

# ALTERNATIVE COMMUNICATION FOR STUDENTS WITH AUTISM AT SCHOOL: A LITERATURE REVIEW<sup>1, 2</sup>

## COMUNICAÇÃO ALTERNATIVA PARA ALUNOS COM AUTISMO NA ESCOLA: UMA REVISÃO DA LITERATURA

Débora Regina de Paula NUNES<sup>3</sup>  
 João Paulo da Silva BARBOSA<sup>4</sup>  
 Leila Regina de Paula NUNES<sup>5</sup>

**ABSTRACT:** Meta-analytical and descriptive studies conducted in recent decades have demonstrated the effectiveness of Augmentative and Alternative Communication (AAC) for people with Autism Spectrum Disorders (ASD). Most of these investigations have focused, however, on the clinical effectiveness of AAC without considering pragmatic aspects of assisted communication in unstructured contexts, such as schools. The aim of this investigation was to expand, through an integrative literature review, the current body of research, analyzing the contexts where AAC was used with students with ASD in regular schools. In this sense, a search was carried out on the Coordination for the Improvement of Higher Education Personnel (CAPES) journals portal and on the electronic catalog of theses and dissertations of this same agency with previously defined terms. The eight studies found, published between 2015 and 2018, included participants between 3 and 12 years of age who used assisted communication systems, primarily AAC boards and picture cards. All studies were conducted in the regular classroom and/or Multifunctional Resource Rooms, but two included the home environment. Despite the use of AAC in natural contexts, involving known interlocutors, gaps were identified in pragmatic aspects of student communication. There was a predominance of imperative communication, focusing primarily on pragmatic solicitation behaviors. Despite the limitations identified, the studies revealed positive results on the use of AAC for students with ASD.

**KEYWORDS:** Augmentative and Alternative Communication. Autism Spectrum Disorder. Pragmatic Language.

**RESUMO:** Estudos meta-analíticos e descritivos conduzidos nas últimas décadas têm demonstrado a efetividade da Comunicação Alternativa e Ampliada (CAA) para pessoas com Transtorno do Espectro Autista (TEA). A maior parte dessas investigações tem focado, contudo, na efetividade clínica da CAA sem atentar para os aspectos pragmáticos da comunicação assistida em contextos não estruturados, como a escola. O objetivo desta investigação foi ampliar, por meio de uma revisão integrativa da literatura, o acervo de pesquisas tratadas em revisões anteriores e, assim, analisar os contextos em que a CAA foi utilizada com educandos com TEA na escola regular. Para isso, foi realizada uma busca no portal de periódicos da Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) e no catálogo eletrônico de teses e dissertações dessa mesma agência com termos previamente definidos. As oito pesquisas encontradas, publicadas entre 2015 e 2018, incluíram participantes entre 3 e 12 anos de idade que utilizavam sistemas assistidos de comunicação, sendo predominantes as pranchas/álbuns de CAA ou pictogramas avulsos. Todos os estudos foram conduzidos na sala de aula regular e/ou nas Salas de Recursos Multifuncionais, mas dois deles incluíram o ambiente domiciliar. Apesar do uso da CAA em contextos naturais envolver interlocutores conhecidos, foram identificadas lacunas em aspectos pragmáticos da comunicação dos educandos. Observou-se a predominância da comunicação imperativa, a qual focava primordialmente nos comportamentos pragmáticos de solicitação. Embora limitações tenham sido identificadas, os estudos revelaram resultados positivos sobre o uso da CAA para alunos com TEA.

**PALAVRAS-CHAVE:** Comunicação Alternativa. Transtorno do Espectro Autista. Linguagem pragmática.

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<sup>3</sup> Ph.D in Special Education. Associate Professor - Graduate Program in Education at the Universidade Federal do Rio Grande do Norte (UFRN). Natal/Rio Grande do Norte/Brazil. E-mail: [deboranunesad@gmail.com](mailto:deboranunesad@gmail.com). ORCID: <http://orcid.org/0000-0001-8758-8916>

<sup>4</sup> Pedagogue, Master's student. Graduate Program in Education (UFRN). Natal/Rio Grande do Norte/Brazil. E-mail: [joaopaulods@gmail.com](mailto:joaopaulods@gmail.com). ORCID: <https://orcid.org/0000-0002-2101-7798>

<sup>5</sup> Ph.D. in Special Education. Full Professor – Graduate Program in Education at the Universidade do Estado do Rio de Janeiro (UERJ). Faculdade de Educação - Campus Maracanã. Rio de Janeiro/Brazil. E-mail: [leilareginanunes@gmail.com](mailto:leilareginanunes@gmail.com). ORCID: <https://orcid.org/0000-0003-2012-6973>

## 1 INTRODUCTION

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder that affects one in 54 children in the world (Maenner et al., 2020). More than a third of this population do not use or understand speech nor spontaneously develop non-verbal forms of communication, while most have language development delays or deviations (Schlosser & Wendt, 2008). In pragmatic terms, limitations are observed in the communicative functions employed by this population. There is a predominance in the use of communication for imperative purposes or to regulate behaviors (ex: requesting objects/actions) and limited communicative repertoire for declarative purposes (ex: making comments or requesting information) and social interaction (ex: greeting or requesting permission) (Wetherby, 1986).

One of the ways of expanding the socio-communicative possibilities of people with ASD is through Alternative and Augmentative Communication (AAC), an area of multidisciplinary knowledge that deals with the interactions of people with complex communication needs. AAC involves the use of hand gestures, graphic symbols, voice assisted systems, among other resources used to replace or supplement, temporarily or permanently, unintelligible, non-functional or non-existent speech (Iacono et al., 2016).

AAC should not be reduced to its technical dimension, with the risk of overvaluing technological resources at the expenses of human interactions (Nunes et al., 2018). Furthermore, communication is carried out by partners, who affect and are contingently affected by the actions of other, enabling the shared construction of meaning (Fogel, 1993). In this perspective, to become a competent communicator, Bates (1976) argues that it is essential to focus on two aspects of pragmatic language use. The first concerns the reasons for communicating. We communicate, among other reasons, to regulate behavior, establish/maintain social interactions or share information. The second aspect refers to the presupposition, that is, the ability to assess what the partner already knows prior to providing new information. Thus, the competent communicator regulates speech considering, for example, the listener's maturation level or what the individual (supposedly) knows about a topic.

AAC is an interventional practice recommended for people with ASD by international research agencies (National Research Council [NRC], 2001; Steinbrenner et al., 2020). Many meta-analytical and descriptive studies that sustain this recommendation have revealed the effectiveness of AAC for the purpose of regulating behavior, as well as privileged AAC use in natural environments, such as the school (Ganz et al., 2012; Nunes, 2008; Schlosser & Wendt, 2008; van der Meer & Rispoli, 2010). Despite these assets, two important limitations are identified in these studies. First, little research has dealt with broader pragmatic aspects, such as AAC for declarative or social interaction purposes (Iacono et al., 2016). Second, these interventions have been considered "unnatural", since they have been mediated by researchers/clinicians, in structured contexts (segregated rooms in the regular school), during activities without clear communicative purposes (Holyfield et al., 2017).

Considering the ideas presented above, the aim of this investigation was to expand, through an integrative literature review, the current body of research, analyzing the contexts where AAC was used with students with ASD in regular schools. More specifically, the focus is on identifying the types of teaching systems/protocols adopted, the context of interactions,

and to evaluate pragmatic language aspects of AAC users described in national investigations, published in the last 5 years. The relevance of this investigation is anchored in three arguments. The first is attributed to the national school census that has registered, in the last 10 years, a significant increase in the number of students that are eligible for receiving special education services, in regular schools (National Institute for Educational Studies and Research 'Anísio Teixeira' [INEP], 2018). The second argument, resulting from the first factor, concerns teacher training to work with this new contingent of students, specifically those with ASD. A considerable number of teachers are unaware of intervention strategies that can minimize the socio-communicative deficits of these students, such as the use of AAC systems (Nunes & Walter, 2018). The third argument refers to the difficulties that students with ASD present in generalizing behaviors from structured to unstructured environments (Waddington et al., 2017). In fact, international research agencies, such as the NRC (2001), advise for the prioritization of interventional practices in natural contexts, suggesting that teaching the use of AAC in regular classrooms is more beneficial than in laboratory environments.

## 2 METHOD

This study is characterized as an Integrative Literature Review (ILR). This method aims to identify, analyze, and synthesize results from experimental and non-experimental studies, conducted independently, on a specific subject matter (Souza et al., 2010). By overviewing the state of knowledge of a given topic, ILR favors the identification of the best interventional practices, as well as gaps that may direct the development of future research (Mendes et al., 2008).

To guide the literature search process, the following question was asked: In what interactive contexts and which AAC systems have been used with students diagnosed with ASD in regular schools in Brazil, in the last 5 years? Then, the first and second authors independently conducted a search for studies of this nature on the CAPES journal database and on the electronic catalog of theses and dissertations of that same agency.

Considering Cochrane's recommendations (Higgins et al., 2019), a limited number of terms with a large number of synonyms was used as a search engine. The OR operator was used between groups of words and the AND operator used to connect words from different groups (Higgins et al., 2019). The search terms included three sets of words, in Portuguese and English<sup>6</sup>: (a) "autism\*" or "autism spectrum disorder"; (b) "augmentative and alternative communication" or "AAC" or "augmentative communication" or "alternative communication" or "supplementary and alternative communication"; and (c) "classroom" or "regular room" or "school" or "multifunctional resource room (MRR)"<sup>7</sup>.

After assessing the publications, the three authors independently read each manuscript. The studies included for analysis: (a) involved participants diagnosed with ASD; (b) registered the use of AAC symbol systems in the regular school; (c) described the resources used, such as individual cards, boards, albums, electronic resources with or without voice output; (d)

<sup>6</sup> (a) "autism" ou "autism spectrum disorder"; (b) "augmentative and alternative communication" ou "AAC" ou "augmentative communication" ou "alternative communication"; e (c) "classroom" ou "regular classroom" ou "school".

<sup>7</sup> Used only in the search for national papers.

described the teaching protocols - Picture Exchange Communication System - PECS (Frost & Bondy, 1994), Adapted-PECS (Walter, 2000); (e) identified the partners involved in the interaction - teachers, peers, researcher; and (f) had been published in the last 5 years (January 2015 to January 2020). Investigations that did not meet these five criteria or that were not available in full in the databases were excluded.

For data analysis, two synoptic tables were elaborated. The first included information regarding the research objectives, the type of AAC system/protocol used, the context where the AAC was used, and participants' characteristics. In the second table, students' pragmatic behaviors described in the studies were identified. In this process, the second and third authors transcribed segments of the responses of students with ASD or excerpts from the researchers' field notes/records that exemplified the communicative interactions.

After the transcription, the three authors classified the pragmatic behaviors identified based on two protocols. In the first, developed by Wetherby (1986), communicative acts, conceptualized as gestures, vocal emissions or use of AAC were classified as imperative, social interactive or declarative. The imperative acts concern intentional communicative behaviors that aim at regulating the partner's conducts, instigating them to do something or preventing them from performing an action. The second aims to initiate, respond or maintain interaction with the other. Declarative acts are intended to modify the partner's mental state.

The second protocol, adapted from the Coggins and Carpenter model (1978), details Wetherby's model (1986), specifying seven pragmatic behaviors of declarative, social or imperative nature.

**Table 1**

*Pragmatic behaviors*

Function	Response	Definition
Declarative	Comment	Communicative acts that inform the interlocutor about feelings and sensations.
	Request for information	Communicative acts that require the interlocutor to provide information about an object, action or location.
	Request for permission	Communicative acts that require authorization from the partner to perform an action.
Social Interaction	Compliance	Communicative acts that express recognition of the interlocutor's presence.
	Response	Communicative acts that comply the partner's request for action/information
	Recognition	Communicative acts that announce that the previous message of the interlocutor has been received.
Imperative	Request for action or object	Communicative acts that require the partner to give out/act on an object.

*Note.* Adapted from Coggins and Carpenter (1978) and Wetherby (1986).

### 3 RESULTS AND DISCUSSION

Based on the selection criteria previously described, one article published in a scientific journal, six Master's thesis and one Doctoral dissertation were found. Two synoptic tables containing the variables investigated in the eight studies analyzed are presented below.

**Table 2**

*Study, objectives, type of AAC, context, participants (quantity, sex, communication skills and age)*

Study	Research objective	AAC type	Context	Participants
Brito (2016)	Evaluate the effects of an AAC teacher training program on the communication of students with ASD.	Picture exchange system.	MRR.	8 M (6 restricted speech; 2 non-verbal; 5 - 10).
Cândido (2015)	Analyze the effects of GRID on academic performance and communication of a student with ASD.	GRID software and low-cost visual resource.	Home and MMR.	1 M (restricted speech; 8).
Fiorini (2017)	Characterize the routine activities of students with ASD in Early Childhood Education.	Communication boards.	Regular classroom.	5 M, 2 F (3 verbal; 4 non-verbal; 4 - 6).
Fontoura (2018)	Describe the effects of storytelling and drawing mediated by visual aids in the symbolization of children with ASD.	Communication board.	Regular school and home.	4 M (verbal; 7 - 9).
Monte (2015)	Analyze the appropriation of visual narratives measured by SCALA in the inclusion of children with ASD.	SCALA software.	Regular classroom.	3 M (1 restricted speech and 2 non-verbal; 3 - 4).
Olmedo (2015)	Train teachers to use Adapted - PECS with students with ASD.	Adapted-PECS.	Regular classroom.	3 M and 1 F (2 restricted speech and 2 non-verbal; 3 - 5).
Togashi e Walter (2016)	Enable a teacher from the Specialized Educational Service (SES) to use AAC with students.	Adapted-PECS.	MRR and regular classroom.	1 M (fala não funcional; 12).
Xavier (2017)	Analyze the feasibility of using Boardmaker + Speaking Dynamically Pro® for children with ASD.	Boardmaker communication board.	Regular classroom.	3 M (non-functional speech and 1 M non-verbal; 4 - 8).

*Note.* M – Male; F- Female.

**Table 3**  
*Examples of the pragmatic functions identified in the studies*

<b>Declarative</b>		<b>Fontoura (2018)</b>	<b>Monte (2015)</b>	<b>Olmedo (2015)</b>	<b>Togashi e Walter (2016)</b>	<b>Xavier (2017)</b>
		Caleb asked the researcher if it was "friend's day". She said yes. Mathews hugged me and said he loved me.	"Do you want to sit with me?" He says no [...]. Researcher says: come see! What will be inside of this black bag? Guilherme approaches.	Teacher showed the dish and asked the children the name of each food. Mateus once repeated "eão" ("eans" - beans), after the children answered "beans" in unison.	Guilherme built the sentence with the cards and gave the teacher aide his request to go to the bathroom. Guilherme built the phrase: "I'm sad".	When student B wanted go to the bathroom, he pointed to the symbol on the notebook screen.
<b>Social Interaction</b>		The researcher asked the child to illustrate the story. The child made a drawing.				Teacher clicked on the image "let's study", telling the student to sit down [...]. Student B sat next to her, showing complete understanding of the given command.
		During the collage, the teacher asked: "Where is the roof? Where is the window?". And the student pasted the figures in the appropriate places for these objects.				Student A was asked what he wanted (showing a computer screen). He pointed to the item "material".
<b>Imperative</b>		The researcher showed the children the cards corresponding to the session activities and said: Shall we put it on the board? Children 1, 3 and 4 took the cards and set up their routine independently.				
		Child 2 used a card to request cake. She put the board in front of Child 1 with the favorite items and asked, "What do you want?" Child replied with "I want", removing the picture card.				

From the eight identified national studies, three evaluated, through quasi-experimental research designs, training programs involving picture exchange systems (Brito, 2016; Olmedo, 2015; Togashi & Walter, 2016). Olmedo (2015) developed and evaluated a training protocol involving the Adapted-PECS<sup>8</sup> for three Early Childhood Education teachers and two mediators. The research was carried out in three stages, including baseline, intervention, and follow-up. The results showed that, throughout the sessions, students began communicating with teachers and mediators, through picture exchange, in a more spontaneous way. In addition, the use of vocalizations was registered as a form of interaction in 3 out of 4 students with ASD. It is worth mentioning that these interactions occurred in natural contexts, typically frequented by students with ASD and their peers, such as the regular classroom, the reading room, and the cafeteria. The frequency of teachers' initiations and responses displayed in verbal, and gestural modalities, and with the use of pictograms was measured. As shown in Table 2, two types of pragmatic behaviors were identified: a response and an object request. It is important to note that, although the researcher reported an increase in declarative functions, no examples were identified in the study.

Togashi and Walter (2016), in a follow-up investigation of the previous study, evaluated the use of AAC by a teacher - previously trained in the use of Adapted-PECS - with a student with ASD in the context of MRR. Then, they analyzed the communicative interactions of this student with the regular classroom teacher and with the teacher aide. The results of the first study demonstrated that the MRR teacher incorporated the AAC in educational activities with the boy, as well as in transition periods between MRR routines. In pragmatic terms, the Adapted-PECS was used by the student not only to make requests for objects and permission, using the pictogram "I want", but also in a declarative way, using the "I am" card to inform about his feelings.

The data from the second study (Togashi & Walter, 2016) conducted in the regular classroom of the first segment of Elementary Education, indicated that the student started to use the AAC system with a teacher aide and a teacher. Data collection for the second research took place in a natural environment in which the student was inserted. Neither the researcher nor the educators structured or modified the environment. The teacher's and the teacher aide's communicative acts directed to the student involved requesting for action, encouraging communication, and providing feedback.

In this study, examples of communication with declarative and imperative purposes were identified, precisely to request permission, to comment on feelings and to request objects. It is worth noting, as Togashi and Walter (2016) point out, that other communicative situations were identified in the study, with reference to Togashi's Master's thesis. Thus, it is likely that there were episodes with other communicative functions.

Data ultimately indicated that the student's interactive episodes with the teacher aide were more frequent than with the classroom teacher. These data highlight the difficulties in defining the roles of support professionals of students with ASD in regular classrooms. In line with other investigations, the presence of mediators in the classroom can impact the teacher's

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<sup>8</sup> Adapted-PECS is an adaptation of the PECS protocol developed by Walter (2000). This adaptation was structured on the assumptions of the teaching methodology based on the Natural Functional Curriculum (Togashi & Walter, 2016).

protagonist role since the teacher may feel unobligated to work with the student. This may lead the child to interact more with the teacher aide than with the classroom teacher and other peers (Nunes et al., 2013; Togashi & Walter, 2016). Thus, although guaranteed by law (Law no. 10,764, of December 27, 2012), it is necessary to define the roles of these professionals in regular classrooms.

A quasi-experimental research design was also employed by Brito (2016), who used picture exchange communication as the AAC teaching protocol. In this study, carried out in an MRR of a regular school in Teresina, eight teachers who worked in Specialized Education Services (SES) and their students diagnosed with ASD participated. Brito (2016) developed a teacher training program from a behavioral paradigm (Skinner, 1953).

In this program, in addition to the discussion of topics such as AAC and verbal behavior of children with ASD, AAC resources were individually used by teachers when providing specialized educational assistance. In this structured context, the student was taught to interact with the teacher, using the AAC. In pragmatic terms, imperative communicative forms were highlighted, mainly for requesting objects, as well as maintaining social interaction.

In addition to low-cost resources, this review identified four studies that adopted electronic resources to favor the communicative skills of students with ASD (Cândido, 2015; Fontoura, 2018; Monte, 2015; Xavier, 2017). In the first investigation, Cândido (2015) analyzed, through an action research, the effects of the GRID2<sup>9</sup> software on the academic performance and communication of a student with ASD. The study was conducted in two scenarios: at the student's home and at the MRR he attended. The student, who was enrolled in an Elementary School, his mother, and his teacher participated in the investigation.

In order for the student to become familiarized with the GRID2 software, low-tech AAC resources were initially introduced in the classroom and at home as a preparatory activity for using the software. These resources were made in the form of matching games, communication notebooks and visual routines at home and at school. In the first object / figure relationship game, the student was instructed to identify, on a board, pictograms corresponding to objects presented by the teacher. It is worth mentioning that he did not use figures, or even objects to communicate. The second game, which had the function of stimulating writing and favoring the recognition of symbols, was structured in a notebook, containing images that were familiar to the student (ex. picture of his mother). In this task, the student had to write, with detachable letters, the words corresponding to the images. Finally, the visual routines, made as frames with pictograms vertically positioned, had the purpose of organizing the physical environment, as well as supporting the participant's communication of his wants.

According to Cândido (2015), the student and his communicative partner were to remove and manipulate the pictograms arranged, both in the school and at home. Despite the use of AAC resources in typical contexts (home and school), involving natural partners (mother and teacher), it is relevant to consider the pragmatic communication functions used. In the matching game, for example, it was up to the student to answer the social partner's verbal commands - characterizing social interaction - without, however, engaging in more complex

<sup>9</sup> GRID2 is a AAC tool that has approximately twenty thousand symbols and is intended for people who use or not a mouse and keyboard and have some type of dysfunction (Cândido, 2015).



communicative exchanges. The same applied to the notebook activity, where he had to respond to the teacher's request and produce written information. No episodes where the student used visual aids for imperative or declarative purposes were identified. The figures used in the school and home routines resembled visual aids for regulating behavior.

Although images can be used to facilitate communication in a conversation, they seem to work more as strategies or discriminative stimuli to induce the communicative partner to orally formulate utterances, than as linguistic symbols that can be combined by the AAC user to form more complex utterances (Nunes, 2003; von Tetzchner et al., 1996). Yet, the messages produced by means of figures resembles a protolanguage or *pidgin*, that is, it is expressed with truncated and limited syntax, where meaning needs to be expanded and/or negotiated with the partner (von Tetzchner, 1985)

Then, the work began with GRID2 software. It was held in the MRR and divided into sessions. For each board presented to the participant, the teacher pointed to the images and pre-recorded questions. The student had to answer the questions by pointing, with the mouse, to the correct response. Considering the pragmatic functions of language described by Bates (1976), there seemed to be no presupposition. That is, the student provided information that the partner already knew. Therefore, although the computerized system described by Cândido (2015) provided a "voice" to the student, one cannot affirm that this voice was being used in a conversational context. After all, this ability involves exchanges of information not known by the communicative partner.

In a qualitative study, Xavier (2017) analyzed the feasibility of using an AAC resource, produced through Boardmaker with Speaking Dynamically Pro<sup>®10</sup> in a regular classroom context. Four teachers and their students with autism, one from Kindergarten and three from Elementary School, participated in the research. At first, interviews were conducted with teachers, students were observed and AAC boards were constructed using the above-mentioned system. Then, the resource was applied using the computer.

The results revealed limited teacher knowledge regarding autism, as well as AAC. Students had little participation in activities due to communication limitations with teachers and peers. After the insertion of dynamic boards in the classrooms, there was an increase in the frequency of students' social interactions. These boards contained symbols of request to go to the bathroom, to store materials, to call the teacher, and to leave, among other commands. The resources were to be used by the student and the teacher to expand or supplement expressive and receptive communication. In this sense, if the student wanted to go to the bathroom, he activated the corresponding symbol, which triggered the word "bathroom". Regarding receptive language, the teacher used, for example, the pictogram "let's study", instructing the student to sit down and complete a task. Considering the classification system adopted in the present study, communicative acts were identified to request permission and objects, as well as respond to the partner's intervention.

Using case studies, four investigations discussed the relevance of using Visual Support (VS) in the socio-communicative and behavioral skills of students with ASD (Cândido, 2015;

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<sup>10</sup> Computer program for learning and alternative communication with accessibility and voice generation.

Fiorini, 2017; Fontoura, 2018; Monte, 2015). VS are visual resources used for communicative or behavior regulation purposes (Shane, 2006). According to Shane and Simmons (2001 as cited in Shane, 2006), three types of VS are typically used with people with ASD. The first, called Visual Expression Mode (VEM) is used as an expressive communication tool. It is configured as symbols, from an ideographic or pictographic nature, used to replace or supplement speech. In this perspective, photographs, line drawings or symbolic systems like Bliss are typically used as VEM.

The second type is called Visual Mode of Organization (VMO) and has the function of organizing activities, routines, scripts, or activity schedules. It is used as a visual cue that favors receptive language, enabling the understanding and the anticipation of events in a given routine, facilitating the transition between activities performed by the individual. In this configuration, the horizontal arrangement of a food item picture, followed by an arrow and an image of a book could indicate the transition from recess to an academic activity.

Finally, the Visual Instruction Mode (VIM) refers to the simultaneous use of the visual resource with speech or written language, to stimulate receptive language (comprehension). Its purpose is to emphasize instructions, by incorporating a visual element to complement or replace speech. Considering the previous example, the teacher would be using the VIM when pointing to the images of the food item, the arrow, and the book while, simultaneously, verbalizing “let’s go to recess and then go back to class”. Another example would be the use of images during storytelling, where the pictograms would help the student understand what is verbalized by the narrator.

It is important to note that Visual Supports are not, in themselves, AAC systems. This understanding is supported by the way a symbol is agreed upon, the functions it assumes and the way it is used. In the first case, it is worth considering that the meanings are not inscribed in the graphic symbols but are constructed during the social interactions of individuals with their communication partners (Nunes, 2003). Based on the socio-interactionist perspective defended by Tomasello (2003), the meaning of “recreation” attributed to the picture of the food item in the example above, is constructed during the teacher-student interaction. If the student did not understand this convention, communication would fail.

Second, it is necessary to recall the idea that AAC is used to replace, supplement or complement speech, which regarding its communicative purpose, would have the function of regulating behaviors, initiating or maintaining social interaction and/or sharing information (Wetherby, 1986). This dynamic necessarily presupposes a social interaction where the partners share the meanings of the symbols.

Finally, the third factor concerns how a set of symbols will be used for communicative purposes. In other words, it can be agreed as a picture exchange system, the manual indication of figures on a communication board or the activation of sounds in an electronic device, among others. In this context, Walter (2018) alerts for the need of defining the usage protocol, allowing, for example, the teachers to follow the program’s steps and be able to evaluate the communication development of their students. Examples of this organization are the PECS protocols (Frost & Bondy, 1994) and the Adapted-PECS (Walter, 2000) which are structured in stages. For the student to proceed to a subsequent stage, it is necessary to have developed a certain skill in the previous stage.

The different VS modalities were described in the study conducted by Fiorini (2017), which aimed to characterize the activity routines of students with ASD in the Early Childhood Education context. In this process, the author interviewed nine teachers and conducted observations of seven students with ASD engaged in school activities. The data indicated that the teachers used images, symbols and signs to regulate behavior and expand expressive communication. In the first case, she acknowledged the use of pictograms to anticipate events, characterizing VOM. In the second, she described VS's support during storytelling activity. In this dynamic, the teacher initially told a story, supplementing her speech with the pictograms. Then, a student with ASD was instructed to retell the story to classmates through speech and figures illustrated in the book. At the end of the school year, the student managed to tell the story by reading the words. It was not detailed, however, if, at the time of reading, the teacher simultaneously spoke and used the book images or if this book was utilized as an AAC resource.

The results of this research revealed flaws in the use of visual resources used by teachers. According to the reports, the teachers tried to introduce figures on the AAC boards, but they failed to note any student interest in this resource. They replaced the figures for photos but were unsure if the students were able to understand them. This phenomenon was attributed to the teachers' limited knowledge about this technology, an issue observed in Olmedo's study (2015).

It should be noted that there are no details on how the resources were introduced in the activities. In this sense, based on the examples provided by Fiorini, it is unclear whether the resources provided were used as AAC systems or Visual Supports.

Despite these limitations, episodes of social interactions with declarative, imperative, and social interaction functions were identified in four students who verbally communicated. The use of AAC by the three students without functional speech was not registered. As indicated by one of the teachers, the AAC system was still in the process of being implemented.

SVs were also used in two other studies, which were based on storytelling. In the first, Monte (2015) analyzed, through a case study, the level of participation and interaction of three students with autism when using visual narratives mediated by the Alternative Communication System for the Literacy of Students with ASD (SCALA). In this process, with the support of the researcher, the children set up stories using low and high technology resources, including puppets, costumes and the Scala software, which allowed, among other elements, the creation of scenarios, characters, and speech balloons. The storytelling activities were carried out in environments typically frequented by students with ASD and their peers, a regular classroom, and a computer room.

Monte (2015) structured the intervention in three periods. In the first, she conducted the storytelling using resources, for example, a "magic box" and "letter from the character of the story". In the second, she worked with the objects that were inside the "magic box" and that were removed during the storytelling. In the third, she created a story with everyone in the classroom using the SCALA system. At this moment, the teacher presented SCALA and instructed the students to build the scenery and the characters on the computer, with her help. Finally, the researcher told the story constructed with SCALA, characterizing the VIM (simultaneous use of images with oral and/or written language).

According to Monte (2015), both high and low technology resources provided positive results in relation to students' joint attention during the activities, interaction, and participation with communicative exchanges. The data suggest that the intervention proposal favored student participation in the activities. According to the author, interaction levels, including oral and gestural communication, increased during the meetings. AAC, however, was not used, despite the three participants having impaired verbal communication. The communicative acts identified had the purpose of maintaining social interactions and were of imperative nature.

Fontoura's (2018) purpose was to stimulate the symbolization skills of four children with ASD through a pedagogical practice that combined children's storytelling with drawing mediated by visual resources. In this research, outlined as a case study with intervention, the researcher told the students, in a school and a residential environment, children's stories, incorporating pictograms into the narratives. Then, with the support of the same images, she verbalized questions to assess the understanding of the narrated tales. Among the images, there were the Aragonese Center for Augmentative and Alternative Communication (ARASAAC)<sup>11</sup> symbols that, used in conjunction with reading and verbalized questions, characterized the VIM described by Shane (2006).

After discussing the story, each participant was instructed to represent the narrative or part of it through drawings. Finally, the children were asked to identify, in the drawings produced, the elements of the story by means of picture cards. In other words, they had to match the drawings produced with the available pictograms. In Fontoura's (2018) perspective, this practice favors symbolic development since drawing is associated with a representation of something concrete.

The results of the research revealed the promising effects of using VS in storytelling activities, favoring both verbal comprehension and the development of symbolic representation skills. Thus, the data indicated that the children were able to adequately answer the questions. Finally, imitation and creativity were identified in three children who managed to come up with novelties. In pragmatic terms, episodes were identified where communication was used with imperative, declarative, as well as social interaction purposes.

As in the studies conducted by Fiorini (2017) and Monte (2015), the data from Fontoura's (2018) research suggest that VS were not included in AAC systems but were used in VIM to favor the receptive language of students with ASD. In this sense, Walter (2018) states that, currently, it is common for teachers and specialized professionals to find difficulties in differentiating educational methods that are structured using figures and communication programs. Studies conducted in schools have reported the tendency for teachers to use pictures to facilitate the performance of academic tasks and favor the receptive language (understanding) of students with complex communication needs, which often places expressive language in the background (Nunes et al., 2018; Nunes & Walter, 2018).

<sup>11</sup> ARASAAC – the portal offers free graphic and material resources to facilitate communication between people who have communication impairments (<https://arasaac.org/>, for more detail).

## 4 CONCLUSIONS

The purpose of this manuscript was to identify what national research studies, published in the past 5 years, have revealed about the contexts where AAC is used with students with ASD. Specifically, the research evaluated pragmatic aspects of students' communication, as well as identified the protocols/types of AAC systems adopted.

The eight studies analyzed included participants between 3 and 12 years of age who used assisted communication systems, with a predominance of AAC boards/albums or picture cards. Four investigations additionally adopted computers with voice output. Studies of an interventional nature were predominant, as well as investigations concerning teacher training.

The way in which AAC systems were implemented with students were systematically described in three studies. In them, pictures exchange communication prevailed, using PECS or the Adapted-PECS protocols. In four investigations it was not possible to identify whether visual aids (e.g. visual routines) were used as AAC systems.

All studies were conducted in the regular classroom and/or MRR. In two investigations, AAC use was also registered in a home environment. Despite the use of AAC in natural contexts, involving familiar partners (parents, peers or teachers), gaps were identified in pragmatic aspects of students' communication. First, in line with international studies, it is worth noting the predominance of imperative communication, focusing primarily on pragmatic behaviors of requesting objects. Although research highlights the predominance of this function in populations with ASD, it is questioned whether the communicative partners offered conditions for the emergence of more advanced functions of declarative or social interactive natures.

Second, it is important to highlight that metacognitive aspects of communication, as postulated by Bates (1976), were neglected in several interactions. Thus, there seemed to be no real purpose for providing information in some of the interactions described. In such cases, the partners typically asked questions that they already knew the answers. Or, in more critical cases, that the student was aware that his answers did not contribute to the partner's knowledge.

The third aspect to be highlighted is the lack of full transcriptions of communicative acts in these environments, where one could observe the interactive communication links. This gap hinders the possibility of conducting richer analysis of the communicative functions used by these participants.

Despite the limitations identified, the studies found revealed positive results on the use of AAC for students with ASD in regular schools. Among them, the expansion of students' verbal repertoire, increase in the frequency of interaction between peers and in the teacher-student dyad, greater autonomy, organization of the school routine, as well as more participation in pedagogical activities are highlighted.

The data from this review suggest that AAC is an unknown resource for a considerable number of teachers and other education professionals. That said, the urgency to invest in the training of teachers and other educators is stressed. This would enable them to understand the complexity of autism and how to use AAC.

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