

Contributions of alternative communication in the development of communication in children with autism spectrum disorder

Contribuições da comunicação alternativa no desenvolvimento da comunicação de criança com transtorno do espectro do autismo

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ABSTRACT

This article demonstrates the benefit of using a high-tech Augmentative and Alternative Communication (AAC) system in the development of the communication skills of a child with Autistic Spectrum Disorder (ASD). A case study was carried out with a two-year-and-two-month-old child during 24 therapy sessions over 8 months. As assessment instruments, the Autism Treatment Evaluation Checklist (ATEC) and the protocol for Communication Assessment in Autism Spectrum Disorder (COATEA) were used. During the interventions, the Development of Communication Skills in Autism (DCSA) method was used and, as an AAC resource, the high-tech board from the aBoard app. Postintervention results showed improvement in the scores of the evaluation instruments for expressive skills, comprehension, and social interaction. The child's vocabulary also increased, with the acquisition of new lexical categories; initiative to request objects beyond his visual reach with the AAC; and better social communication in the family and educational context. The results point to contributions of the use of a high-tech assistive system of AAC in the development of communication skills of a child with ASD.

Keywords: Autism Spectrum Disorder; Augmentative and alternative communications systems; Assistive technology; Speech, Language and Hearing Sciences; Child language

RESUMO

Este artigo apresenta as contribuições do uso de um sistema de Comunicação Aumentativa e Alternativa de alta tecnologia no desenvolvimento das habilidades comunicacionais de uma criança com Transtorno do Espectro do Autismo (TEA). Para isso, foi realizado um estudo de caso com uma criança de 2 anos e 2 meses, durante 24 sessões de terapia, ao longo de oito meses. Como instrumentos de avaliação, foram utilizados o *Autism Treatment Evaluation Checklist* e o protocolo Avaliação da Comunicação no Transtorno do Espectro do Autismo. Durante as intervenções, utilizou-se o método Desenvolvimento das Habilidades Comunicacionais no Autismo e, como recurso de Comunicação Aumentativa e Alternativa, a prancha de alta tecnologia do aplicativo *aBoard*. De acordo com os resultados, após as intervenções foram observadas melhoras nos escores dos instrumentos de avaliação, quanto às habilidades de expressão, compreensão e interação social. Além disso, observou-se aumento do vocabulário da criança, com aquisição de novas categorias lexicais; realização de solicitações de objetos fora do alcance visual, utilizando a Comunicação Aumentativa e Alternativa, e melhor comunicação social no contexto familiar e educacional. De acordo com os resultados obtidos, puderam ser observadas as contribuições do uso de um sistema de alta tecnologia assistiva de Comunicação Aumentativa e Alternativa no desenvolvimento das habilidades comunicacionais de uma criança com TEA.

Palavras-chave: Transtorno do Espectro Autista; Sistemas de comunicação alternativos e aumentativos; Tecnologia assistiva; Fonoaudiologia; Linguagem infantil

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INTRODUCTION

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition with an increasing number of cases. It is characterized by persistent deficits in communication and social interaction, and restricted and repetitive patterns of behavior, interests, or activities⁽¹⁾.

The first symptoms of ASD are mostly identified by family members and caregivers, and communication difficulties are one of the main reasons of concern for parents^(2,3). Delays in language acquisition and development are common in individuals with ASD, who may present linguistic impairment in morphology, phonology, syntax, semantics, and pragmatics⁽³⁾.

Among the intervention proposals for the development of functional communication in children with ASD is Augmentative and Alternative Communication (AAC). This communication system provides a variety of techniques, resources, and strategies to temporarily or permanently compensate and facilitate the communication and interaction of people with complex communication needs⁽⁴⁾.

Aiming to increase communication skills using the AAC, the Development of Communication Skills in Autism (DHACA) method was adopted, which has as theoretical presupposition the sociopragmatic approach of Tomasello⁽⁵⁾.

The DHACA describes the communication skills that must be developed and the goals for achieving it. It has two versions: one to be used with the communication board with moving figures; and another for the communication board with fixed figures, the flipbook. Both versions can be applied with low- or high-tech resources⁽²⁾.

This study used the high-tech resource, with the aBoard⁽⁶⁾ application. This application is part of a computational platform for AAC that is based on pictograms and developed to help people with complex communication needs. The graphical interface of aBoard has two main areas: one to display vocabulary, which can be customized by mediators (e.g., health/education professionals or family members) in an editor available on the platform; and another to build sentences, which allows to visualize the communication construction process. Noteworthy, the application provides visual and audible feedback when selecting any pictogram or other buttons, which works as a reinforcement for the user.

Studies show the effectiveness of high-tech AAC intervention in expanding functional communication in people with ASD^(5,7). However, Brazil lacks research on AAC, especially with regard to the use of high-tech devices⁽⁵⁾. Therefore, this case report aimed to demonstrate the impact of using a high-tech alternative communication system on the development of communication skills in a child with ASD.

PRESENTATION OF THE CLINICAL CASE

This research was approved by the Research Ethics Committee of the Federal University of Pernambuco (CEP-UFPE), under number 2,106,800. The research was conducted at the Speech Therapy Clinic of UFPE, in Recife city, Pernambuco State, Brazil. It is a longitudinal case study of a two-year-and-two-month-old male child diagnosed by a child psychiatrist with Autism Spectrum

Disorder (ASD) according to the criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5)⁽¹⁾.

The child's mother, directly responsible for him, responded to an initial interview. She was given explanations about the project, with the presentation and signature of the Informed Consent Form.

The interview analyzed biopsychosocial aspects of the child, from pregnancy to the present. According to the mother's report, there were no complications during pregnancy or childbirth (cesarean). Family history included a cousin diagnosed with ASD. As for feeding, the child was breastfed until 4 months of life, with a history of gastroesophageal reflux from 3 to 18 months of age. Moreover, the patient had a difficulty in food transition, refusing to eat soft foods. The beginning of verbal production occurred at 12 months ("vovó", or grandma; "titi"; or auntie; "vovô", or grandpa; "mainha", or mommy), then this ability decreased. According to the mother, at the time of the interview, he could only speak the numbers "one" ("um"), "three" ("três"), "ten" ("dez"), and the word "car" ("carro"). There was no report of motor development delay, self-care activities were performed with the help of an adult, and the child still did not have sphincter control. The mother reported that the child was agitated, sometimes aggressive, that he would tantrum when irritated and that he was hypersensitive to loud sounds, covering his ears with his hands on these occasions.

The second meeting included the application of the project's Indirect Preference Assessment protocol, which consists of an interview script to investigate the child's preferences for activities, toys, and social routines to be used during therapy. According to the mother, the child liked the ball, car, and water. He was also interested in the odor, texture, or parts of objects, and in repetitive activities such as turning and lining up toys, and preferred to play alone.

The second meeting also included the application of the Autism Treatment Evaluation Checklist (ATEC)⁽⁸⁾ protocol, developed for children over 2 years of age. The ATEC is a questionnaire that must be answered by parents and is composed of 4 subscales: 1) Speech, Language, and Communication (14 items with scores between 0 and 28); 2) Sociability (20 items with scores between 0 and 40); 3) Sensory and Cognitive Perception (18 items with scores between 0 and 36); 4) Health, Physical Aspects, and Behavior (25 items with scores between 0 and 75).

In total, the ATEC comprises 77 items with scores ranging from 0 to 180, where lower values are better. In this clinical case, the ATEC was answered by the parents during an interview mediated by the researcher. The initial score obtained was 85.

For the assessment of communication skills, the pilot protocol Communication Assessment in Autism Spectrum Disorder (ACOTEA) (Annex 1) was applied, which has 34 questions on expressive and comprehensive communication and social behavior. Thus, the score ranges from 0 to 34, in which the higher the score, the better the performance of functional communication.

For its completion, it is necessary that the therapist seeks to establish communicative situations with the child through playful activities, using toys and activities of interest according to the Indirect Preference Assessment protocol. The evaluation took place in two weekly sessions of forty minutes each, with the presence of the main therapist and an assistant, in addition to an intern who followed the procedures through the observation mirror, recording her impressions. The protocol

was completed by the group after the sessions and the initial score obtained was 10.

The information obtained in the interview and assessment protocols enabled the elaboration of the intervention plan. This plan relied on the DHACA method and included the use of the high-tech resource — tablet, with the alternative communication board of the aBoard application — adapted for gradual insertion of the pictograms considering the communicative skills to be developed.

Twenty-four sessions were held, twenty of which were for intervention and the others for interviews and evaluation. The sessions took place weekly, lasting forty minutes each. The room in which these sessions took place had a rubber mat on the floor, which was the space intended for the activities, in addition to a table with three chairs, a two-door cabinet with toys, a sink, and an observation mirror on one wall of the room. The head therapist and an assistant were always present in the activities.

The intervention started with the stimulus of the CFEQXID skill (Brazilian acronym for “Sentence Construction with I + Want + a word on the board”) of the DHACA⁽²⁾ method, which was acquired in the third session. The next four sessions promoted the generalization of this skill and the expansion of vocabulary. Then the university had a six-week recess.

After recess, from the eighth session onwards, the professionals promoted the development of the CFEQXXID skill (Sentence Construction with I + Want + two words). The skill was acquired after three sessions and was generalized using other pictograms of different lexical categories until the twelfth session of the intervention, when the development of the CF4OP skill (Construction of Phrases with Four or More Words) began. After four sessions, the distribution of pictograms was reorganized due to the diversity of folders with lexical categories, with consequent return to the previous skill (CFEQXXID) so that the child could adapt to the new configuration. The CF4OP skill was resumed in the eighteenth session and was generalized in the twentieth session.

The child did not use the tablet for three sessions due to device system update. During this period, however, he achieved a good performance using low-tech resources. Around the seventeenth session, the child verbalized phrases with three words without using the tablet, such as “I want lego” (“*eu quero lego*”) and “where is the wheel?” (“*cadê a roda?*”). Notwithstanding, if he could use the high-tech AAC feature, he would verbalize sentences with four or more words.

The sessions included strategies to facilitate the learning of communication skills with the communication board. Some examples of these strategies are the use of activities selected according to the child’s preferences and the use of physical, visual, and/or verbal cues according to his needs.

It is also worth mentioning the use of the modeling strategy, in which the therapist used the AAC board to communicate with the child or with another interlocutor, providing the child with a reference. The strategy was also used by his parents at home.

At the end of each session, the parents received information about the activities performed and guidance on how to continue at home, enabling generalization in different environments, in addition to the therapeutic. The parents either observed the sessions periodically through the observation mirror in the room while the auxiliary therapist guided the procedure, or they were invited to participate in the session.

Considering the importance of the family in the therapy, periodic meetings were held with parents to clarify any doubts. In this reported case, working together with the parents, who were engaged and participative, significantly contributed to the child’s evolution.

At the end of the intervention period, the child used the tablet to request objects out of his visual range and acquired several semantic-lexical categories: animals, food, toys, cartoons/YouTube channel, activities of daily living, colors, letters, numbers, greetings (social expressions), places, and adverbs of place.

According to the mother’s report, other relevant aspects were the higher quality of socialization with other children in the educational environment and a more efficient communication with the child. This resulted in a better understanding of his requests for an object, food, or his requests to use the bathroom or take actions with regard to personal hygiene.

Quantitative data also pointed to the positive impact of the intervention. The results obtained from the application of the ATEC protocol showed a change in the score, reaching 76 on a scale from 0 to 180, which corresponds to a decrease of 9 points in relation to the initial score. It is noteworthy that in ATEC, the lower the score, the better the result. Thus, the variation obtained corresponded to an improvement of 12% in relation to the initial score.

This study, which emphasized the development of communication skills using AAC, highlighted the results of the ATEC subscale Speech, Language, and Communication (Table 1).

The data obtained in the ACOTEA reassessment also indicated advances (Table 2). The score of the reassessment reached 29.5, which represents a variation of 195% in relation to the initial score.

The ACOTEA item that showed the greatest variation between the initial and final assessment was expressive communication, which increased from 5 to 20 points, representing a variation of 300% (Table 3). Receptive communication varied by 75%, and social behavior by 100%.

Table 1. Description of the initial and final responses of the Speech, Language, and Communication subscale of the *Autism Treatment Evaluation Checklist*

PROPOSITION	INITIAL	FINAL
Knows his own name	Not true	True
Responds to ‘No’ or ‘Stop’	More or less	True
Can obey certain orders	More or less	True
Can use one word at a time	Not true	True
Can use 2 words together	Not true	True
Can use 3 words together	Not true	Not true
Knows 10 words or more	Not true	True
Can use sentences with 4 or more words	Not true	Not true
Explains what he wants	Not true	Not true
Asks questions that make sense	Not true	Not true
His language is often relevant/ meaningful	Not true	More or less
Often uses several successive sentences	Not true	Not true
Keeps reasonably good conversation	Not true	Not true
Has normal communication skills for his age	Not true	True
Total ATEC Score [0-28]	26	13

Subtitle: ATEC = *Autism Treatment Evaluation Checklist*

Table 2. Initial and final assessment of expressive and receptive communication and social behavior through the application of the Communication Assessment in Autism Spectrum Disorder protocol

EXPRESSIVE COMMUNICATION				
PROPOSITION	INITIAL		FINAL	
Expresses discomfort when in pain, when wet, hungry, or scared	No	0	Yes	1
Protests to show he does not want something	Yes	1	Yes	1
Demonstrates interest in things	No	0	Yes	1
Demonstrates interest in other people	No	0	Yes	1
Asks for continuity when an activity, gesture, or play is interrupted	Yes	1	Yes	1
Makes a request when an object is removed or when he wants another food	No	0	Yes	1
Calls for your attention	Yes	1	Yes	1
Asks for something that you have never offered, but that is within his visual, auditory, or tactile range	No	0	Yes	1
Requests objects that are not in sight	No	0	Yes	1
Expresses affection and care	Yes	1	Yes	1
Greets people	No	0	Sometimes	0.5
Offers or shares things	No	0	Yes	1
Shows something to you	No	0	Yes	1
Uses social interactions (“hi”, “thank you”, “bye”)	No	0	Yes	1
Asks questions	No	0	Yes	1
Names objects or people, spontaneously or in response to your question	No	0	Yes	1
Makes comments	No	0	Yes	1
Uses sentences with four or more words	No	0	Yes	1
Respects shifts and keep a conversation	No	0	Yes	1
DOES NOT tantrum	No	0	Sometimes	0.5
Smiles	Yes	1	Yes	1
Subscale partial [0-21]		5		20
Subscale variation		15 points (300% increase)		
RECEPTIVE COMMUNICATION				
PROPOSITION	INITIAL		FINAL	
Answers by his name	Yes	1	Yes	1
Gazes when you point at, look, or show something	Yes	1	Yes	1
Responds to “no”	No	0	Sometimes	0.5
Understands and executes simple orders	No	0	Yes	1
Subscale partial [0-4]		2		3.5
Subscale variation		1.5 points (75% increase)		
SOCIAL BEHAVIOR				
PROPOSITION (ACOTEA)	INITIAL		FINAL	
Intentionally chooses something among other objects	Yes	1	Yes	1
Presents shared attention	No	0	Yes	1
Has eye contact	Yes	1	Yes	1
DOES NOT have stereotypies	Yes	1	No	0
DOES NOT have sensory changes (auditory, tactile, visual, aromatic, palatal)	No	0	No	0
Has initiative to carry out some activity	No	0	Yes	1
DOES NOT show fixation on any object, situation, food	No	0	No	0
Plays functionally (with toys or performing more abstract, “make believe” activities)	No	0	Yes	1
Plays enthusiastically with another person	No	0	Yes	1
Subscale partial [0-9]		3		6
Subscale variation		3 points (100% increase)		
ACOTEA Total [0-34]		10		29.5
Total variation		19.5 points (195% increase)		

Subtitle: ACOTEA = “Avaliação da Comunicação no Transtorno do Espectro do Autismo” (Communication Assessment in Autism Spectrum Disorder)

Table 3. Comparative values of the results of the Assessment of Communication in Autism Spectrum Disorder protocol before and after speech therapy intervention

SUBSCALE		INITIAL		FINAL		VARIATION	
Name	Range	Score	Percentage	Score	Percentage	Score	Percentage
Expressive Communication	0-21	5	24%	20	95%	15	300%
Receptive Communication	0-4	2	50%	3.5	88%	1.5	75%
Social Behavior	0-9	3	33%	6	67%	3	100%
ACOTEA Total	0-34	10	29%	29.5	87%	19.5	195%

Subtitle: ACOTEA = "Avaliação da Comunicação no Transtorno do Espectro do Autismo" (Communication Assessment in Autism Spectrum Disorder)

DISCUSSION

Among the data obtained in the interview stand out a report of language regression in individuals with ASD, a common aspect in this disorder. Evidence shows that oral language is the most commonly affected skill, occurring in approximately 25% of these individuals. However, the results of the evaluations showed that language regression did not compromise the development of communicative skills with the use of AAC. This result corroborates a previous study, in which the authors did not find a correlation between the occurrence of oral language regression and subsequent impairment of the social-communicative development of children with ASD⁽³⁾.

The results obtained in the ATEC showed a reduction of 9 points between the initial and final evaluations, representing a positive variation of 12%. In the Speech, Language, and Communication subscale, which comprises aspects of receptive and expressive language, the reduction was 13 points, meaning a variation of 100%. Interventions with AAC show positive results in all the desired behavioral aspects; however, communication skills have greater effects than other skill categories⁽⁹⁾.

As for prelinguistic skills, according to the result presented in the social behavior subitem of ACOTEA, Shared Care (SC), one of the deficit skills in ASD⁽¹⁰⁾, increased after speech therapy intervention with AAC. This skill is fundamental to language development, as it allows the child to understand the other as an intentional agent, consequently understanding the objective of social communication⁽²⁾.

For expressive communication skills, the ACOTEA data showed greater variation, from 5 to 20 points. This result is reinforced by the data that describe the child's evolution, which point that, after the intervention, he started to verbalize and present communication initiatives through spontaneous speech, which did not happen at the beginning of the intervention. In addition, he started to use AAC not only as a protest or request, but also to greet, offer or share things, and express interest in people, that is, for the pragmatic categories of social interaction, described as the most harmed in children with ASD⁽⁴⁾.

Early speech therapy intervention with the use of AAC enabled vocabulary expansion, with gradual inclusion of new lexical categories, also extending the sentence structure. This corroborates a case report that also identified gains in the frequency of verbalizations and the use of semantic and morphosyntactic components⁽¹¹⁾.

Early implementation of AAC is essential for language development, especially for the development of expressive skills⁽¹²⁾. Among the results obtained in the ATEC and ACOTEA stand out the development of mixed communication, that is, the child started to produce sentences with two and three words

together, verbally; however, with the AAC resource, he used longer sentences, of four or more words.

The acquisition of the DHACA CF4OP skill through aBoard allowed the use of more complex sentences, with the construction of more elaborate sentences and an increase in pragmatic functions. In addition to requesting and answering, the child started to ask questions and make comments using functional communication, which did not occur at the beginning of the intervention, when he had a reduced repertoire. This result demonstrates the advance in the skills of the intervention method. The literature still lacks reports on this issue, and it is common to find results that describe only the first phases of the intervention methods, not advancing to the use of more complex language functions⁽¹¹⁾.

The ACOTEA data showed that the child also started to use polite social interactions, such as "hello", "thank you", and "bye", through the use of the device and speech production. This corroborates another case study that used a high-tech resource in the development of communication skills⁽¹³⁾.

The ACOTEA also demonstrated that the child began to express himself and to play functionally and enthusiastically with another person. A similar study was carried out with 58 children who were between 5 and 8 years old, and who had had at least two years of intervention before participation. After six months performing a more naturalistic intervention added to a speech generator device, many of them began to play symbolic games, presenting an increase in expressive language skills⁽¹⁴⁾.

The use of physical, visual, and/or verbal cues also contributed to the acquisition of new skills. The use of concrete tips, such as visual and tactile cues, increases the efficiency of teaching new skills to children with ASD, ensuring greater understanding and motivation to carry out the proposed activities, given the ease these children have to interact with visual stimuli⁽²⁾.

Factors such as family participation as sequencers (taking the activities beyond the clinical environment) and the child's age when starting therapy contributed to the evolution of DHACA skills. Parents are essential in the therapeutic process; when trained and guided, they increase the effectiveness of the intervention⁽¹⁵⁾. Furthermore, early intervention with AAC, especially in the first three years of life, favors the child's language development and ensures communicative initiative and intention. This promotes proper development and interaction in their social contexts, regardless of the time it takes to conquer autonomy through verbal means⁽¹²⁾.

Another favorable aspect to the implementation of AAC and the development of communication skills was the use of the high-tech system. The advantages were similar to those of a review study⁽⁷⁾ that indicated, among other factors, greater flexibility in programming and access to the application. This enables the insertion of pictograms more easily and quickly,

even during daily activities, and every time the need to add vocabulary arises.

Moreover, the sound feedback presented by the app favored the child's speech development. Initially, he presented immediate echolalia to the app's sound stimulus, which included the intonation that was later replaced by spontaneous speech prosody.

Among the limitations of this study stand out the fact that it is a case study, not having a significant sample, in addition to the frequency of intervention sessions, which occurred only once a week. Despite the longitudinal character of the study, the authors could not continue the intervention for a longer period.

Regardless of the results obtained, more research is needed on the use of high-tech AAC systems. It is essential to conduct national studies in this area, addressing the Brazilian culture and reality and the technological resources produced in the country. It is also essential to develop intervention programs that seek to develop more complex communication skills.

FINAL CONSIDERATIONS

The results obtained in this case study, evidenced by the advancement in the skills of the DHACA method and the variation in the ATEC and ACOTEA scores, indicate the impact of using a high-tech AAC system on the development of communication skills in children with ASD. More specifically, the study showed improvements in morphosyntactic, semantic, and pragmatic aspects, as well as in the extension of shared attention and in the quality of social interaction.

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REFERENCES

- American Psychiatric Association. DSM-5: manual diagnóstico e estatístico de transtornos mentais. Porto Alegre: Artmed; 2014.
- Montenegro ACA, Xavier IALN, Lima R. Autismo comunicacional: comunicação alternativa promovendo acessibilidade comunicacional. In: Araújo NA, Lucena JA, Studart-Pereira L, editores. Relatos de experiências em Fonoaudiologia. Recife: Editora UFPE; 2021.
- Backes B, Zanon RB, Bosa CA. A relação entre regressão da linguagem e desenvolvimento sociocomunicativo de crianças com transtorno do espectro do autismo. *CoDAS*. 2013;25(3):268-73. <http://dx.doi.org/10.1590/S2317-17822013000300013>. PMID:24408339.
- Nunes D, Walter C. AAC and autism in Brazil: a descriptive review. *Int J Disabil Dev Educ*. 2020;67(3):263-79. <http://dx.doi.org/10.1080/1034912X.2018.1515424>.
- Tomasello M. *Origens culturais da aquisição do conhecimento humano*. São Paulo: Martins Fontes; 2003.
- Lima T, Silva E, Lima A, Franco N, Fidalgo R. aBoard: uma plataforma computacional na nuvem para comunicação alternativa e educação inclusiva. In: *Anais dos Workshops do Congresso Brasileiro de Informática na Educação*; 2017; Recife, PE. Porto Alegre: Sociedade Brasileira de Computação; 2017. p. 102-9.
- Schirmer CR. Pesquisas em recursos de alta tecnologia para comunicação e transtorno do espectro autista. *ETD: Educação Temática Digital*. 2020;22:68-85.
- Rimland B, Edelson M. *Autism treatment evaluation checklist*. San Diego: Autism Research Institute; 1999.
- Ganz JB, Earles-Vollrath TL, Heath AK, Parker RI, Rispoli MJ, Duran JB. A meta-analysis of single case research studies on aided augmentative and alternative communication systems with individuals with Autism Spectrum Disorders. *J Autism Dev Disord*. 2012;42(1):60-74. <http://dx.doi.org/10.1007/s10803-011-1212-2>. PMID:21380612.
- Zaqueu LCC, Teixeira MCTV, Alckmin-Carvalho F, Paula CS. Associações entre sinais precoces de autismo, atenção compartilhada e atrasos no desenvolvimento infantil. *Psicol, Teor Pesqui*. 2015;31(3):293-302. <http://dx.doi.org/10.1590/0102-37722015032243293302>.
- Monnerat T, Walter CCF. A estimulação precoce e a Comunicação Alternativa para crianças com Transtorno do Espectro do autismo: relatos de casos utilizando o PECS adaptado. In: *Deliberato D, Nunes DRP, Gonçalves MJ, editores. Trilhando juntos a comunicação alternativa*. Natal: ABPEE; 2017. p. 257-72.
- Pires SCF. A comunicação suplementar e alternativa na estimulação precoce para a aquisição da competência comunicativa. In: *Deliberato D, Nunes DRP, Gonçalves MJ, editores. Trilhando juntos a comunicação alternativa*. Natal: ABPEE; 2017. p. 245-56.
- Mohan V, Kunnath SK, Philip VS, Mohan LS, Thampi N. Capitalizing on technology for developing communication skills in autism spectrum disorder: a single case study. *Disabil Rehabil Assist Technol*. 2019;14(1):75-81. <http://dx.doi.org/10.1080/17483107.2017.1413144>. PMID:29241371.
- Chang Y-C, Shih W, Landa R, Kaiser A, Kasari C. Symbolic play in school-aged minimally verbal children with autism spectrum disorder. *J Autism Dev Disord*. 2018;48(5):1436-45. <http://dx.doi.org/10.1007/s10803-017-3388-6>. PMID:29170936.
- Karst JS, Van Hecke AV. Parent and family impact of autism spectrum disorders: A review and proposed model for intervention evaluation. *Clin Child Fam Psychol Rev*. 2012;15(3):247-77. <http://dx.doi.org/10.1007/s10567-012-0119-6>. PMID:22869324.

Annex 1. Communication Assessment in Autism Spectrum Disorder

ACOTEA Communication Assessment in Autism Spectrum Disorder

Name:
Date:
Therapist:

EXPRESSIVE COMMUNICATION	
1.	<p>Expresses discomfort when in pain, when wet, hungry, or scared () YES () NO () SOMETIMES How? _____</p>
2.	<p>Protests to show he does not want something or when something is denied () YES () NO () SOMETIMES How? _____</p>
3.	<p>Demonstrates interest in things () YES () NO () SOMETIMES How? _____</p>
4.	<p>Demonstrates interest in other people () YES () NO () SOMETIMES How? _____</p>
5.	<p>Asks for continuity when an activity, gesture, or play is interrupted () YES () NO () SOMETIMES How? _____</p>
6.	<p>Makes a request when an object is removed or when he wants another food () YES () NO () SOMETIMES How? _____</p>
7.	<p>Calls for your attention () YES () NO () SOMETIMES How? _____</p>
8.	<p>Asks for something that you have never offered, but that is within his visual, auditory, or tactile range () YES () NO () SOMETIMES How? _____</p>
9.	<p>Requests objects that are not in sight () YES () NO () SOMETIMES How? _____</p>
10.	<p>Expresses affection and care () YES () NO () SOMETIMES How? _____</p>
11.	<p>Greets people () YES () NO () SOMETIMES How? _____</p>

12. **Offers or shares things**
 YES NO SOMETIMES
 How? _____
13. **Shows something to you**
 YES NO SOMETIMES
 How? _____
14. **Uses social interactions (“hi”, “thank you”, “bye”)**
 YES NO SOMETIMES
 How? _____
15. **Asks questions**
 YES NO SOMETIMES
 How? _____
16. **Names objects or people, spontaneously or in response to your question**
 YES NO SOMETIMES
 How? _____
17. **Makes comments**
 YES NO SOMETIMES
 How? _____
18. **Uses sentences with four or more words**
 YES NO SOMETIMES
 How? _____
19. **Respects shifts and keep a conversation**
 YES NO SOMETIMES
 How? _____
20. **Does tantrum**
 YES NO SOMETIMES
 When? _____
21. **Smiles**
 YES NO SOMETIMES
 In which situations? _____

RECEPTIVE COMMUNICATION

22. **Answers by his name**
 YES NO SOMETIMES
 How? _____
23. **Gazes when you point at, look, or show something**
 YES NO SOMETIMES
 How? _____
24. **Responds to “no”**
 YES NO SOMETIMES
 How? _____

26. **Understands and executes simple orders**

YES NO SOMETIMES

How? _____

SOCIAL BEHAVIOR

27. **Intentionally chooses something among other objects**

YES NO SOMETIMES

How? _____

28. **Presents shared attention**

YES NO SOMETIMES

How? _____

29. **Has eye contact**

YES NO SOMETIMES

How? _____

30. **Has stereotypies**

YES NO SOMETIMES

How? _____

31. **Has sensory changes (visual, auditory, tactile, palatal, aromatic, vestibular)**

YES NO SOMETIMES

How? _____

32. **Has initiative to carry out some activity**

YES NO SOMETIMES

How? _____

33. **Has fixation on an object, situation, food**

YES NO SOMETIMES

How? _____

34. **Plays functionally (with toys or performing more abstract, "make believe" activities)**

YES NO SOMETIMES

How? _____

35. **Plays enthusiastically with another person**

YES NO SOMETIMES

How? _____