

Case reports

Development of communication skills in an adolescent with autism, using alternative communication: a case report

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ABSTRACT

Alternative communication has been successfully used in interventions to develop communication skills in children with ASD. However, few studies in Brazil have approached nonverbal adolescents with autism. This article aimed to demonstrate the impact of using an alternative communication system on the development of communication skills in a nonverbal adolescent presented with ASD. This is a single-case study with longitudinal intervention. Skills were assessed with the Communication Assessment in Autism Spectrum Disorder (ACOTEA). There was progress in communicative and behavioral skills. Receptive communications had a greater variation between the first, second, and third applications, increasing from 50% to 66.60% and then 83.30%, followed by social behavior, which increased from 45.80% to 70.80% and then 75%. The use of alternative communication with a robust communication system indicated evidence of the development of communication skills and social behavior in the adolescent with ASD that received the treatment.

Keywords: Autism Spectrum Disorder; Communication; Speech, Language and Hearing Sciences; Self-Help Devices; Communication Aids for Disabled

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INTRODUCTION

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by interaction and social communication difficulties and repetitive and restricted behaviors¹.

Communication changes include verbal communication deficits (such as expressive and receptive language deficits), absence of speech, linguistic skill deficits, repetitive speech (echolalia and delayed or immediate repetitions), and prosody changes. Nonverbal communication can also be affected, with inadequate body language in social interaction (strange, rigid, or exaggerated), absent or diminished eye contact, comprehension deficits, and impaired use of gestures/facial expressions and shared attention¹.

One of the resources to develop communication in people with ASD is augmentative and alternative communication (AAC), one of the fields of assistive technology for people with communication difficulties (speech and/or writing deficits)².

AAC helps people express their thoughts, desires and needs through various techniques and tools, including image communication boards, line drawing, speech-generating devices, and so forth. The term “augmentative” refers to complementing the existing speech, and “alternative” is used in place of absent or non-functional speech. AAC can also be used temporarily (e.g., in patients in intensive care unit stay) or permanently (in patients who need to use it continuously throughout their lives)².

The DHACA method (which, in Portuguese, stands for Development of Communication Skills in Autism) was developed to promote communication skills using AAC. The method aims to expand functional communication based on the following premises: 1) developing imitation and shared attention through fun activities planned according to the child’s previously assessed preferences; 2) encouraging the families’/caregivers’ participation, given the importance of the interlocutor in the communicative process; and 3) using the child’s sociocultural context. DHACA can be used as a low-technology communication book or a tablet application³.

The method has been most frequently used in children with minimum shared attention, unaffected fine motor and eye-hand coordination, and no comorbidities such as intellectual or visual disabilities. However, it can also be used in interventions in adolescents with ASD as long as they have these requirements.

Adolescence is a stage of various physical, psychological, and social changes that characterize the transition from childhood to adulthood. Adolescents with ASD undergo all such changes, but they differ in that they have limited social experiences, and their relationships are mostly limited to their relatives⁴. Some families also report behavioral changes in this phase, demonstrating the importance of adequate interventions to minimize behavioral and communication problems – the more effective their communication, the better they develop and interact with social groups^{4,5}.

AAC has been successfully used in interventions to develop communication skills in children with ASD. Studies on DHACA demonstrate that interventions with AAC help develop functional communication regarding morphosyntactic, semantic, and pragmatic aspects; longer shared attention; and improved social interaction and quality of life in children with ASD and their families^{3,4}. Nonetheless, studies on AAC in Brazil are scarce, especially in the context of speech-language-hearing (SLH) therapy, adolescents, or nonverbal ASD.

The resource used in DHACA is a robust communication book with various advantages, such as expanding functional communication and developing imitation and shared attention, which points to the need for further studies on the topic encompassing adolescents. It is believed that SLH interventions using this adapted tool will help adolescents change their communicative behavior, favoring their interaction and autonomy.

Given the above, this case report aimed to demonstrate the impact of using a low-technology alternative communication system to develop communication skills in a nonverbal adolescent presented with ASD.

CASE PRESENTATION

This research was approved by the Research Ethics Committee of the Federal University of Pernambuco, Brazil, under evaluation report no. 4.692.479, CAAE no. 48157221.3.0000.5208. The participant’s guardian signed an informed consent form at an SLH office in a private clinic in Recife.

HMG, a male adolescent aged 14 years and 9 months, was diagnosed with ASD by a pediatric neurologist and a pediatric psychiatrist when he was 2 years and 6 months old. Therapeutic interventions, including SLH therapy, began at the age of 3 years. The family reported that he acquired his first functional sounds before 1 year old, producing onomatopoeias (animal sounds), and emitted his first words near 1 year old.

However, after 3 years old, he gradually lost his speech skills (regression). Since then, he underwent various therapeutic SLH, occupational therapy, psychology, pedagogy, psychomotricity, and physical education interventions.

HMG did not verbalize and only vocalized a few nonfunctional sounds. He communicated by guiding the other person's hand to the desired object and nodding (yes) or shaking his head (no).

He was introduced to the Picture Exchange Communication System® (PECS®) when he was a child but had no gains with it, not even asking for things. The family reported that they had difficulties employing this communication resource functionally in their everyday lives.

He was assisted by an SLH therapist, an occupational therapist, a pedagogue, and an educator. His hearing thresholds were normal, and he had no comorbidities.

The adolescent's communication was assessed with the Communication Assessment in Autism Spectrum Disorder (ACOTEA, in Portuguese), a protocol with 36 items whose scores range from 0 to 3 (0 = never; 1 = sometimes, 2 = often, 3 = always) – except for the questions on tantrum, stereotypy, hypersensitivity, and hyperfocus, whose scores are inverted (0 = always; 1 = often; 2 = sometimes; 3 = never). It analyzes aspects of expressive and receptive communication and social behavior. The item scores are added, and the final one ranges from 0 to 96 – the higher the score, the better the child's functional communication performance.

To fill out the protocol, the SLH therapist must establish communicative situations with the subject (action and reaction games, dolls and action figures, cars, balls, shape sorters, electronic applications and games, books etc.).

After four assessment sessions, it was found that the adolescent would rather be alone and was uninterested in games and activities, except for watching and listening to music videos on YouTube. As for pragmatic functions, he did not point to things or verbalize to ask for anything at any moment during sessions. To get what he wanted, he simply took it from the SLH therapist's hands. Neither did he use social expressions or ask for information. He emitted nonfunctional vocalizations, with two to three different sounds characterized as echolalia. He also quite frequently had motor stereotypy (hand flapping), and his hands were always looking for objects with textures.

He would look to the SLH therapists when called and respond to simple commands, though he responded inconsistently to "stop" and "no". He would throw a tantrum with self-harming behavior (biting his hands) when challenged but was interested in interacting with the therapist, looking at her, smiling, and pulling her arm to follow him.

The DHACA communication book with tabs was used in weekly interventions at HMG's home, in two individual 1-hour sessions, as shown in Chart 1 (which describes the activities and their frequency). Also, his mother and the team of pedagogues and occupational therapists were instructed on how to continue using DHACA in subsequent sessions in the environments the adolescent attended, especially at home and school.

Chart 1. Description of activities and their frequency

Activity	Frequency
Sessions per week	2 sessions a week: Mondays and Friday
Session time	Mondays: 1 hr and 20 min Fridays: 2 hr 20 min
Intervention setting	Mondays: at home Fridays: at school. Activities along with therapy companion.
Meetings with parents and the team	46 meetings lasting approximately 1 hour each.

The version of the communication book that was used (Annex A) had 66 pictograms of essential vocabulary on a single page. It also had smaller separate overlapping pages with a row of 10 pictograms of secondary vocabulary each, arranged per lexical category, gradually introduced throughout the therapeutic process.

DHACA aims to progressively develop communication skills by using AAC, as follows:

- Making requests with separate pictures – constructing sentences with I + want + a separate word. The child should be able to ask for something near the interlocutor pointing to the pictures corresponding to I + want (in the book) + what they want (separate picture). The sentence is constructed sequentially as the subject points to the pictures, possibly accompanied by speech. They must be able to use up to four separate pictures before beginning to acquire the next skill.
- Making requests with secondary vocabulary – constructing sentences with I + want + a word in the book. The child should be able to ask for something distant from the interlocutor, pointing to the pictures corresponding to I + want + a picture in the secondary vocabulary. The sentence is constructed sequentially as the subject points to pictures, possibly accompanied by speech. They must use it with interlocutors in different contexts before beginning to acquire the next skill.
- Making requests with expanded lexicon 2A or 1EA – constructing sentences with I + want + two words. The child should be able to form sentences with the pictures corresponding to I + want + another two pictures (including articles, adjectives, and numerals). The sentence is constructed sequentially as the subject points to pictures, possibly accompanied by speech. They must use it with interlocutors in different contexts before beginning to acquire the next skill.
- Asking for information/making comments – constructing sentences with four or more words. The child should be able to form sentences with four or more words, ask questions, make comments, or ask for something with four or more words. The sentence is constructed sequentially as the subject points to pictures, possibly accompanied by speech. They must use it with interlocutors in different contexts before beginning to acquire the next skill.
- Narrative – constructing narratives. The child should be able to develop a sequential narrative while pointing to pictures, possibly accompanied by speech. They must use it with interlocutors in different contexts.

The method approach in this study was to develop the first four skills: constructing sentences with “I want” plus a word, constructing sentences with “I want” plus two words, constructing sentences with four or more words, and constructing narratives.

To develop the first skill – **“requesting with a separate picture”** –, the subject is stimulated to ask for the item they want by constructing sentences with I + want + a separate word. To acquire this skill, the child must be able to ask for something near the interlocutor by pointing to the pictures I + want (in the book) + a separate picture of what they want. The pictures were initially placed with paper clips on the page with the essential vocabulary. When the adolescent was already using four separate pictures, he advanced to the second skill – **“requesting with secondary vocabulary”**. The separate pictures were replaced with the secondary vocabulary pages (tabs); each tab had up to 10 pictograms, arranged per lexical category. In this stage, he was encouraged to construct sentences with I + want + a word in the secondary vocabulary in the book.

The sentences were constructed sequentially, as the subject pointed to pictures, possibly accompanied by speech. The adolescent’s preferences were analyzed (foods, electronics, books) and then the corresponding pictograms were placed in the secondary vocabulary tab in the communication book. Also, the activities were selected so that these pictograms would be used in the session.

During the activities, HMG’s items of interest were placed in his visual field, and he was encouraged to ask for something by pointing to the pictograms in the communication book that referred to the sentence I + want + word – e.g., “I want jellybean”.

At first, physical cues were used to teach the skill to the adolescent; then, they were gradually replaced with visual and verbal cues. The therapist also used modeling, a strategy in which the interlocutor demonstrates the construction of the desired sentence, thus giving a model until the subject requests without any cues. The desired item was handed to the adolescent after he asked for it by using the communication book.

It is important to point out that, as the therapists gathered reports and assessments, they identified

that HMG had visual discrimination difficulties. In some cases associated with high motivation, he could discriminate and choose the item presented in the secondary vocabulary, whereas, at other moments, he had a low performance, seemingly pointing to any item, not recognizing the right one. Other related behaviors were his difficulty maintaining attention during activities and his intense motor stereotypy with the hands.

Advancing to the third skill requires the generalization of the second one – i.e., using it with various communication partners in different contexts. In this regard, the participation of the family and therapists was essential.

In the third skill – **“requesting with expanded lexicon 2A or 1E1A”** –, the adolescent was encouraged to construct sentences with I + want + two words. The new skill was taught with physical, visual, and verbal cues, which were likewise gradually removed. Since “food” was one of his preferred items in the sessions, the SLH therapist modeled the use of the verbs to eat and to drink – e.g., I + want + to eat + popcorn.

Besides stimulating requests with two words, the modeling strategy was used to develop a lexicon on self-care and feelings, as well as the use of other verbs (e.g., open, feel, finish, wait, and help), which were employed in pragmatic functions in his routine to ask for help, accept intervals/waiting, and taking turns (“my turn”). The adolescent began showing interest in and using these verbs (though inconsistently), thus expanding the use of communication functions.

After the third skill, HMG had difficulties choosing items. The pictograms he chose often did not correspond to the foods that were exposed, making evident his discrimination difficulties.

The family asked to have the communication book implemented with a high-technology system because the adolescent was interested in electronic devices. After analyzing the possibilities, it was decided to use REAACT, an application whose structure is similar to that of the communication book, enabling the use of vocalizers with specific software, and ensuring great communication effectiveness. The application was installed on a tablet computer – on which it was the only accessible tool, so the subject could understand that the device would only be used for communication, rather than other purposes.

Hence, after 10 months of intervention (November 2020 to September 2021), the transition began from the low-technology book to REAACT. After 4 months of using REAACT (a mean of 25 intervention sessions), the

patient was assessed with ACOTEA, which identified progress in the following items: imitation, the direction of gaze, comprehension of simple commands, offering objects, requesting, demonstrating, protesting, responses to “no”, shared attention, affectivity, and eye contact, as well as a decrease in tantrums and stereotypies. On the other hand, the expressive communication score was lower, especially in the following items: showing affection and interest in other people, calling the other person’s attention, asking for something that had never been offered, showing something, asking for help, and naming objects. Therapists initially used high-technology boards to model sentences, though always making the paper book available to the adolescent. As HMG increased his interest in the application and began trying to use it, only the high-technology book on the tablet was used. “Greetings” were included in the secondary vocabulary in the application, enabling HMG to greet in different ways, improving his social skill performance, especially in places he regularly attended, such as the school. This skill stood out the most with the application and was often used at school, exploring as many communication opportunities as possible with his classmates and school workers.

REAACT was used in the adolescent’s communicative exchanges for only 4 months, as his frustration, irritability, self-harming (biting his hands), and harming others (pinching) noticeably increased as he used it. These inadequate behaviors occurred when the device did not identify HMG’s touch on the pictograms on the screen that corresponded to his intention, which would be used in the sentence structure I + want + word, possibly because he touched it lightly and quickly and therefore imprecise to the system. As previously mentioned, the adolescent had expressive fine motor difficulties, which hindered his communication progress with the high-technology DHACA book. Thus, its use was discontinued.

When he returned to the low-technology resource, the adolescent’s communication was less interactive. Therefore, the therapist invested more in fun activities that interested him in combination with communicative exchanges, using nouns, verbs, and adverbs related to his favorite items.

This case study initially used modeling with some keywords such as want, be, go, open, take, eat, drink, finish, stop, turn on, like, help, more, my turn, no, yes, now, later, inside, and outside. The therapists or relatives spoke to the adolescent while pointing to the pictograms, reinforcing his receptive language, and

helping him learn new concepts (expanded vocabulary), new morphosyntactic formations, and different communicative functions.

The models to exemplify how adolescents should construct linguistic structures were often used to make requests with 2 A or 1E1A. This occurred at various moments when he did not adequately produce the desired sentence, with verbs, adverbs, and interrogative pronouns of the essential vocabulary. Therapists and relatives would repeat the sentences the adolescent wanted to make, giving him a model, besides including those words in the conversation with him, whether making comments, naming things, asking, or requesting. For instance, in a situation when the SLH therapist said, "We finished the potatoes" pointing to the pictograms, HMG was supposed to answer "I want to eat potatoes", but he only answered "I want potatoes", pointing to the pictograms. Then, the therapist gave him the model, pointing to the pictograms and saying "Right, you want TO EAT potatoes. Let's get some?".

Since adolescence is characterized by various levels of physical, psychological, and social changes, feelings and facial expressions were included in the activities. He increasingly often responded with, "I + am + feeling", expressing his state which frequently referred to family situations.

During sessions, the SLH therapist allowed family participation, encouraging and instructing them on how to correctly use the communication book and modeling and the importance of making the book always available, in a place where he could easily get and take it wherever they would go. Every fortnight, professionals of the various areas that attended HMG and his family met to discuss his progress and strategies

to increase the adolescent's exposure to the resource, thus providing a model of how to use and potentialize learning. There were sessions intended to give specific instructions to the family as well.

At these moments, they also suggested activities to do at home, aiming at the goals for the skills they were working on, ensuring further stimulation opportunities. The family accepted well the activities suggested throughout the intervention, though they did not always do them in their routine.

The research lasted 18 months, which was the time of data collection. ACOTEA was applied three times in the process to follow up systematically on the results and progress.

RESULTS

This study focused on the development of communication skills using AAC and highlighted the results of ACOTEA-1 applied at three moments.

The results point to advancements in communicative and behavioral skills after the intervention sessions using the robust communication system. The ACOTEA item with the greatest variation between the first, second, and third applications was receptive communication, which progressed from 50% to 66.60% and then 83.30% in the final one; it was followed by social behavior, from 45.80% to 70.80% and then 75%. Expressive communication increased from 38.3% to 46.60% from the first to the second application but then decreased to 41.60% in the third application. This decrease can be probably explained by the introduction of REAACT, as the adolescent had fine motor coordination difficulties and many hand stereotypies (Figure 1).

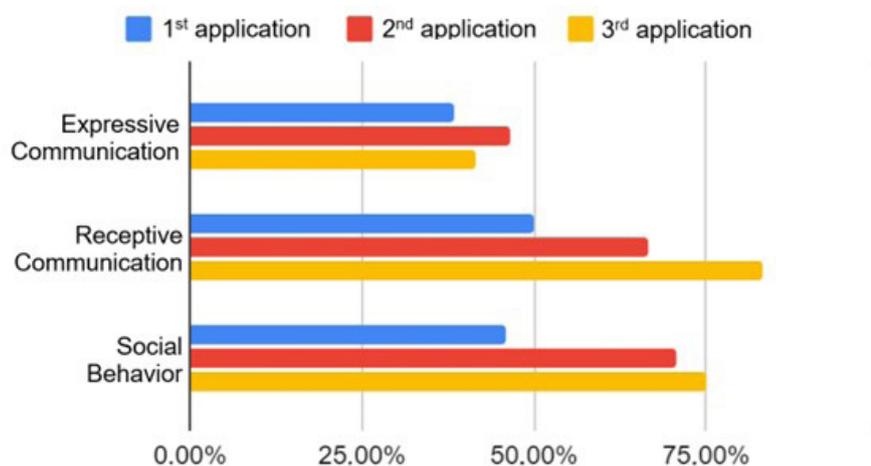


Figure 1. Descriptive chart of ACOTEA-1 results in the 1st, 2nd, and 3rd interventions

The analysis of expressive communication (Figure 2) showed that AAC helped improve some communicative functions, despite the difficulties of using REAACT. He progressed in asking for things,

asking for continuity, and sharing or offering things, demonstrating an important increase in intentionality and shared attention, which is required for communication.

Expressive Communication

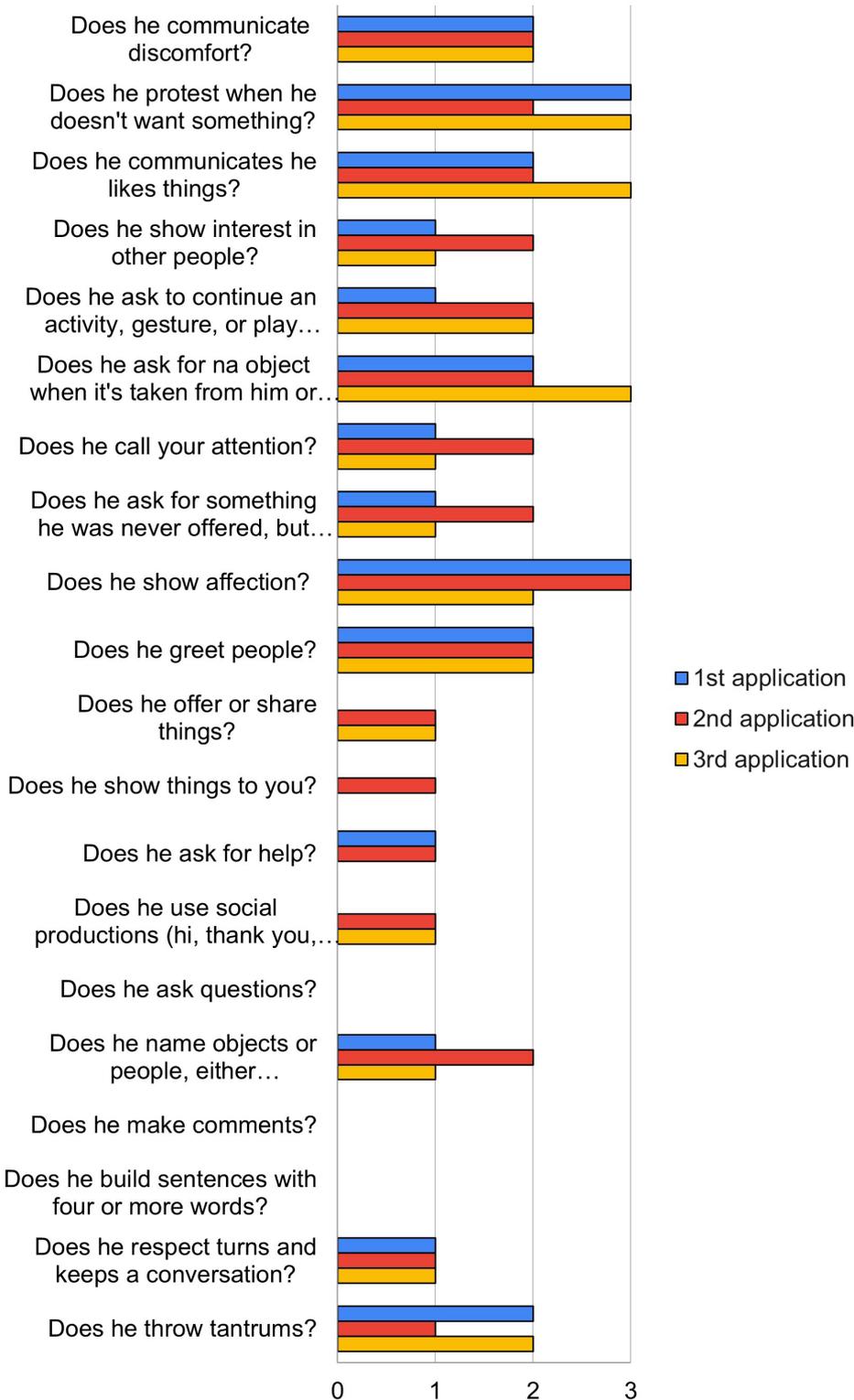


Figure 2. Descriptive chart of ACOTEA-1 expressive communication results in the 1st, 2nd, and 3rd interventions

Receptive communication (Figure 3) developed in all communicative functions, especially in directing

the gaze and comprehending and carrying out simple commands, whose frequency of use varied by 25%.

Receptive Communication

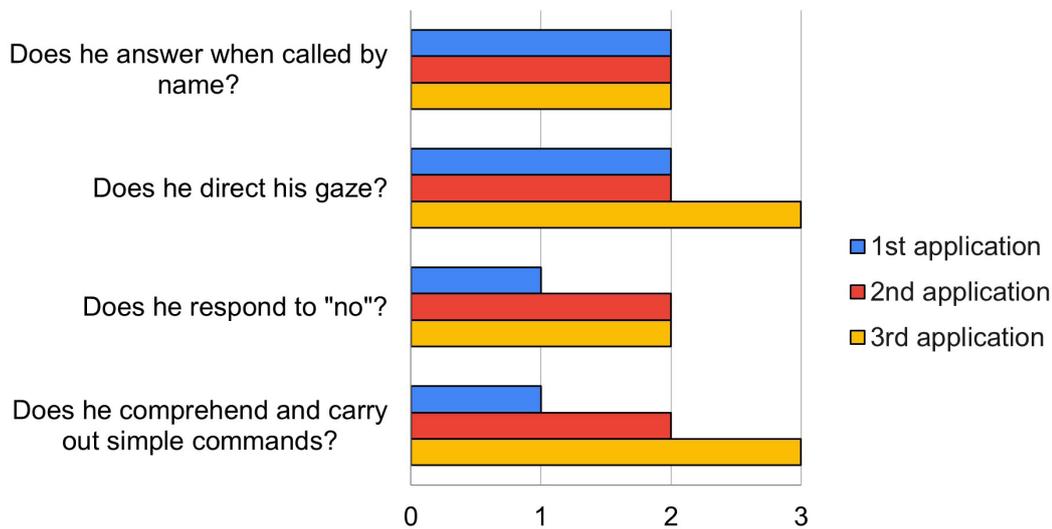


Figure 3. Descriptive chart of ACOTEA receptive communication results in the 1st, 2nd, and 3rd interventions

AAC use also favored the development of social behavior (Figure 4), with a 25% increase in the

frequency of the use of imitation, shared attention, and engaged play.

Social Behavior

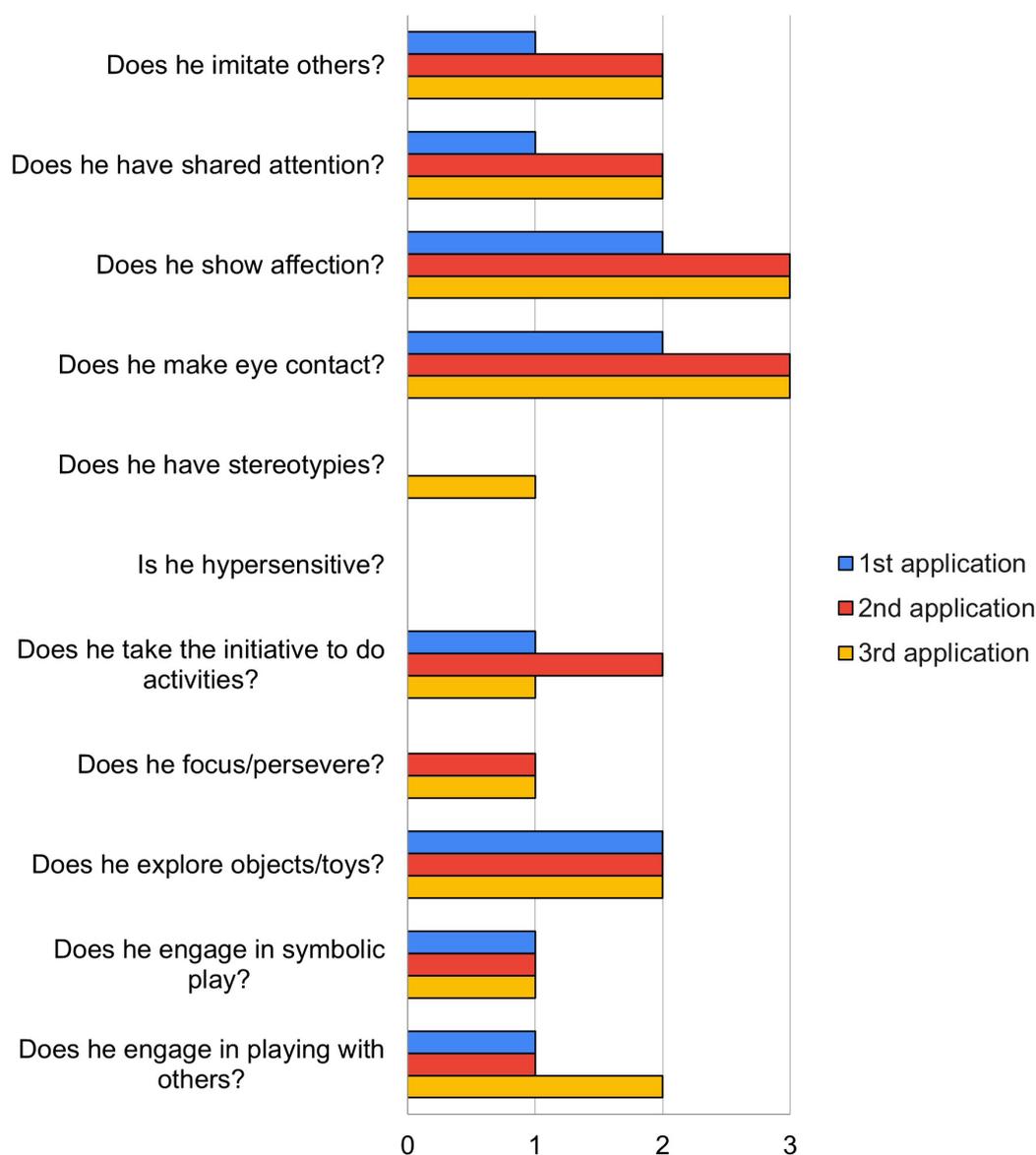


Figure 4. Descriptive chart of ACOTEA social behavior results in the 1st, 2nd, and 3rd interventions

DISCUSSION

Data obtained after applying ACOTEA-1 three times demonstrate that the SLH intervention using the robust AAC system helped develop expressive and receptive communication and behavior skills, with emphasis on receptive skills. The authors of a study that used a robust alternative communication system also described findings in which such a system helped develop all skills, particularly those of receptive language⁶.

Interventions with AAC change communicative and behavioral aspects, with more evident results

in communication skills than in other categories⁷. Other studies demonstrate the benefits of AAC in promoting communicational accessibility of subjects with ASD, with significant progress in communicative competencies^{5,8}.

The analysis of data on expressive communication skills showed that “requesting for something to continue” progressed from “sometimes” in the first application to “often” in the second and third applications. Likewise, the frequency of “asking for an object that was taken from him” varied positively, from “often” in the first and second applications to “always” in the third one. These results demonstrate progress in the

adolescent's intentionality in sharing his interest with the communication partner, showing skills in shared attention response, and outlining a common attention focus⁹.

The results also point to growth in shared attention initiative in situations when the adolescent spontaneously directed the attention of his communication partner to an object of his interest – i.e., without the adult having asked to share the interest in the said situation. Using AAC expands the use of shared attention initiative responses, besides helping develop functional skills¹⁰.

The robust communication system favors the child's comprehension of the adults' intentional actions directed at the child, triggering shared attention and other receptive and expressive communication skills⁶. These data corroborate another study that used AAC in home interventions for adolescents with ASD, which reported progress in expressive language with communicative intention and enough expressive vocabulary to convey needs and desires⁵.

Before using the AAC book, “asking for something that had never been offered” was manifested through eye contact or pulling the other person, with nonverbal communicative actions. On the other hand, after using the robust AAC system, the adolescent used this skill more often and asked while pointing to the AAC book, without speaking. Likewise, “calling the other person's attention” varied positively, as seen in Figure 3, indicating the development of communicative skills after the intervention with the robust AAC system⁶.

These data corroborate a study that assessed the effects of using an AAC program at home by training relatives of nonverbal adolescents with ASD and/or with nonfunctional speech. It demonstrated progress in their expressive language, with an increase in the number of figures they used to communicate something they needed or wanted or to inform something; these figures were used with communicative function⁶.

Further, on expressive communication, it was found that the adolescent progressed by having social interaction initiatives, “offering or sharing things” and “showing something”, which did not happen before the intervention. This result shows progress in socioemotional reciprocity, increasing social motivation in interactive situations. This information is relevant, as young people and adults with ASD tend to be at greater risk of depression¹¹.

The use of social production appeared in the second and third interventions (Figure 2), a skill that the

adolescent did not use to have but developed by using AAC. This is another relevant information, given the increase in socialization experiences in adolescence and consequently, more social demands. Hence, the development of expressive skills helped the adolescent socialize.

As for receptive communication skills, ACOTEA-1 data (Figure 4) showed progress in almost all subitems, such as “directing the gaze”, “responding to no”, and “comprehending and carrying out simple commands”, in which the adolescent respectively progressed by 50%, 25%, and 50% from the first to the third application (Figure 3). Before the intervention with AAC, the adolescent had difficulties in obeying verbal commands; the communication partner had to use gestures, such as pointing. After the intervention, there was evident development of receptive communication skills.

A scoping review aimed to map the evidence on supported or non-supported AAC use on the receptive language of children with developmental disabilities. Its authors conclude that high-quality studies suggest that expanded exposure to the AAC system (i.e., with various simultaneous stimuli, such as visual and auditory) can help these children's receptive language development. However, they report that the studies focused on learning vocabulary with a single word or symbol and emphasized predominantly expressive language rather than receptive language development. Hence, they identified a gap regarding the effects of interventions with AAC on morphological, syntactic, and discursive comprehension¹².

These findings diverge from those in the present study, in which the communication partner used the robust communication system and the modeling strategy, constructing sentences in natural contexts and various situations – which favored both expressive and receptive development in pragmatic, semantic, and morphosyntactic aspects.

Although the adolescent maintained the same frequency of “responding to his name”, an important aspect was that there was no skill regression. Generally, using the AAC system increased his responsiveness in social interaction.

Concerning social behavior skills, ACOTEA-1 data demonstrated an increased frequency of imitation, engaged play with the other person, and eye contact. In general, the increased set of social skills helps develop expressive communication skills. Data point to the relevance of using AAC, since imitation is a predictor of

expressive language in older children and adolescents with ASD¹³.

The authors of a systematic review that investigated interventions with AAC for adolescents and adults with ASD highlight that such interventions proved to be highly effective in this population. They also point out that, despite the relevance of early intervention, older subjects also benefit from interventions with AAC¹⁴.

An important aspect to point out is the use of physical cues and modeling when teaching new skills, then gradually removing them as the child acquired the skill. Using physical, visual, and/or verbal cues increases the effectiveness of teaching new skills to children with ASD, ensuring greater comprehension and motivation to do activities, as it is easier for these subjects to interact with visual stimuli³. People with ASD of various age groups can interact more easily with visual stimuli (i.e., perform better in visual processing), benefiting from the use of concrete stimuli with visual cues – which increase comprehension and participation in activities¹⁵.

Furthermore, all therapists used the same alternative communication resource as the SLH therapist. The family also used the book often in their daily routine, and the adolescent took it to the other environments he attended, such as school. Parents are essential in the therapeutic process, enabling the use of models and access to resources and support, which potentializes the intervention. Family engagement ensures that the therapeutic goals are extended to their homes, providing greater communicative and social synchronicity and contingency e social between the child and interlocutors, empowering the family, and decreasing their emotional overload¹⁶.

FINAL CONSIDERATIONS

The results of this study point out that using alternative communication helped develop communication skills in this adolescent with ASD that underwent the treatment. The main findings include progress in communicative intention, favoring the development of functional communication, verified by the increase in receptive and expressive communication skills.

Communication partners used the robust system and modeling strategies to construct sentences in natural contexts and various situations. This allowed the adolescent to learn new concepts and develop expressive and receptive communication in pragmatic and morphosyntactic aspects.

Since this is a case report, further studies using the robust communication system with larger samples of adolescents with ASD should be conducted to better observe the gains found in this study and make it possible to generalize the results. The scarcity of studies addressing interventions with AAC in adolescents with ASD, hindering the comparison of the results with that of other similar samples, can also pose a limitation.

Despite the shortcomings of this study, the results indicate evidence of the development of communicative skills and progress in social behavior by using the DHACA robust communication system. It can be promising to carry out studies on interventions for adolescents with ASD emphasizing the training of their families and other communication partners to effectively use the AAC resource in natural contexts, enabling greater opportunities to learn and develop communication skills.

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Author contributions:

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GAL: data curation and writing;

DAAM: data collection, investigation, data curation, and writing;

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IALNX: article writing, review, and editing;

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ANNEX A. DHACA COMMUNICATION BOOK

