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Original articles

Morphosyntactic development in autistic children by implementing the Development of Communication Skills in Autism (DHACA) method

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ABSTRACT

Purpose: to investigate whether the Development of Communication Skills in Autism (DHACA) method promotes morphosyntactic development in nonverbal and minimally verbal autistic children.

Methods: a case series study with a sample of 12 nonverbal or minimally verbal children with autism spectrum disorder (ASD), aged 2 to 5 years. The intervention consisted of 16 to 20 sessions, using alternative communication through the DHACA method, by employing a low-tech alternative communication book. Data were collected from each child's weekly progress records.

Results: after the intervention, two children (16.67%) developed the ability to produce three-word sentences, eight children (66.67%) began producing 3-to-4-word sentences, and two children (16.67%) produced sentences with varied parts of speech. Considering the communicative skills achieved after the intervention, these children attained morphosyntactic structures with 3 to 7 words and diverse pragmatic functions.

Conclusion: the intervention using the DHACA method contributed to morphosyntactic development, evidenced by an increase in sentence length and complexity, development of pragmatic functions, and expansion of vocabulary, ultimately promoting more functional communication.

Keywords: Autistic Disorder; Communication; Speech, Language and Hearing Sciences; Communication Aids for Disabled; Child Language

A study conducted at the Universidade Federal de Pernambuco - UFPE, Postgraduate Program in Human Communication Health, Recife, PE, Brazil.

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INTRODUCTION

Language develops gradually, with its pragmatic, semantic, morphosyntactic, phonetic, and phonological components evolving in alignment with their respective maturational stages – which are continuously influenced by the environment and interactions with others[1]. Morphosyntactic aspects are foundational pillars in communication development, as they address the internal structural components of language, including word formation and syntax (function)[1,2].

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by persistent deficits in social communication, language, and social interaction; restricted, repetitive, and/or stereotyped patterns of behavior; and limited interests or activities, present from early childhood[3,4]. Morphosyntax may be impaired in ASD, manifesting as difficulties in word combinations and grammatical aspects, including structural truncations and errors and word omissions and substitutions. These impairments may involve errors in verb tense marking, article and conjunction use, and generally reduced use of closed-class words (e.g., pronouns), particularly in the early language acquisition stages[3,4].

Augmentative and alternative communication (AAC) is one of the various resources available to develop communication in individuals with ASD. AAC is a subfield of assistive technology, providing individuals whose communication needs are complex with the means to improve and establish functional communication tailored to their specific characteristics, individualities, and realities[5,6]. The Development of Communication Skills in Autism (DHACA) is a method adapted to the linguistic reality of Brazilian Portuguese[7-10], employing a robust AAC system to foster communication development in children with ASD.

The DHACA method is based on Tomasello's sociopragmatic theory[11], according to which language originated in the culture, emerging from linguistic signs transmitted through daily interactions between individuals. This process fosters language development by viewing interlocutors as communication partners and intentional agents who contribute to the primary transmission and communication modes. Additionally, during language acquisition, children perceive entire linguistic structures within the language input as effective units for constructing their own language. Hence, communication partners have an essential role in providing an AAC-supported linguistic model[9-11].

The DHACA method is a pioneering, Brazilian approach designed to promote communication skills through a robust alternative communication system in speech-language-hearing interventions. It emphasizes the development of linguistic aspects (pragmatic, semantic, and morphosyntactic), expanding communicative functions. As children achieve new skills, they begin to use diverse morphosyntactic elements, represented within communicative contexts mediated by the interlocutor[10]. The method employs strategies such as modeling and physical, visual, and verbal cues. It also incorporates a playful and personalized approach tailored to each child's interests in objects or activities, fostering interaction and engagement. This strategy supports functional language learning[8,10].

This study aimed to investigate whether the DHACA method promotes morphosyntactic development in nonverbal and minimally verbal autistic children, from the perspective of linguistic process development, using the DHACA communication book.

METHODS

The study was approved by the Human Research Ethics Committee at the Universidade Federal de Pernambuco, PE, Brazil, under protocol number 4.692.479 and CAAE 66933317.9.0000.5208, adhering to ethical principles and legal regulations in force. All parents/guardians who participated in the study signed an informed consent form, ensuring they were fully informed about the study's objectives.

This longitudinal case series study had a sample of 12 children with ASD. Participants were recruited through the waiting list management of a speech-language-hearing teaching clinic affiliated with the Unified Health System (SUS). All research procedures were carried out at this clinic in a chronological sequence, including an interview/medical history survey, assessment, intervention, and reassessment.

The inclusion criteria were as follows: nonverbal or minimally verbal children, aged 2 to 5 years, with a positive medical diagnosis of ASD and support level 1 or 2, who had never received speech-language-hearing therapy with alternative communication. The exclusion criteria were children with the following comorbidities: intellectual disability, ophthalmological issues, hearing impairment, speech motor disorders, developmental coordination disorders, and/or untreated epilepsy.

Clinical data collection began by surveying the children's medical history with their parents/guardians, gathering information on general identification, pregnancy (perinatal, prenatal, and postnatal), and the child's overall development (motor, sensory,

behavioral, language, speech, breastfeeding, nutrition, sleep, health history, and early signs of ASD). In the second phase, the 12 children were assessed with formal protocols. Then, interventions began using a robust low-tech alternative communication system from the DHACA method, filling out progress forms with specific topics for later analysis.

The DHACA method gradually stimulates children according to each of the five skills, as outlined in Chart 1.

Chart 1. Skills of the Development of Communication Skills In Autism method (Montenegro et al., 2024)[10]

Number	DHACA method's skills
1	Initial Communicative Intention
2	Request with Lexical Expansion in Accessory Vocabulary
3	Request with Lexical and Morphosyntactic Expansion
4	Morphosyntactic, Lexical, and Communicative Functions Expansion
5	Dialog

Each child received a DHACA book, consisting of 66 pictograms representing essential vocabulary on a single page with pre-established figures, along with tabs containing additional vocabulary pictograms. These were added as the child's skills progressed, in a personalized manner based on the objectives of each skill (Appendix 1). The pictograms were overlaid with single lines, representing lexical categories such as colors, numbers, alphabet, people, time, feelings, shapes, foods, fruits, vegetables, places, hygiene, attributes, body parts, greetings, animals, means of transportation, toys, children's videos (YouTube), and so forth. These were added according to the child's linguistic development, family needs, and other social contexts during the intervention. Parents/guardians received guidance at the end of each session to encourage the use of the DHACA book beyond the clinical therapeutic environment.

The intervention initially stimulated all children to develop the first (1) skill, "Initial Communicative Intention," aimed at constructing the sentence "I + Want + Pictogram" by inserting a single pictogram above the essential vocabulary page, reaching up to four pictograms. The second (2) skill focuses on "Request with Lexical Expansion in Accessory Vocabulary," where the child is encouraged to request something from the communication partner by constructing the sentence "I + Want + Pictogram." In this case, the pictogram is no longer isolated but is present in the accessory vocabulary tabs, which are inserted in this skill. It is important to note that, starting from this skill, in addition to the child's specific demand and restricted and repetitive interests, pictograms related to family needs are added to the accessory vocabulary, with tabs being added beyond the child's interests, allowing communication partners to use the DHACA book. The third (3) skill introduces greater complexity, as it involves "Request with Lexical and Morphosyntactic Expansion," where the child is encouraged to construct the sentence "I + Want + 2 Pictograms." The pictograms used to form sentences can come from either the accessory or essential vocabulary tabs. In the fourth (4) skill, "Morphosyntactic, Lexical, and Communicative Functions Expansion," the child is expected to form sentences with three or more words, expressing various communicative functions, such as questions with interrogative pronouns (when, what, who, where, etc.), comments, spontaneous information, expression of feelings, ideas, and greetings (salutations, farewells, and thanks). In the fifth (5) and final skill, "Dialog," the child is stimulated to develop greater communicative complexity, being able to communicate through the book with an expanded lexicon and demonstrating improved conversational skills – e.g., narrating, telling and retelling stories, telling jokes, and sustaining and maintaining conversations in various communicative contexts.

Thus, 20 individual sessions lasting 30 to 45 minutes were held weekly over 9 months. The therapeutic room where the sessions took place measured 3 m^2, with an infant-sized table and chair (60 cm), rubber mats on the floor, and a two-door wooden cabinet. The latter was used to store the therapeutic materials presented throughout the session according to the child's interests and requests through the personalized pictograms in the DHACA book. Additionally, at the end

of each session, the caregivers received guidance on how to use the DHACA book in other contexts (such as church, park, school, etc.), beyond the clinical environment.

As the sessions advanced, the follow-up therapists filled out progress forms systematically while the fixed therapist conducted the intervention in the therapy room. These forms contained information about the method's skill being stimulated and acquired, the pictograms the child used in sentences, and whether they used the pictograms spontaneously or after the communication partner prompted a response. After each session, the progress form was corrected by the therapist who conducted the intervention. This information was entered into a Google Excel spreadsheet along with general data initially collected in the medical history survey, including details such as the child's sex and age and their and their caregivers' education levels. Post-intervention data were collected in the weekly progress record form from each child's file (Appendix 2), including communicative skills acquired per session, the number of pictograms used in each skill, the pictograms used in each session according to the parts of speech, the total number of pictograms used after the intervention, and the sentences they constructed. It is important to note that the productions were considered based on communication mediated by the DHACA AAC book, not on verbal production associated with the resource.

RESULTS

Male children predominated among the 12 participants, as 10 (83.3%) were males, and only two (16.7%) were females. As shown in Table 1, age was distributed as follows: five children (50%) were 36 to 47 months old, five children (50%) were 48 to 50 months old, and only two children were 25 to 35 months old. Six (50%) children attended daycare, while the other six (50%) did not attend any educational institution.

Table 1. Distribution of sex, age group, and education in the sample

Sex	**n = 12**	**%**
Males	10	83.3%
Females	2	16.7%
Age	n = 12	%
25 to 35 months	2	16.67%
36 to 47 months	5	41.67%
48 to 50 months	5	41.67%
Children's education level	n = 12	%
Attending daycare centers	6	50%
Not attending daycare canters	6	50%

Captions: n = total sample number. % = percentage per sex, age and children's education level.

Furthermore, C3, C4, C5, and C12 were nonverbal, while C1, C2, C6, C7, C8, C9, C10, and C11 were minimally verbal. Only C1 and C9 were females, while the remaining children were males.

Regarding the caregivers' education level, nine (75%) mothers were high school graduates, while three (25%) had a bachelor's degree. As for the fathers, eight (66.67%) were high school graduates, three (25%) had incomplete middle school, and one (8.33%) was illiterate, as shown in Table 2.

Table 2. Parents/guardians' education level

Parents/guardians' education level	Mother's education (%)	Father's education (%)
Illiterate	0%	8.33%
Incomplete middle school	0%	25%
High school graduates	75%	66.67%
Bachelor's degree	25%	0%

Caption: % = percentage of the parents/guardians' education levels, divided between mothers and fathers, in relation to the total number of participants.

Table 3 presents the DHACA method's communicative skills data before and after the intervention. The results indicate that all children had acquired the first skill ("Initial Communicative Intention"). Moreover, only two (16.67%) remained in the second skill ("Request with Lexical Expansion in Accessory Vocabulary"), whereas 66.67% of the sample reached the third skill ("Request with Lexical and Morphosyntactic Expansion"), and two (16.67%) children reached the fourth skill ("Morphosyntactic, Lexical, and Communicative Functions Expansion"). None of them reached the "Dialog" skill.

Table 3. Skills of the Development of Communication Skills in Autism method present before and after the intervention

DHACA skills	Number of children before the intervention	Children	Number of children after the intervention	%
Initial Communicative Intention (1)	0	0	0	0%
Request with Lexical Expansion in Accessory Vocabulary (2)	0	C8 and C11	2	16.67%
Request with Lexical and Morphosyntactic Expansion (3)	0	C2, C3, C4, C6, C7, C9, C10, and C12	8	66.67%
Morphosyntactic, Lexical, and Communicative Functions Expansion (4)	0	C1 and C5	2	16.67%
Dialog (5)	0	0	0	0%

Caption: % = percentage of the number of children who acquired the corresponding skills in the Development of Communication Skills in Autism method after the intervention.

Table 4 shows a greater use of morphosyntactic structures and longer sentences constructed using the DHACA alternative communication book as the children progressed through skills 2, 3, and 4. C8 and C11 (16.67%) reached skill 2, constructing three-word sentences. C2, C3, C4, C6, C7, C9, C10, and C12 (66.67%) produced four-word sentences and used new verbs, nouns, articles, and adjectives, thus presenting broader morphosyntactic structures. C1 and C5 (16.67%) reached skill 4 and produced extensive and complex sentences with up to seven words and various communicative functions, using constituent segments heterogeneously.

Table 4. Sentence structured per skill after the intervention with the Development of Communication Skills in Autism method

Method's skill	Children	Sentence structure
Request with Lexical Expansion in Accessory Vocabulary (2)	C8 and C11	Pronoun + Verb + Noun
Request with Lexical and Morphosyntactic Expansion (3)	C2, C3, C4, C6, C7, C9, C10, and C12	Pronoun + Verb + Verb + Noun Pronoun + Verb + Noun + Adjective Pronoun + Verb + Article + Noun
Morphosyntactic, Lexical, and Communicative Functions Expansion (4)	C1 and C5	Pronoun + Verb + Verb + Noun Pronoun + Verb + Noun + Adjective Pronoun + Verb + Article + Noun + Adjective Pronoun + Verb + Article + Noun + Adverb Pronoun + Verb + Verb + Article + Noun + Adjective + Adverb Article + Noun + Verb + Adjective Article + Noun + Adjective + Verb + Preposition + Article + Noun

Figure 1 and Table 4 show a significant variation as they acquired more complex skills regarding morphological word classification, according to the pictograms used in the sessions and DHACA's communicative skills. This variation reflects the lexicon expansion and the increase in parts of speech within morphosyntactic construction.

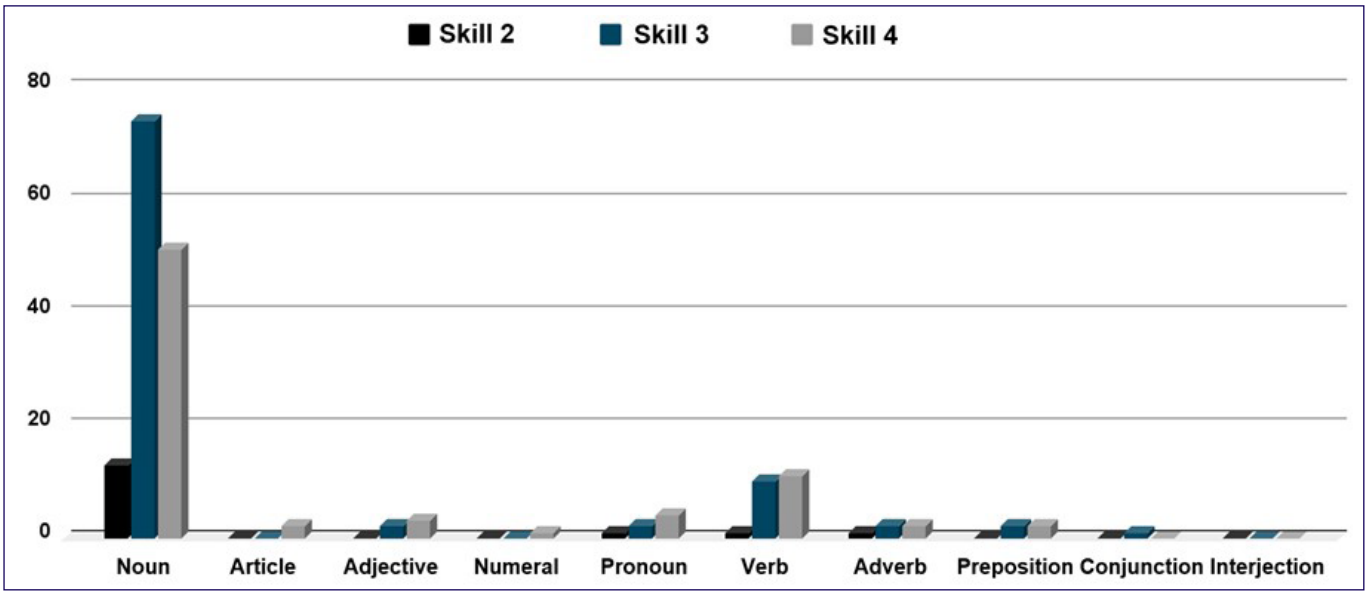

Figure 1. Total number of pictograms used in the communication skills achieved after the intervention with the Development of Communication Skills in Autism, per part of speech

C1 and C5, upon reaching the fourth skill, used more pictograms (approximately 53.5) than the other children, who were distributed across skills 2 and 3. There was also an increased use of words and greater heterogeneity in the morphological sentence structure, as indicated by the data in Figure 2 and Table 4.

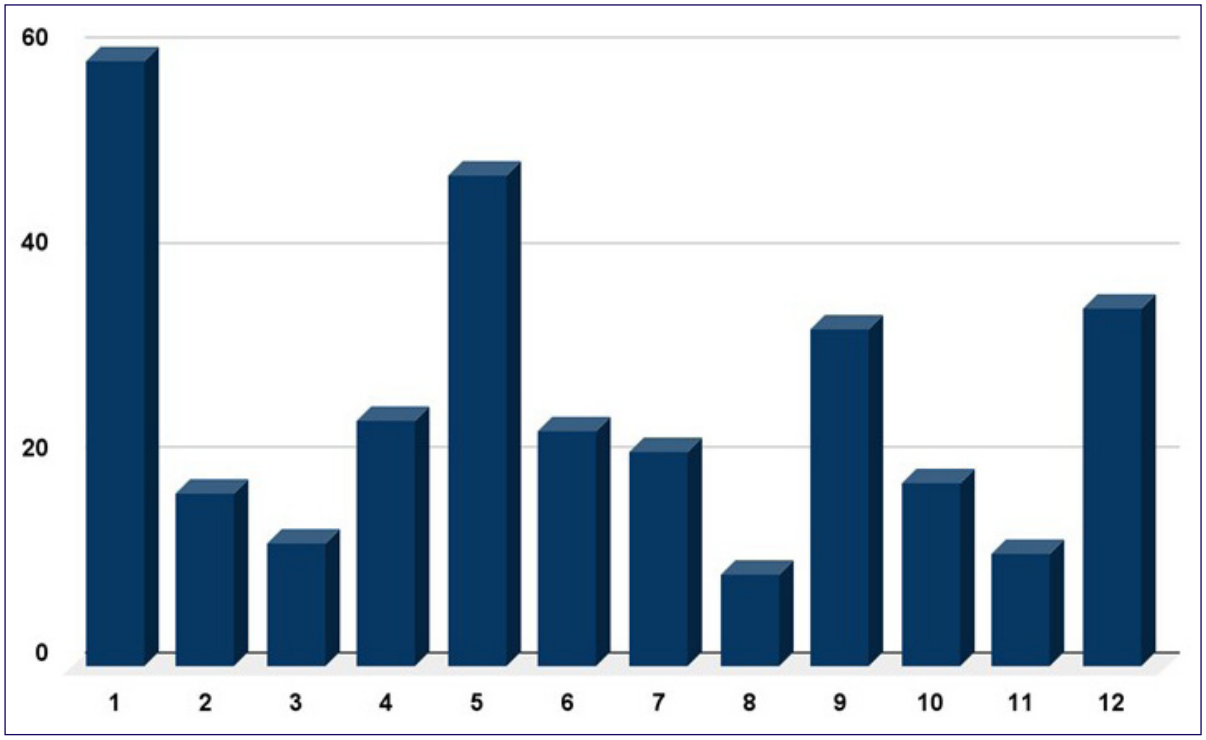

Figure 2. Number of pictograms used by children after the intervention with the Development of Communication Skills in Autism method

Figure 3 shows that C1 and C5 stood out for using a greater variety of pictograms, as they had reached the DHACA method's fourth skill, with greater morphosyntactic extension and complexity, along with the use of other communicative functions. The eight children in the third skill used an average of ±22.8 different pictograms, as shown in Table 3, whereas C8 and C11 used approximately ±10 pictograms, as presented in Table 5.

Table 5. Children's average use of word pictograms per communication skill achieved after the intervention with the Development of Communication Skills in Autism method

DHACA skills after the intervention	Children (C)	Average number of pictograms used by the children
Request with Lexical Expansion in Accessory Vocabulary (2)	C8 and C11	±10
Request with Lexical and Morphosyntactic Expansion (3)	C2, C3, C4, C6, C7, C9, C10, and C12	±22.8
Morphosyntactic, Lexical, and Communicative Functions Expansion (4)	C1 and C5	±53.5

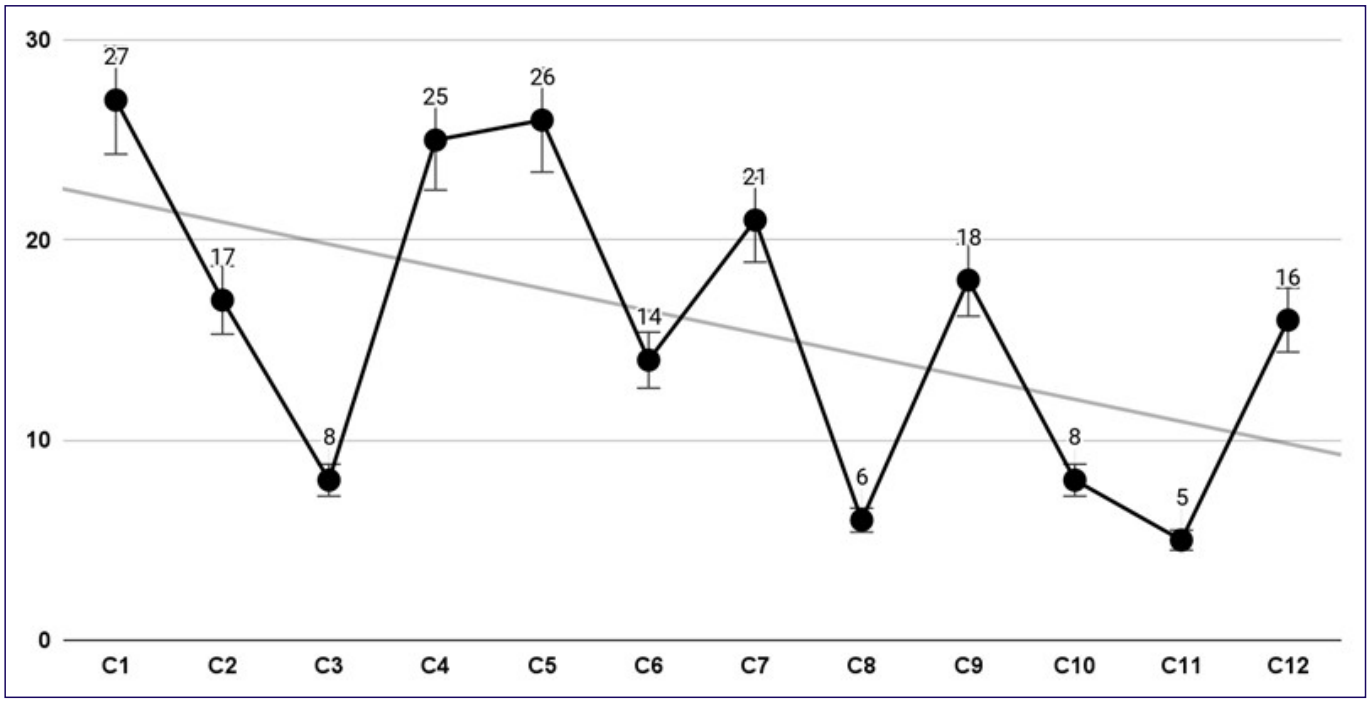

Figure 3. Number of different sentences constructed by children after the intervention with the communication book of the Development of Communication Skills in Autism method

Figure 3 shows a heterogeneous distribution of the number of different sentences each child constructed after the intervention. C1 and C5 produced the most, followed by C2, C4, C7, C9, and C12.

DISCUSSION

Language development in childhood is a dynamic process, characterized by the expansion of the lexicon and morphosyntactic structuring[12]. However, in autism, there is a deviation along the way, with significant deficits that impair language acquisition and use. Nonetheless, the literature scarcely addresses morphosyntactic development in ASD in detail[3,4,13-15].

The data analysis indicated a significant predominance of males. This finding supports what the literature describes about the higher prevalence of the disorder in males than females – approximately four times higher (4.3%) than in females (1.1%), according to the latest data published by the Centers for Disease Control and Prevention (CDC)[16]. Similar data have also been reported in Brazil[17,18], although these estimates may vary depending on different age groups, studies, and regions. Moreover, the exact reason for this sex difference in autism prevalence remains an ongoing focus of investigation. This study found no implications that could compromise the results due to the predominance of males.

The analysis found a uniform distribution between the 12 children's education levels, without significant variations. Six (50%) attended daycare centers, while the other six (50%) had not yet attended any formal educational setting, regardless of the level. These results suggest an equal division between the groups of children in the early stages of the intervention, with no evidence of a direct influence on the development of communication and language skills[19]. It is important to note that the analysis in this study showed no significant relationship between the children's education or the parents' education levels influencing the outcomes, given the heterogeneity in the method's skills, highlighting the clinical relevance in autism, as evidenced by the results in Table 3.

The DHACA method's intervention results in sentence construction, presented in Table 4, show that it favored and enhanced the linguistic organization and enabled higher levels of structuring the linguistic system of the participating children with ASD. These results are rather important, considering the structural morphosyntactic changes in autism requiring intervention, as they are essential for functional communication development[13,20,21]. Furthermore, despite the efforts in various studies to better understand language development in children with ASD, there is a lack of research with detailed results of grammatical structure

advancements after AAC intervention, particularly with a robust alternative communication system.

The DHACA book[10] (which contains a robust, low-tech alternative communication system) combined with appropriate strategies during the intervention promoted the functional use of more robust linguistic structures, as shown in Table 4. This was accompanied by an expanded vocabulary (Figure 2, Table 5) and various parts of speech, as described in Figure 1. Some recent studies[22,23] show significantly improved functional communication with sentence construction development after using AAC in children with ASD. However, they do not describe the sentence structures achieved in detail.

Tomasello's sociopragmatic theory, which underpins the DHACA method, asserts that language develops through its use[11,24]. Thus, children produced sentence structures during playful activities in therapeutic sessions – i.e., they developed functional communication by using and appropriating the alternative communication system.

Although no Brazilian study has detailed the development of typical or atypical children's vocabulary, children with ASD in this study have noticeably made functional use of simple and complex sentence constructions, according to the communicative skills outlined in the DHACA method (2, 3, and 4). Their vocabulary using the DHACA alternative communication book ranged from eight to 58 words, as shown in Figure 2. The lack of studies presenting the number of words typical children use in AAC books is a significant gap in communication and language development research, as the absence of complementary parameters limits analytical generalization.

Furthermore, noun use increased significantly. Using nouns with pictograms representing objects, food, and activities related to the children's preferences is part of the DHACA method's intervention strategy for early skills. Literature discussions indicate that the high number of nouns may be linked to restricted and repetitive interests, focusing on specific items or activities – the increased noun usage could be attributed to these interests, a clinical characteristic of children with ASD[25]. It is important to note that this strategy helps them acquire initial sentence construction (subject + verb + noun), encouraged in the DHACA method's first skill ("Initial Communicative Intention"). It also helps children strengthen their ability to communicate[26,27] and expand their vocabulary. Moreover, the nouns were selected individually for each child based on their interests, highlighting the importance of a personalized alternative communication book.

The children who advanced in the DHACA method's communicative skills made varied functional use of new verbs, understanding the aspects that give meaning to an object through language and its application. Furthermore, the visual and concrete nature of the DHACA alternative communication book facilitated the association between morphosyntactic structures (form and function)[28], as the children understood the different uses of verbs in communicative situations through the DHACA book. This aligns with the perspective that AAC promotes transversal communicative and behavioral performance – i.e., across different contexts, situations, and environments[29].

Tables 4 and 5 and Figures 1 and 2 show a noticeable heterogeneous expansion of linguistic structural elements. The two (16.67%) children who acquired skill 2 demonstrated initial sentence constructions for requesting, using pronoun-verb-noun combinations such as "I want ball," "I want water," "I want milk," "I want juice," with varied noun usage always tied to their interests. The children who reached skill 3 – the largest group (66.67%) of children per skill – used sentences with more diversified communicative functions and pronouns, verbs, nouns, adjectives, adverbs, and prepositions – e.g., "I want to drink water," "I'm going to get the car," "I want more snacks," "I want to go out now," "I want to eat pasta," forming more extensive and complex morphosyntactic structures with four to five words. Moreover, the two (16.67%) children in skill 4 expanded their morphosyntax, lexicon, and communicative functions as proposed. As a result, their morphosyntactic constructions had greater diversity, with more elaborated sentences and the use of other parts of speech – e.g., "I'm going to get the blue car," "I'm going to get the red circle," "The doll is inside the house," "The water is hot," "The cow is outside the house," "I want to play with the ball," "I want to play with the yellow ball," "The doll is sad," and so on. They used more pictograms with diverse communicative functions, forming sentences of up to seven words. The 12 children constructed 191 sentences altogether after the intervention, a significant value considering the lack of parameters in other studies and the fact that such morphosyntactic constructions had not been observed before the intervention.

Furthermore, the children constructed diverse sentences after the intervention, as shown by the data in Table 5 and Figure 3. This demonstrates

that the DHACA method allows the child to make their own analyses and generalizations in language development[11].

It was also observed that as children began using longer sentences with various pragmatic functions and expanded the possibilities and gains in communicative functions, they used nouns less often. As a result, they were no longer limited to using language for requesting and intentionally manipulated morphosyntactic structures. Given that language structure emerges from its use[11,24], the children developed language primarily by communicating with the interlocutor and understanding how they use language. In the context of this study, this development was facilitated by the DHACA book[10]. Some authors state in their studies that children with ASD show positive correlations with visual attention, their inputs, and receptive language. Therefore, the greater the capacity for comprehension and representational understanding of pictographic symbols and the relationship between them, the greater their language comprehension and expansion of pragmatic functions[28,30,31].

It can also be inferred that the children with ASD analyzed in this study developed not only their communication and language but also their cognitive performance, as they enhanced their ability to understand and apply linguistic knowledge in a communicative context progressively, showcasing a rich linguistic repertoire. It is important to note that language development and cognitive skills are intrinsically linked and develop simultaneously[24,32]. In other words, as the children's language developed, so did their cognition, based on the premise that language is a cognitive skill[24,32].

It is important to highlight that the study had some limitations. The first limitation refers to the small sample size used for analysis, with only 12 children. Another limitation was inclusion criteria, encompassing only non-verbal or minimally verbal children with ASD, rather than children from the entire spectrum. Additionally, the age range was restricted to children between 2 and 5 years old, excluding other children with diverse characteristics. The brief intervention period may not have been enough to observe changes and desired results in detail. Also, the data was recorded by an observing researcher in a clinical setting.

CONCLUSION

The study found remarkable advances in the communication skills of children presented with ASD after the intervention with a robust alternative communication system – they did not have significant or even rudimentary communicative abilities before. The advancements evidenced after the intervention with the DHACA method were linked to a notable expansion and complexity in the morphosyntactic structure of the sentences, an increase in vocabulary, and the development of pragmatic functions used by the children, providing them with the necessary tools for more functional communication.

Communication development also promoted autonomy and greater inclusion in social contexts, as they could express themselves using the method's robust alternative communication system. This research has vast and multifaceted implications. Its results provide a foundation for future investigations exploring in greater depth and breadth the morphosyntactic development in children with ASD, using the DHACA method.

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GNOM: Data curation; Formal analysis; Writing - Review & editing.

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Data sharing statement:

We declare that the data used in this article were collected for the purposes of this research only and cannot be made publicly available.

APPENDIX 1 – SKILLS OF THE DEVELOPMENT OF COMMUNICATION SKILLS IN AUTISM (DHACA)

Skill	Objectives	Strategies
Initial communicative intention	The child should have communicative intention, requesting something from the interlocutor, pointing to the pictograms I + WANT (in the communication book) + single pictogram* of what they desire. The child should build the sentence in sequence, pointing to the respective pictograms, possibly accompanied by speech. To advance to the next skill, the child must be able to discriminate up to four single pictograms and independently (i.e., spontaneously, without cues) build the sentence I + WANT + pictogram.	1. The therapist initially places a single pictogram related to an item of the child's preference at the top of the core vocabulary page. 2. The activity should be prepared to trigger in the child the desire to ask for preferred items. 3. As the child shows interest in objects, the therapist uses physical and verbal cues to help them point to the pictograms that form the sentence: I + WANT + item. Visual cues are used to gradually remove physical ones. If the child has difficulty identifying I + WANT, colored adhesive tape can be used to indicate the pictograms. 4. When the child is able to perform the above task, another pictogram is included; physical cues may be used again. 5. The therapist uses the communication book to guide their talk with the child, pointing to pictograms in the core vocabulary page, modeling their communication – i.e., pointing to the pictograms of the words they are saying. 6. Enable parents to use the book continuously, showing how to use it in the therapeutic setting, and train other relatives and professionals from various contexts. 7. When the child uses up to four pictograms to build the sentence, discriminating each one by independently pointing at them, they can move on the develop the next skill. 8. The therapist must instruct caregivers to promote skill acquisition, by showing how they use it with the child and then ask the caregiver to practice with the child in the therapeutic setting. The therapist must help the caregiver with feedback during practice.
Requesting with lexical expansion from the fringe vocabulary	The child should be able to ask the interlocutor for something by pointing to the pictograms I + WANT + a pictogram in the fringe vocabulary from one of the two tabs with distinct lexical categories. They should build the sentence in sequence by pointing to the pictograms, possibly accompanied by speech. To advance to the next skill, the child must request with the construction "I + WANT + a pictogram in the fringe vocabulary", independently, spontaneously, and without cues.	1. The therapist should dismiss the single pictograms and bind with a spiral initially one or two tabs of fringe vocabulary pictograms. Each tab has a line with up to 10 pictograms in lexical categories related to the items of preference used in the previous skill. 2. The activity must be planned to trigger in the child the desire to ask for some of their preferred items. 3. When the child wants an object but cannot ask for it by pointing independently at it, they must be guided with physical, visual, and/or verbal cues or modeling to point to the pictograms of the sentence: I + WANT + item in one of the fringe vocabulary tabs. 4. The therapist begins using the communication book by talking to the child, pointing to pictograms in the core vocabulary page and fringe vocabulary tabs, modeling their communication (i.e., pointing to the pictograms of the words they are speaking), and enabling parents to use the book continuously, as demonstrated in the therapeutic setting. They should also train other relatives and professionals from different contexts. 5. The therapist can model by showing the child how to form the desired sentences. 6. When the child is able to ask for up to two different items in the fringe vocabulary, pointing at them independently, they can move on to develop the next skill. 7. The therapist must instruct caregivers to help the child acquire the skill, demonstrating how to do it with the child and then having the caregiver practice with the child in the therapeutic setting. Thus, they enable parents to use it continuously and train other relatives and professionals from various contexts. The therapist must help caregivers, by providing feedback during practice.

Skill	Objectives	Strategies
Requesting with lexical and morphosyntactic expansion	The child should be able to form sentences with the pictograms: I + WANT + two pictograms from either the fringe or core vocabulary. Three or more tabs should be added. They should build the sentence in sequence by pointing to the pictograms, possibly accompanied by speech. To advance to the next skill, the child must be able to point to I + WANT + two pictograms from either the fringe or core vocabulary, independently, spontaneously, without cues.	1. The therapist must include fringe vocabulary tabs such as foods, toys, qualities, and places, besides the ones used in the previous skill. 2. The activity must be planned to trigger in the child the desire to ask for preferred items. 3. When the child desires an object, action, person, or some help but has difficulty finding the desired pictogram or leafing through the tabs, they can be helped with physical, visual, and/or verbal cues or modeling to leaf through them independently and point at the pictograms of the sentence: I + WANT + two pictograms from either the fringe or core vocabulary. 4. The therapist must use the communication book by speaking to the child, pointing to pictograms in the core vocabulary page and fringe vocabulary tabs, and modeling their communication. 5. The therapist can model by demonstrating to the child how to form the desired sentences. 6. When the child is able to ask for up to two items from different tabs, leaf through the tabs independently, and point to the pictograms of the sentence I + WANT + two pictograms from either the fringe or core vocabulary independently, they can move on to develop the next skill. 7. The therapist must instruct caregivers to help acquire the skill by demonstrating how to use the book with the child and then asking them to practice with the child in the therapeutic setting. The therapist must help the caregiver with feedback during practice, enabling them to use it continuously and train other relatives and professionals from various contexts. 8. The family must be encouraged to further use new words from the core and fringe vocabulary stimulated during the sessions.
Morphosyntactic, lexical, and communicative function expansion	The child should be able to form sentences with three or more words, with different goals: Developing communicative functions: • Informative/interrogative function, asking questions with interrogative pronouns (who, when, which, where, etc.). • Commenting: making comments, giving spontaneous information, showing something, demonstrating pain, giving opinions, and sharing ideas. • Expressing feelings, gratitude. • Social-interactive function: greeting, saying goodbye, thanking, apologizing, and showing off. They should build the sentence in sequence by pointing to the pictograms, possibly accompanied by speech. They must use them with interlocutors in various contexts to begin acquiring the next skill.	1. The therapist can include new fringe vocabulary tabs, such as feelings, the notion of time, other verbs, and social greetings, besides the tabs used in the previous skill. 2. The activity should be planned to encourage the development of communicative functions with four or more pictograms. 3. When the child wants to use any communicative function and has difficulties finding the desired pictogram or leafing through the tabs, they can be helped with physical, visual, and/or verbal cues or modeling to point at the four pictograms independently. 4. The therapist must use the communication book to speak to the child, pointing at pictograms in the core vocabulary page or fringe vocabulary tabs, and modeling their communication. 5. The therapist can model by demonstrating to the child how to form the desired sentences. 6. The therapist can use structured visual resources to help develop the skill. 7. When the child is able to form sentences with four or more words with different pragmatic goals, using items from different tabs, and leafing through the tabs independently, then they can move on to develop the next skill. 8. The therapist must instruct the caregiver to help the child acquire the skill by demonstrating how to use the book with the child and then having them practice with the child in the therapeutic setting. The therapist must help caregivers with feedback during practice, enabling them to use it continuously, and training other relatives and professionals from various contexts. 9. The family must be encouraged to further use new words from the core and fringe vocabulary used to stimulate the child to form new sentences during the sessions.

Skill	Objectives	Strategies
Dialog	The child should be able to use the following communicative functions: Reporting: telling a fact or retelling a story. Imagination: creating a story or telling a joke. Conversation: maintaining a conversation. They should build the sentence in sequence by pointing to the pictograms, possibly accompanied by speech. They must use it with interlocutors in various contexts.	1. The therapist can insert new fringe vocabulary tabs, according to the child's and family's demands in the child's various social and school contexts. 2. The activity must be free to encourage dialog using various communicative functions, maintaining conversation, creating, telling, and retelling stories, and reporting facts. 3. When the child wants to use any communicative function but had difficulties finding the desired pictogram, they can be helped by rephrasing with modeling. 4. The therapist must use the communication book to speak to the child, modeling their communication. 5. The therapist can also model by demonstrating to the child how to form the desired sentences. 6. The therapist can use structured visual resources to help the child develop the skill. 8. The therapist must instruct caregivers to help the child acquire the skill by demonstrating how to use the book with the child and then including the caregiver in the conversation for them to also use the AAC book with the child and the therapist. The therapist must help the caregiver with feedback during practice enabling them to use it continuously and train other relatives and professionals from various contexts. 9. Acquiring this skill indicates independence to use the DHACA communication book, beginning the assisted discharge process, and allowing caregivers to insert new tabs as needed.

*Single pictogram – loose laminated pictogram, separate from the fixed communication board.

APPENDIX 2 – WEEKLY PROGRESS RECORD FORM

WEEKLY PROGRESS RECORD DATE: ____/____/_____

Child: _____ **Therapist:** _____
Note-taker: _____ **Session no.:** _____

Goal: _____

Stimulate the skill: ( ) Request with single picture ( ) Request with 1A lexical expansion ( ) Request with 2A or 1E1A ( ) Request for information/comment ( ) Narrative

Acquired skill: ( ) Request with single picture ( ) Request with 1A lexical expansion ( ) Request with 2A or 1E1A ( ) Request for information/comment ( ) Narrative

Skill present in the child: ( ) Request with single picture ( ) Request with 1A lexical expansion ( ) Request with 2A or 1E1A ( ) Request for information/comment ( ) Narrative

Lexical categories used: _____
_____

Pictograms most used by the therapist: _____
_____
_____
_____

Pictograms used by the child with the therapist's cues:
_____
_____
_____

The child used pictograms without cues:
( ) Spontaneously ( ) Independently ( ) Alone ( ) In a sentence ( ) With verbalization
( ) Yes ( ) No

Please, describe the context: _____
_____
_____
_____

Cues: ( ) Yes ( ) No **Which ones?** ( ) Visual ( ) Physical ( ) Verbal

Eye contact: ( ) No ( ) Sometimes ( ) Yes

Vocalizations: ( ) Yes ( ) No

Verbalizations: ( ) Yes ( ) No **Which ones?** _____
_____

Onomatopoeia: ( ) Yes ( ) No **Which ones?** _____
_____

Echolalia: ( ) Yes ( ) No ( ) Late ( ) Immediate

Singing along when music was used: ( ) Yes ( ) No ( ) Imitation ( ) Independent

Making gestures when music was used: ( ) Yes ( ) No ( ) Imitation ( ) Independent

Spontaneous speech without the board: ( ) Yes ( ) No

Spontaneous speech with the board: ( ) Yes ( ) No

Physical stimulation: ( ) Yes ( ) No

Toys used:
_____
_____
_____
_____

Start time - Child's initial behavior - Child's emotional behavior - Interest and exploration of the environment - Child's reaction to the communication book - How did they accept and use the book? - Activities carried out - Child's response to the activity - Engagement - Did the activities need to be readapted? - Difficulties in the session and how they were overcome - What were the facilitating means to overcome the difficulty? – Guardian's participation in the session (description) - End time - Were there any guidelines for the guardians? - What guidelines? - Did the guardians point out any issues? - Did they request the inclusion of pictograms in the book?