to a lesser amount. Please circle only one rating for each statement.	<b>READ HERE:</b> This questionnaire will help us learn a little about you, your child, and your family life when it comes to your child’s face-to-face communication. Fill out the questionnaire saying how much you agree with each statement. For example, the first item states: “ <i>My child needs help from others to communicate</i> ”. If you strongly agree with this statement because your child always needs help from others when communicating, circle “7”. If you strongly disagree because your child never needs help, circle “1”. Circle one of the other numbers if you agree or disagree in a lower value. Circle only one classification for each statement.
1- My child needs help from others when communicating.	1- My child needs help from others to communicate.
2- My child lets me know if something is wrong.	2- My child lets me know if something is wrong.
3- I need more support from family members when caring for my child.	3- I need more support from family members when caring for my child.
4- I find it easy to play with my child.	4- I find it easy to play with my child.
5- My child needs a lot of help to be understood.	5- My child needs a lot of help to be understood.
6- Being independent improves my child’s self-esteem.	6- Being independent improves my child’s self-esteem.
7- My child tells me what <i>she/he</i> wants.	7- My child tells me what <i>they</i> want.
8- My child <i>has a tough time starting</i> a conversation with people.	8- My child <i>finds it difficult to start</i> a conversation with people.
9- If my child got lost, <i>she/he could</i> ask someone for <i>directions</i> .	9- If my child got lost, <i>they would be able to</i> ask someone for <i>information</i> .
10- <i>Others</i> share the <i>caregiving responsibilities</i> for my child.	10- <i>Other people</i> share the <i>responsibility of caring</i> for my child.
11- My child tells me about <i>her/his</i> day.	11- My child tells me about <i>their</i> day.



Original version	Back-translated version
12- My child's <i>communication disability affects</i> my ability to work outside the home.	12- My child's <i>complex communication needs affect</i> my ability to work outside the home.
13- It is <i>hard</i> for me to get anything else done when my child is at home.	13- It is <i>difficult</i> for me to do anything else when my child is at home.
14- My child <i>likes to be</i> independent.	14- My child <i>enjoys being</i> independent.
15- My child can <i>phone</i> for help in an emergency.	15- My child can <i>call</i> for help in an emergency.
16- I need <i>help from professionals</i> to care for my child.	16- I need <i>professional help</i> to take care of my child.
17- More than one person is <i>required</i> to help my child communicate.	17- More than one person is <i>needed</i> to help my child communicate.
18- My child knows how to take turns during conversations.	18- My child knows how to take turns <i>asking and answering</i> during conversations.
19- My child is learning to communicate independently.	19- My child is learning to communicate independently.
20- My family needs to <i>give up</i> many other luxuries so my child can have the <i>devices she/he needs</i> .	20- My family needs to <i>forfeit</i> many other luxuries so that my child can have the <i>necessary devices</i> .
21- My child communicates with other people on the phone.	21- My child communicates with other people on the phone.
22- All <i>family members</i> take turns supporting my child when <i>going out into</i> the neighborhood.	22- All <i>members of the family</i> take turns supporting my child when <i>walking around</i> the neighborhood.
23- My child is very sociable.	23- My child is very sociable.
24- My child communicates with family members.	24- My child communicates with family members.
25- I feel my child is safe if I leave <i>her/him</i> with another <i>babysitter/</i> caregiver.	25- I feel that my child is safe if I leave <i>them</i> with another <i>nanny/</i> caregiver.
26- My child communicates with people <i>with whom she/he is</i> less familiar.	26- My child communicates with people <i>they are</i> less familiar <i>with</i> .
27- I find it tiring to help my child communicate.	27- I find it tiring to help my child communicate.
28- My child's <i>communication disability affects family finances</i> .	28- My child's <i>complex communication needs affect the family's finances</i> .
29- <i>I do most of the caregiving for my child</i> at home.	29- <i>I am my child's primary caregiver</i> at home.
30- <i>We watch our finances because of my child's communication disability</i> .	30- <i>We are careful with our finances due to my child's complex communication needs</i> .
31- Other people understand my child.	31- Other people understand my child.
32- It is very <i>demanding saying</i> what my child wants to others.	32- It is very <i>difficult to say</i> what my child wants to others.
33- My child knows how to <i>keep</i> a conversation <i>going</i> .	33- My child knows how to <i>hold</i> a conversation.
34- Everyone in my family knows how to communicate with my child.	34- Everyone in my family knows how to communicate with my child.
35- My child plays with friends.	35- My child plays with friends.
36- <i>Communication devices for my child</i> make it difficult for my family to <i>afford</i> anything else.	36- <i>My child's communication devices</i> make it difficult for my family to <i>buy</i> anything else.
37- My child tells me when <i>she/he is afraid</i> .	37- My child tells me when <i>they are scared</i> .
38- My child's independence is increasing.	38- My child's independence is increasing.
39- My child communicates <i>her/his</i> ideas.	39- My child communicates <i>their</i> ideas.

Original version	Back-translated version
40- Much of my time during the day is spent helping my child to communicate.	40- Much of my time during the day is spent helping my child communicate.
41- My child participates in community activities.	41- My child participates in community activities.
42- My child tells me when <i>she/he feels</i> sick.	42- My child tells me when <i>they feel</i> sick.
43- My child needs my help to <i>communicate with others</i> .	43- My child needs my help <i>when communicating with other people</i> .
44- My child <i>converses</i> well with friends.	44- My child <i>talks</i> well with <i>his</i> friends.
45- It is hard work <i>helping</i> my child with homework.	45- It is hard work <i>to help</i> my child with <i>their</i> homework.
46- My child could never go out in the neighbourhood <i>on her/his own</i> .	46- My child could never go out in the neighborhood <i>alone</i> .
47- My child prefers <i>to communicate</i> with me <i>rather</i> than other family members.	47- My child prefers <i>communicating</i> with me than <i>with</i> other family members.
48- My child socializes with <i>others</i> at <i>mealtime</i> .	48- My child socializes with <i>other people</i> at <i>mealtimes</i> .
49- My child's teacher is satisfied with <i>my child's</i> performance <i>in</i> school.	49- My child's teacher is satisfied with <i>their</i> performance <i>at</i> school.
50- Other family members need to help me care for my child.	50- Other family members need to help me care for my child.
51- My child <i>must</i> be with <i>others</i> to be <i>content</i> .	51- My child <i>needs to</i> be with <i>other people</i> to be <i>happy</i> .
52- I have <i>difficulty managing</i> my child's behavior.	52- I have <i>a hard time controlling</i> my child's behavior.
53- My child can spend a <i>long</i> time doing <i>one</i> activity.	53- My child can spend a <i>lot of</i> time doing <i>an</i> activity.
54- My child can communicate with <i>others</i> .	54- My child can communicate with <i>other people</i> .
55- My child enjoys school.	55- My child enjoys school.
56- I need longer breaks <i>from watching</i> my child.	56- I need longer breaks <i>when taking care of</i> my child.
57- My child <i>gets frustrated easily</i> .	57- My child <i>is easily frustrated</i> .
58- I have little time to <i>get chores done around the house</i> .	58- I have little time to <i>do housework</i> .
59- My child behaves well around me.	59- My child behaves well around me.
60- I have <i>trouble coping</i> with the demands of caring for my child.	60- I have <i>a hard time dealing</i> with the demands of caring for my child.
61- My child participates in the classroom.	61- My child participates in the classroom.
62- My child likes to explore <i>her/his</i> surroundings.	62- My child likes to explore <i>their</i> surroundings.
63- My child acts appropriately <i>towards</i> other family members.	63- My child acts appropriately <i>with</i> other family members.
64- My child wants to be with me when I leave the room.	64- My child wants to be with me when I leave the room.
65- I would like <i>to get more breaks from caring for</i> my child.	65- I would like <i>to have more free time when taking care of</i> my child.
66- My child is performing well <i>in</i> school.	66- My child is performing well <i>at</i> school.
67- I would like to spend more time with my other family members.	67- I would like to spend more time with other family members.
68- My child gets bored easily.	68- My child gets bored easily.
69- My child can play games.	69- My child can play games.
70- My child <i>is well behaved</i> at school.	70- My child <i>behaves well</i> at school.
71- I <i>must</i> take my child with me when I go from one room to another.	71- I <i>need to</i> take my child with me when I leave one room for another.
72- I need to <i>get more things done around the house</i> .	72- I need to <i>do most of the housework</i> .

Original version	Back-translated version
73- My child can be happy when I am not holding <i>her/him</i> .	73- My child can be happy when I am not holding <i>them</i> .
74- I <i>am concerned</i> about my child's safety when <i>she/he</i> is left alone.	74- I <i>worry</i> about my child's safety when <i>they are</i> left alone.
75- My child participates in extra-curricular activities at school.	75- My child participates in extracurricular activities at school.
76- My child can use <i>her/his</i> hands to play.	76- My child can use <i>their</i> hands to play.
77- I need help <i>to take</i> care of my child.	77- I need help <i>taking</i> care of my child.
78- I am satisfied with my child's <i>achievement</i> of personal goals at school.	78- I am satisfied with my child's <i>achievements</i> of personal goals at school.
79- My child feels self-confident.	79- My child feels self-confident.
80- A family member needs to be <i>near</i> my child during the day.	80- A family member needs to be <i>around</i> my child during the day.
81- I wish my child could give me a few minutes <i>to myself each</i> day.	81- I wish my child could give me a few <i>personal</i> minutes <i>every</i> day.
82- I am concerned about the way my child behaves.	82- I am concerned about the way my child behaves.
83- My child can control toys without help.	83- My child can control toys without help.
84- My child is proud of <i>her/his</i> schoolwork.	84- My child is proud of <i>their</i> schoolwork.
85- My child can <i>be</i> happy when left alone to play.	85- My child can <i>feel</i> happy when <i>they are</i> left alone to play.
86- My child needs me <i>nearby to</i> do many activities.	86- My child needs me <i>around to</i> do many activities.
87- My child <i>disrupts her/his</i> classmates.	87- My child <i>disturbs their</i> classmates.
88- I can <i>manage</i> my child on my own.	88- I can <i>take care of</i> my child on my own.
89- My child <i>likes to be</i> near me.	89- My child <i>enjoys being</i> near me.

## Face validation

After administering the translated scale to the five participating family members, it was identified that five (items 16, 22, 41, 72, and 80) of the 89 items on the scale generated questions among the respondents. They took 19.5 minutes on average to complete the application of the scale.

Given these results, the research group created a new chart (Chart 3) to compare the original items with their respective translated versions. The expert judges were consulted again to obtain their opinions on what adjustments and corrections were needed in these selected items.

Based on the judges' analysis of these items and their subsequent adjustments, as shown in Chart 3, it

was identified that three out of the five items in question needed modifications. The researcher responsible for the changes proceeded according to the judges' suggestions. Most of the judges' suggestions were related to either specific aspects or the structure of parts of the statements. However, the judges considered that items 22 and 72 did not need changes, despite the researcher's observations.

After the item modifications, a new version of the scale was created. This revised version was then back-translated and forwarded to the authors of the original FIATS-AAC in Canada, thus ensuring that the new version remained aligned with the content and meaning of the original version.

**Chart 3.** Item adjustment according to the judges' analyses

Item	Original	Translation	Observations	Adjustment
16	I need help from professionals to care for my child.	Eu preciso da ajuda de profissionais para cuidar do meu filho.	Specify that they are for daily care	Eu preciso da ajuda de profissionais para <i>os cuidados diários</i> do meu filho.
22	All family members take turns supporting my child when going out into the neighborhood.	Todos os membros da família se revezam apoiando meu filho ao sair pela vizinhança.	They found the phrase "strange", but they understood it	The item was not changed
41	My child participates in community activities.	Meu filho participa de atividades comunitárias.	Questions about what community activities are	Meu filho participa de <i>atividades na comunidade</i> .
72	I need to get more things done around the house.	Eu preciso fazer mais tarefas domésticas.	Questions about whether these tasks are related to caring for the child who uses the resource.	The item was not changed
80	A family member needs to be near my child during the day.	Um membro da família precisa estar perto do meu filho durante o dia.	Questions that were answered explaining the need for supervision or assistance	Um membro da família precisa estar perto do meu filho durante o dia, <i>supervisionando-o ou o auxiliando</i> .

Chart 4 shows the initial considerations made by the authors of the original scale concerning the updated instrument version. They identified possible inconsistencies in only three of the 89 items (items 22, 65, and 72) and made observations to help improve the

back-translated scale, suggesting adjustments and improvements in this new version.

It is important to note that two of the three items highlighted by the authors of the original scale (items 22 and 72) coincided with those that the judges did not consider necessary to change, as described in Chart 4.

**Chart 4.** First considerations by the authors of the original Canadian scale regarding the first version of the Family Impact of Assistive Technology Scale for Augmentative and Alternative Communication (FIATS-AAC-BR)

Item	Original	Back-translation	Considerations
22	All family members take turns supporting my child when <i>going out</i> into the neighborhood.	All members of the family take turns supporting my child when <i>walking</i> around the neighborhood.	The term "walking" can be very specific. "Going out" involves a variety of activities outside the home/around the neighborhood.
65	I would like to get more <i>breaks</i> from caring for my child.	I would like to have more <i>free time</i> when taking care of my child.	"Breaks" implies the need for relief from childcare, while "free time" does not convey the same meaning.
72	<i>I need to get more things done</i> around the house.	<i>I need to do most of the housework</i> .	"I need to get more things done" implies that they don't have enough time to get everything done. The reverse translation doesn't convey this message.

Considering these observations, the items were changed, including completing the sentence or revising it to a more faithful version or a more literal translation. This revised version was then submitted to the second translator for a blind back-translation into English (as

shown in Chart 5) and sent back to the authors of the original scale. The authors of the scale expressed their agreement after this new submission, completing the face validation stage of FIATS-AAC-Br.

**Chart 5.** Comparison of items with the second back-translation

Item	Original	New Portuguese version	2 <sup>nd</sup> back-translation
22	All family members take turns supporting my child when going out into the neighborhood.	Todos os membros da família se revezam apoiando meu filho ao sair pela vizinhança.	All members of the family take turns supporting my child when going out around the neighborhood.
65	I would like to get more breaks from caring for my child.	Eu gostaria de ter mais pausas ao cuidar de meu filho.	I would like to have more breaks when taking care of my child
72	I need to get more things done around the house.	Eu preciso fazer mais tarefas e cuidados com a casa.	I need to do more chores and house care

## DISCUSSION

The judges who contributed to the research in the theoretical validation stage had in-depth knowledge and expertise in the use of AAC resources, which enabled them to offer valuable insights into the FIATS-AAC. Each judge thoroughly analyzed each item on the scale, using the Semantic, Idiomatic, Experiential, and Conceptual Equivalence Assessment Protocol, as detailed in the procedures, expressing their agreements or disagreements and providing suggestions.

Idiomatic equivalence refers to idiomatic and colloquial expressions, which, although difficult to translate into another language, should convey similar ideas, even if some words need to be replaced<sup>31</sup>. Experiential equivalence focuses on adapting the sentences of the original instrument to the cultural context into which it is being translated, recognizing that words or phrases even when easily translated may not be culturally appropriate in another country<sup>31,32</sup>. Lastly, conceptual equivalence equates concepts, considering that sentences may have different meanings in different cultures, possibly requiring the replacement or adaptation of items<sup>31,32</sup>.

Some differences from the original instrument were identified after analyzing the back-translations. However, they did not affect the meaning or comprehension of the sentences – they were simply alternative ways of constructing the sentences. The linguist involved in the first translation stage also confirmed that these differences were not significant enough to change the purpose of the instrument's questions.

Face validation is an important step in the adaptation of measurement instruments, as it aims to determine whether the instrument questions or items appear to be measuring what they are intended to measure. This procedure is essential, as it allows us to assess whether the items of the instrument are appropriate and relevant, helping to identify and correct any problems

the target audience may have in understanding or interpreting the questions<sup>29</sup>.

As described in the results, the Brazilian version of the scale was administered to five participants, who had questions regarding five of the 89 items. These were then submitted to a group of expert judges, who made the necessary adjustments and adaptations to their wording. In contrast, in the original version, seven parents of children with complex communication needs who used AAC met to review the scale items. In this process, unclear items were reformulated or eliminated by group consensus. The parents independently reviewed the list of revised items and identified those that remained questionable<sup>19</sup>.

Thus, the comparison between the Brazilian and the original scale version makes clear that the Brazilian one employed a specific method to assess face validity, involving the participation of a group of expert judges in the review of questionable items. Additionally, the scale was back-translated to ensure semantic equivalence between the original and translated versions. Hence, the procedures aimed to ensure that the scale was clear and relevant to the instrument's target audience.

## CONCLUSION

Given the above, the study objectives were clearly achieved, enabling the beginning of the cross-cultural validation of the FIATS-AAC scale for the Brazilian context. The initial translation, reconciled translation, back-translation, content evaluation by experts, and face validation were completed. Additionally, all items were thoroughly analyzed, with some adaptations based on the judges' suggestions, ensuring the relevance and reliability of the results, after applying the instrument in a national context.

This development will allow us to continue with the empirical validation process, carrying out procedures to assess the psychometric properties. This will include

the analysis of internal reliability, test-retest reliability, convergent validity, and other tests that may be applied. Hence, the research will continue towards its final objective, contributing to the adaptation and validation of the FIATS-AAC scale for the Brazilian context and enriching AAC practices.

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CCAL: Data curation; Formal analysis; Funding acquisition; Writing - Original draft.

ESC: Data curation; Formal analysis; Writing - Original draft.

GFL: Conceptualization; Data curation; Supervision; Writing - Review & editing.

#### Data sharing statement:

The data from this research will be shared publicly and include the raw results tables, the statistical analyses, and the questionnaires. The data will be available immediately after the publication of the article and will remain accessible for at least 5 years. Access to the data will be provided by contacting the authors via the emails provided in the article. The data will be shared after the request is approved, agreeing to the terms of use and appropriate citation of the data. There will be no additional restrictions on access to the shared data.