

Linguistic and cognitive evolution of children with language disorder after intervention using the PECS method

Evolução linguística e cognitiva de crianças com transtorno de linguagem após intervenção com o uso do método PECS

Evolución lingüística y cognitiva de niños con trastorno del lenguaje después de una intervención utilizando el método PECS

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Abstract

Introduction: Children with severe communication impairments can benefit from augmentative and alternative communication to enable social interaction and, consequently, cognitive and linguistic development. **Objective:** To compare the linguistic and cognitive performance of children with language disorders, both before and after undergoing therapy whose intervention model was the Picture Exchange Communication System (PECS). **Method:** Hybrid retrospective, cross-sectional study with analysis of the medical records of six children diagnosed with a severe language disorder, aged four to nine years. All the participants were attended weekly throughout four months to implement the PECS protocol. They were

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assessed with the behavioral observation protocol and the receptive language assessment subitem of the language development assessment test. **Results:** Regarding the dialogical skills, four children improved their performance after using PECS – one was already at the highest level assessed in this item before the intervention. There were improvements in the communicative functions and means of communication in four children. Symbolism and gesture imitation were developed in two children, as well as sound imitation in four children. **Conclusion:** Using augmentative and alternative communication with PECS, even for a short period, helped develop communication skills, gesture/sound imitation capacity, and verbal comprehension. Circumstances may directly influence the evolution of the patients' communication – for instance, family adherence to the treatment or severe cognitive loss.

Keywords: Social Communication Disorder; Nonverbal Communication; Disabled Children; Child Language; Cognition.

Resumo

Introdução: Crianças com graves comprometimentos na comunicação podem se beneficiar da Comunicação Suplementar e Aumentativa para possibilitar a interação social e conseqüentemente o desenvolvimento cognitivo e linguístico. **Objetivo:** Comparar o desempenho linguístico e cognitivo de crianças com transtornos de linguagem pré e pós terapia utilizando como modelo de intervenção a comunicação por troca de figuras PECS. **Método:** Estudo retrospectivo, transversal híbrido por análise de prontuário de seis crianças com diagnóstico de grave transtorno de linguagem e idades entre quatro e nove anos. Todos os participantes foram atendidos semanalmente, por um período de quatro meses para implementação do protocolo PECS. Para avaliação foram utilizados o Protocolo de Observação Comportamental e o subitem avaliação da linguagem receptiva do Teste de Avaliação do Desenvolvimento da Linguagem. **Resultados:** Em relação às habilidades dialógicas quatro crianças apresentaram melhor desempenho após o uso do PECS, sendo que uma já se encontrava no nível máximo avaliado neste item, antes da intervenção. Houve melhora nas funções comunicativas e nos meios de comunicação em quatro crianças. Observou-se desenvolvimento do simbolismo e na imitação gestual em duas crianças e na imitação sonora em quatro crianças. **Conclusão:** Observa-se que uso da Comunicação Suplementar e Aumentativa por troca de figuras PECS, mesmo por um curto período, auxiliou no desenvolvimento de habilidades comunicativas, na capacidade de imitação gestual/sonora e na compreensão verbal. Intercorrências podem influenciar diretamente a evolução comunicativa dos pacientes, por exemplo, aderência familiar ao tratamento ou prejuízo cognitivo severo.

Palavras-chave: Transtorno de Comunicação Social; Comunicação não verbal; Crianças com Deficiência; Linguagem infantil; Cognition.

Resumen

Introducción: Niños con graves deficiencias comunicativas puede beneficiarse del uso de la Comunicación Complementaria y Aumentada para permitir la interacción social, en consecuencia, el desarrollo cognitivo y lingüístico. **Objetivo:** Comparar el rendimiento lingüístico y cognitivo de los niños con trastornos del lenguaje antes y después de la terapia utilizando la comunicación de intercambio de imágenes PECS como modelo de intervención. **Método:** Estudio retrospectivo, híbrido de sección transversal I por análisis de registros médicos de seis niños con diagnóstico de trastorno del lenguaje y edades entre cuatro y nueve años. Todos fueron tratados semanalmente, durante un período de cuatro meses, para implementar el protocolo PECS. Para la evaluación se utilizó el Protocolo de Observación del Comportamiento y el sub-ítem evaluación de lenguaje receptivo del Test de Evaluación del Desarrollo del Lenguaje. **Resultados:** En cuanto a las habilidades dialógicas, cuatro niños obtuvieron mejores resultados después de utilizar el PECS y uno ya se encontraba en el nivel máximo evaluado en este ítem, antes de la intervención. Hubo una mejora en las funciones comunicativas y los medios de comunicación en cuatro niños. Se observó el desarrollo del simbolismo y la imitación gestual en dos niños y en la imitación sonora en cuatro niños. **Conclusión:** Se observa que el uso de la Comunicación Suplementaria y Aumentativa mediante el intercambio de figuras PECS, incluso por un período corto, ayudó en el desarrollo de las

habilidades comunicativas, en la capacidad de imitar gestos / sonidos y en la comprensión verbal. Las interconexiones pueden influir directamente en la evolución comunicativa de los pacientes, por ejemplo, la adherencia familiar al tratamiento o el deterioro cognitivo severo.

Palabras clave: Trastorno de Comunicación Social; Comunicación no Verbal; Niños con Discapacidad; Lenguaje Infantil; Cognición.

Introduction

The communication disorders encompass language, speech, fluency, and social communication changes and are defined as the impaired reception, expression, processing, and/or comprehension of a symbolic system. They can range in degree of severity and either originate in child development or be acquired, possibly leading to a primary disability or one secondary to other disabilities¹.

People of any age with complex communication needs, whether congenital or acquired, are candidates for the use of Augmentative and Alternative Communication (AAC)² – which is meant to compensate for their difficulties in communication and language skills and help include them in various everyday life contexts, including leisure, studies, games, and social participation³. A complete speech-language-hearing assessment of the linguistic and communication abilities makes it possible to individually choose the best method to be used, enabling an effective communication² of children either using AAC or not. The AAC is a field of clinical practice whose goal at first was to compensate (temporarily or permanently) the difficulties of people with severe expression disorders, ensuring an alternative path for those who could not verbally express themselves. Its use was increasingly broadened and is currently also used in people with comprehension disorders. This field began to be developed internationally at the end of the 1950s, and in Brazil, in the 1990s, to diminish the social impact caused by the difficulty to communicate⁴⁻⁶.

The Brazilian scientific literature on AAC is still relatively small when compared with other fields of language research. The studies with child populations using some type of AAC usually comprise children with cerebral palsy, severe autism spectrum disorder (ASD), or severe intellectual disability^{4,5,8-10}. This paper's differential was to analyze the use of AAC in children with language disorder in a less studied population, secondary to diverse syndromes.

A widely used AAC system is the Picture Exchange Communication System (PECS), which uses the Picture Communication Symbols (PCS) to communicate via the exchange of pictures, with a wide range of symbols representing various situations and activities of daily living^{7,11,12}. Although conceived for people with ASD, it has also been successfully used in other people with communication, cognitive, and physical difficulties¹³⁻¹⁷.

Considering the assumption that the verbal (speech) and nonverbal (gestures) expression skills are cognitive activities and social interaction instruments¹⁸ and given the scarcity of studies using AAC in the literature – particularly that of PECS in children with severe language disorders –, this study aimed to compare the linguistic and cognitive performance of children with language disorders, before and after therapy using PECS as intervention model.

Method

This is a retrospective, longitudinal study that analyzed medical records, speech-language-hearing therapy reports, and videos of children that attended a tertiary public hospital in the state of São Paulo from June 2014 to June 2017. The study was exempted from the informed consent form for being retrospective and was approved by the Research Ethics Committee (approval no. 2912/2018), complying with the ethical recommendations of resolutions 466/12 and 510/16 of the *Conselho Nacional de Saúde* (Brazilian National Health Council).

The medical records included in the research were those of children whose linguistic and cognitive assessments allowed for a hybrid cross-sectional study (with follow-up before and after the speech-language-hearing intervention; diagnosis of language disorders secondary to genetic or neurological disorders, with or without hearing losses and global developmental delay; weekly attending speech-language-hearing therapy to implement

AAC with PECS as intervention model; and assessed in the beginning and after four months of therapy (the time stipulated by the protocol of the service for the first reassessment). Those whose reports and videos annexed to the speech-language-hearing assessment were incomplete, both before and after using the PECS protocol, or who used other forms of AAC, were excluded.

Initially, the data related to the medical diagnoses present in the patients' medical records were collected, such as health history, child's development, other types of intervention or follow-up to which they were submitted, and medication taken at the time of AAC implementation with PECS.

The videos used to apply the behavioral observation protocol¹⁹ and the record sheets of the subitem of the language development assessment test²⁰, aimed at assessing receptive language, were obtained from the speech-language-hearing therapy records of the service and reanalyzed by two language specialists in 2018. It was decided to use only the categories because it is a retrospective study, with no statistical inferences. Hence, the score of the tests was not used as they did not fully portray the real evolution observed. Quantitatively, the numbers may have minimal increases, while the linguistic and/or cognitive performances may have significant changes. Each of the instruments used in the linguistic and cognitive assessment is briefly described below.

Behavioral Observation Protocol

An instrument developed in 2004 to systematize the assessment, through behavioral observation, of small children regarding the development of their communication and cognitive skills. The child is observed for approximately 30 minutes while interacting with their parents and/or assessor. This instrument can also be used with older children with speech difficulties. The protocol is divided into expressive communication skills (communicative functions, dialogical skills, and means of communication), oral language comprehension, and aspects of cognitive development (level of symbolism and imitation capacity). At the end of the assessment, each category is given a score, adding up to a maximum of 200 points, and the child's performance is characterized.

Receptive language item of the language development assessment test

This is a scale whose goal is to identify the changes in language acquisition/development. It can be used to assess language in one- to six-year-old children – as well as older children if these have a severe linguistic delay – to understand their linguistic capacities. This instrument assesses the receptive and expressive domains; however, due to the condition of the children in this project, only the receptive domain was assessed.

According to its administration instructions, the test must begin with the questions/activities meant for children six months younger than the one being assessed, or, in the case of children older than six years, begin with those for six-year-old children. Firstly, it is necessary to define the floor score (when the child gets three consecutive questions right, and then it is inferred that they can perform all the preceding activities – highlighting that the assessor must regress to the questions/activities of a younger age group until the floor score is defined). Then, to conclude the administration, it is necessary to find the ceiling score (when the child mistakes three consecutive questions).

At the end of the administration, a net score for each domain is obtained, and based on the tables of the scale, it is determined whether the child has a linguistic delay. Qualitative analysis can also be made comparing the linguistic development observed according to the expected age group.

It is highlighted that, in the case of children with some degree of hearing loss, this test was administered following the same abovementioned steps, as suggested by the authors of the test. However, these children should be wearing their cochlear implant or hearing aid during the test (these devices are routinely worn by them).

The data were analyzed by a language-specialist speech-language-hearing therapist (who coordinated the research) and descriptively presented. The inferential statistical analysis could not be carried out because of the small number of children included in the research and the heterogeneity of the sample.

Results

The characterization of the six participants in this study, identified as S1 to S6, are shown in Table 1. Their mean age at the beginning of the intervention was 6.4 ± 1.6 years; five of them were females and one, male. Five children had changes in their brain magnetic resonance imaging, whereas

the other one did not undergo this examination. Five children had some type or degree of hearing loss, two of which used a hearing aid (HA) and two had been submitted to the cochlear implant (CI). Three children had some type of syndrome, two had congenital changes, and one had perinatal complications. All the children likewise had multiple disabilities with a severe language disorder, making verbal communication impossible.

Table 1. Characterization of the participants of the research

Participant	Age and sex	Etiology of the Language Disorder	Hearing change	Use of HA or CI	Result of the brain MRI
S1	5 years Female	Mother took psychoactive substances during pregnancy Global Developmental Delay	Bilateral profound sensorineural hearing loss	CI at four years old	Polymicrogyria
S2	5 years Female	Chromosome 11 Deletion (46, XX Del (11) q14q21) History of malnutrition secondary to the syndrome Global Developmental Delay	Absent	NA	Subcortical parietooccipital atrophy
S3	7 years Female	Congenital cytomegalovirus Global Developmental Delay	Bilateral severe-to-profound sensorineural hearing loss	CI at four years old	Calcification of the caudate nucleus and basal ganglia to the left
S4	6 years Female	Neonatal anoxia Global Developmental Delay	Bilateral moderate sensorineural hearing loss	Bilateral HA	Findings compatible with neonatal anoxia
S5	5 years Female	Arnold-Chiari malformation and Noonan syndrome being investigated Hydrocephaly Global Developmental Delay	Mild (left ear) and mixed moderate (right ear) sensorineural hearing loss	Bilateral HA	Image suggestive of stenosis of the mesencephalic aqueduct; supratentorial ventricular dilatation
S6	9 years Male	Down's syndrome Chronic pneumonia Congenital cardiopathy Global Developmental Delay	Unilateral (left) anacusis	Not using HA	Did not undergo the examination

Legend: HA=hearing aid; MRI=magnetic resonance imaging; NA=not applicable.

The communication skills (dialogical skills, communicative functions, and means of communication) are described in Chart 1. The aspects of cognitive development are presented in Table 2.

The results regarding verbal comprehension and cognitive aspects at the two moments of the study are given in Table 3.

Chart 1. Communication skills pre- and post-therapy with Picture Exchange Communication System as the intervention model.

DIALOGICAL SKILLS										
Participant	Communicative intention		Starts the conversation/ interaction		Responds to the interlocutor		Waits for their turn		Actively participates in the dialogical activity	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
S1	P	P	P	P	A	P	A	P	A	P
S2	A	P	A	P	A	P	A	A	A	A
S3	P	P	P	P	A	A	A	A	A	A
S4	P	P	A	P	A	A	A	A	A	A
S5	P	P	P	P	A	P	A	P	A	A
S6	P	P	P	P	P	P	P	P	P	P

COMMUNICATIVE FUNCTIONS														
Participant	Instrumental		Protest		Interactive		Naming		Informative		Heuristic		Narrative	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
S1	P	P	P	P	P	P	A	A	A	P	A	P	A	A
S2	P	P	A	P	A	P	A	P	A	P	A	P	A	A
S3	P	P	P	P	P	P	A	A	A	A	A	A	A	A
S4	P	P	P	P	A	P	A	A	A	A	A	A	A	A
S5	P	P	A	P	A	P	A	P	A	P	A	P	A	A
S6	P	P	P	P	P	P	P	P	P	P	P	P	A	A

MEANS OF COMMUNICATION		
Participant	Pre	Post
S1	Inarticulate vocalizations	Articulated vocalizations
	Conventional gestures	Symbolic gestures
S2	Inarticulate vocalizations	Isolated words
	Conventional gestures	Symbolic gestures
S3	Inarticulate vocalizations	Inarticulate vocalizations
	Conventional gestures	Conventional gestures
S4	Inarticulate vocalizations	Inarticulate vocalizations
	Elementary gestures	Elementary gestures
S5	Elementary gestures	Conventional gestures
S6	Inarticulate vocalizations	Isolated words
	Symbolic gestures	Symbolic gestures

Legend: A=absent; P=present; Protocol used: Behavioral observation protocol.

Table 2. Aspects of the cognitive development pre- and post-therapy with Picture Exchange Communication System as the intervention model.

ASPECTS OF THE COGNITIVE DEVELOPMENT						
Participant	Development of symbolism		Gesture imitation		Sound imitation	
	Pre	Post	Pre	Post	Pre	Post
S1	Symbolic conducts	Symbolic conducts	Imitation of nonvisible gestures/movements in their own body	Imitation of nonvisible gestures/movements in their own body	Does not respond	Syllables and onomatopoeias
S2	Pre-symbolic conducts	Symbolic conducts	Imitation of visible gestures/movements in their own body	Imitation of nonvisible gestures/movements in their own body	Does not respond	Syllables and onomatopoeias
S3	Pre-symbolic conducts	Pre-symbolic conducts	Imitation of nonvisible gestures/movements in their own body	Imitation of nonvisible gestures/movements in their own body	Syllables and onomatopoeias	Syllables and onomatopoeias
S4	Sensory-motor	Sensory-motor	Imitation of visible gestures/movements in their own body	Imitation of visible gestures/movements in their own body	Does not respond	Does not respond
S5	Sensory-motor	Pre-symbolic conducts	Imitation of visible gestures/movements in their own body	Imitation of nonvisible gestures/movements in their own body	Does not respond	Syllables and onomatopoeias
S6	Symbolic conducts	Symbolic conducts	Imitation of nonvisible gestures/movements in their own body	Imitation of nonvisible gestures/movements in their own body	Syllables and onomatopoeias	Words

Legend: Protocol used: Behavioral observation protocol.

Table 3. Comparison of the auditory comprehension pre- and post-therapy with Picture Exchange Communication System as the intervention model.

Participant	BOP – verbal comprehension		LDA – receptive language	
	Pre	Post	Pre	Post
S1	Does not respond	Does not respond	Does not respond	Does not respond
S2	Responds unsystematically Comprehension of order accompanied by gestures	Comprehension of orders not accompanied by gestures	12 - 17m	2y – 2y6m
S3	Responds unsystematically Comprehension of order accompanied by gestures	Responds unsystematically Comprehension of order accompanied by gestures	Does not respond	Does not respond
S4	Does not respond	Responds unsystematically Comprehension of order accompanied by gestures	Does not respond	Does not respond
S5	Responds unsystematically	Comprehension of orders not accompanied by gestures	12m - 17m	2y – 2y6m
S6	Comprehension of two unrelated orders	Comprehension of two unrelated orders	5y -5y11m	5y -5y11m

Legend: y=years; m=months. Protocols used: behavioral observation protocol (BOP) and the receptive language assessment subitem of the language development assessment test (ADL).

The outcome observed at the reassessment, after four months of therapy using PECS as the intervention model, is presented in Table 4. All the participants began at PECS level 1 and, except for

S4, all of them advanced from this level after four months of intervention – S1, S2, and S6 reached level 5/6, S3 reached level 3, and S5 reached level 4, as seen in Table 4.

Table 4. Outcome observed at reassessment, after four months of therapy with Picture Exchange Communication System as the intervention model.

Participant	PECS level	Outcome after 4 months of therapy
S1	5/6	Beginning of communication with the Brazilian Sign Language, mediated by using the PECS method
S2	5/6	Using communication boards and therapy with verbal communication through words and simple phrases
S3	3	Abandoned the therapy
S4	1	Referral to APAE and beginning of intensive training with PECS
S5	4	Continued using PECS
S6	5/6	Using communication boards and therapy with verbal communication through words and simple phrases

Legend: APAE: Portuguese acronym for Association of Parents and Friends of People with Intellectual Disability

Discussion

This study aimed to analyze the cognitive and linguistic evolution of children that needed AAC, using the PECS intervention model. The aspects observed were the children's communication skills (dialogical or conversational skills, communicative functions, and the means of communication used) and verbal comprehension.

Before the intervention, only S6 had communications skills observed in the dialogical skill assessment and the use of communicative functions. However, a great evolution in these aspects was observed in three children (S1, S2, and S5).

Improvements in communications skills were not observed in only one child (S3). It must be emphasized, though, that this participant's medical record reported the parents'/guardians' lack of cooperation with the treatment proposed. The present research only had access to the material collected, but not to the reason for the low adherence to the treatment. S4 advanced in the act of beginning an interaction, despite a quite complex condition with important cognitive delay. She was chronologically five years old but her sensory-motor play and verbal comprehension were that of a child less than one year old.

A study conducted with two- and three-year-old children with typical development, using the

behavioral observation protocol, pointed out that two-year-old children already show their intention to communicate, start/seek interaction, and respond to the interlocutor either with gestures or vocalizations/words, actively participating in the communication. Concerning the communicative functions, that same article points out that three-year-old children present instrumental function (ask for objects/actions), protest function (interrupt something undesired), interactive function (use social expressions to start or end a dialogue), naming function, informative function (comment during the interaction, call the other person to share something), and heuristic function (ask permission for something); only their narrative function was not developed¹⁹.

Corroborating the statement that the intervenive actions with assistive technology, such as the use of AAC, must be implemented early, as they are essential to the development of children with disabilities. Particularly regarding communication development, the use of AAC combined with pedagogical activities of oral language stimulation while still in preschool can speed language acquisition and development in children with disabilities, minimizing the differences in development opportunities to the children without disabilities¹⁸.

The first phases (1 and 2) in PECS aim to "teach" the child to communicate, to seek other people for communicative exchange. The more

advanced levels focus on leading the child to comment on something and to narrate events¹³. Indeed, it was observed in the present study that all the children who achieved a good performance in these two aspects were the same who reached the last levels of the PECS training (levels 5/6).

AAC is one of the approaches that improve communication. More specifically, it allows for the evolution of the pragmatic aspect (dialogical skills, communicative functions, and so forth) and better interaction quality. Also, it is known that communication can greatly favor learning as it enables changes to occur in the psychological structures as an instrument of social origin. To this end, it is necessary to consider all the communication possibilities – verbalizations with phrases containing one or more elements, representative gestures (such as pointing, looking, facial expression, and so on), and graphic symbols^{15,22,23}.

The most prevalent means of communication used by the children in this research before the intervention process was the inarticulate vocalization combined with gestures (present in five children). The gestures ranged from elementary (e.g., holding one's hand) and conventional ones (e.g., pointing, denying with a head movement) to symbolic gestures (ones representing actions, age, and so forth).

After the PECS intervention, four children improved their form of communication (S1, S2, S5, and S6), evolving from communication by gestures and inarticulate vocalizations to articulated ones or isolated words. Only two children did not evolve in these aspects (S3 and S4). Nevertheless, S4 started using the interactive communicative function after the intervention. No communicative evolution was observed in any of the aspects assessed in S3.

The means of communication and the motor and vocal imitation capacity are aspects observed in children with typical or atypical development, as these are prelinguistic communication acts. Moreover, the imitation capacity is also related to the emergence of symbolic playing. Firstly, the child imitates models present around them; then, as the imitation evolves, they begin imitating gestures and sounds even in the absence of models, using these gestures and sounds in other contexts. Thus, the evolution of the imitation capacity suggests how cognitive development is occurring^{19,21}.

As for the cognitive development aspects, assessed with the behavioral observation protocol, two children were in the sensory-motor period, and

two, in the pre-symbolic period. After using PECS, two children evolved (S2 and S5). It is known that the presence of symbolism is a child development milestone, as it suggests that they are leaving the sensory-motor stage and entering the preoperational stage – i.e., leaving a practical intelligence (which relies on action and perception) and entering a representative intelligence (based on abstraction). The presence of symbolic conduct indicates that the child's thinking can go beyond what is within their immediate perception, and the child starts dealing with absent and/or imaginable facts and situations. Symbolism is present, for instance, when the child plays make-believe¹⁹.

In the verbal comprehension assessment, S1, S3, and S4 could not respond to the receptive language test in either of the two moments. This datum was found in both the language development assessment test and behavioral observation. These children identified the sound but could not understand words not even in a closed set. Data obtained from the medical record of S1 indicate a diagnosis of bilateral profound sensorineural hearing loss, with no response to the cochlear implant. This child could imitate some sounds, as they observed their therapist's articulation, but could not perceive the absence/presence of sounds.

S2 and S5 were the children who had significant evolutions in this aspect, starting the use of the PECS method as “children that responded unsystematically to an order” and reaching the level of “comprehension of simple orders without needing to use gestures”.

This study observed the outcome after four months of weekly therapy using the PECS method regarding the continuity of and choice for AAC after such period. Two children began communicating verbally, using the AAC board as a facilitator for the therapeutic strategies (S2 and S6). S1 also changed their form of communication, using the pictures to facilitate learning the Brazilian Sign Language, as she already communicated with conventional gestures and had not evolved with hearing rehabilitation, even after one year using a CI. S5 continued the rehabilitation using the PECS method. On the other hand, S3, whose parents/guardians did not adhere to the therapeutic process, continued to communicate only with symbolic gestures, with no evolution; moreover, after the period of the study, they abandoned the speech-language-hearing treatment. S4 evolved only in the

use of interactive communication and was referred to the Association of Parents and Friends of People with Intellectual Disability (APAE, its Portuguese acronym) and continued with the intensive implementation of PECS.

The outcome found for S2 and S6 evidence what AAC researchers try to explain to the parents, stating that the goal of picture-exchange AAC is to teach the child to communicate somehow, improving their social interaction and stimulating their cognitive development, while speech continues to be stimulated until it can be used as a means of communication^{13,24}.

Also, analyzing the outcome of S1, S2, and S6, even after training other forms of communication (Brazilian Sign Language and speech, for example), picture-using AAC can be a facilitating resource in language development intervention, as it values visual processing. It can be used to help children with cognitive deficit and oral language difficulties to understand the idea that words represent objects, people, and thoughts and can be used to communicate experiences to someone else²⁵. Furthermore, it can be used as a therapeutic instrument when working with morphosyntax (the use of articles, prepositions, conjunctions, and syntactical organization)¹⁷ or other pedagogical issues²⁶. There are reports of the AAC being used as a therapy facilitator in the rehabilitation of people with hearing loss, as well¹⁶.

The effectiveness of using the PECS method with a child and their communication partners can also be seen in another study that observed the improvement of communication skills, and both partners – parents and teacher – understood the relevance of using the AAC as a resource in the teaching-learning process, after associating picture exchange communication with functional curriculum methodology (adapted PECS) in a student with cerebral palsy and their teacher and parents¹⁴.

Furthermore, studies with adolescents show the effectiveness of the PECS method for communication development even when it begins late. An example is a study with an adolescent with autism, in which the authors verified, after four months using the PECS method, an increase in the number of vocalizations with communicative intention combined with a greater independent exchange of pictures, longer visual contact, and social smile, and decrease in inadequate behaviors²⁷. Another example is the study with adolescents with Down's syndrome in which an improvement in morpho-

syntax was verified after one year, favoring the employment of phrasal structures with elements that have a syntactic function, such as articles, prepositions, and conjunctions¹⁷.

Throughout the data analysis and this discussion, the final outcome of S3 and S4 always emerged. S4 had an important cognitive development delay. The therapeutic model offered to this child (therapy once a week, with the speech-language-hearing therapist alone) for only four months was not enough to bring about positive changes in their development. This case exemplifies what the literature refers to as ideal care, which is oftentimes not feasible in the Brazilian scenario. In ideal care, AAC must be implemented by a multiprofessional team, with daily attendances by these professionals encompassing various contexts – such as the school and the home^{18,28-30}.

The results obtained by S3 reinforces the importance of the family's role in this therapeutic process. In this case, the relatives did not follow the instructions, reinforced the children's inadequate behaviors, and did not explore the communication board outside the therapeutic context. Therefore, despite the indicators that they would benefit from the AAC, they did not manage to use it and, after four months, abandoned the speech-language-hearing treatment. This corroborates what was observed in a case study whose objective was to verify the effectiveness of a personalized AAC program using PECS with a nonverbal child diagnosed with cerebral palsy in three contexts of daily living: home, school, and rehabilitation clinic. The child's performance only changed after the communication partner's performance did so too, demonstrating the importance of communication³⁰.

The unsuccessful cases of AAC use encompassed the absence of two variables deemed important in the statistical model presented in the study by Brady and collaborators²¹. The first variable, noticed in S4, is the low cognitive capacity. The authors observed that children with greater verbal comprehension, communication skills, and symbolic games were the most successful ones when using AAC. The other important variable also pointed out by the authors, as it influenced S3's performance, is the participation of the adults in the home, considering that their presence indicates an environment with a greater number and wider range of stimuli.

This study shows that other child populations can benefit from using the PECS method. However, it is important to emphasize the limitation due to the small number of children, which made it impossible to generalize the findings. Also, the intervention took place only in the context of speech-language-hearing therapy due to the limitations of the service. Further studies are necessary, with more participants, a multiprofessional intervention, in both home and school settings.

Conclusions

The analysis of the cases approached in this study confirmed that the use of AAC with PECS, even in a short period, helped develop communication skills, gesture/sound imitation capacity, and verbal comprehension. It was further demonstrated that some patients began speaking or started using other, more complex/abstract forms of communication. Moreover, it was observed that the variables related to poor family adherence to the treatment and the severe cognitive impairment negatively influenced some children's evolution.

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