

THE USE OF AUGMENTATIVE AND ALTERNATIVE COMMUNICATION IN MORPHOSYNTAX INTERVENTION IN ADOLESCENTS WITH DOWN SYNDROME

O uso da comunicação suplementar e/ou alternativa no trabalho com a morfossintaxe em adolescentes com Síndrome de Down

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ABSTRACT

Purpose: to present and to discuss the use of augmentative and alternative communication as a therapeutic tool with the morphosyntax with adolescents with Down syndrome. **Methods:** this pilot study monitored during 12 months four adolescents chronologically aged between 13 and 15 years and mentally aged between 5 and 6 years. It were analyzed the initial and the final assessments, situations of free interaction between the participant and the caregiver videotaped during 30 minutes. The speech samples were analyzed as MLU values considering morphemes and words, comparing both the two situations. All of the participants were submitted to the same procedures during the therapeutic interventions. *Picture Communication Symbols (PCS)* has been used and the symbols were organized according to a simple syntactic structure (substantive + verb + complement) with a gradual extension, and the elements were rated at the following order: articles, prepositions, pronouns (personals, possessives and demonstratives), and conjunctions. Each therapeutic session was recorded in specific protocol. It was used the Wilcoxon test and the p value considered was 5%. **Results:** spites there were no statistical significant differences, increase in number of morphemes and words used between the both assessments was observed. This improve was represented by the worked elements, including prepositions and conjunctions beyond substantives and verbs. For personal pronouns there was tendency to significance (p=0,068). **Conclusion:** the communication system showed to be a therapeutic tool to improve the use of syntactic elements in statement structures, as articles, prepositions and conjunctions, which use for individuals with Down syndrome are difficult.

KEYWORDS: Down Syndrome; Language Development; Linguistics; Language Disorders; Adolescent

■ INTRODUCTION

In children with Down syndrome (DS), vocabulary expansion is slower than in children with

typical development (TD), and literature indicates a relationship between lexicon and grammar. It is reported greater difficulties in functional words, such as articles, pronouns, prepositions and conjunctions, which have greater grammatical load, than in words with semantic content, such as nouns, verbs, and adjectives. In addition, these children have difficulties combining words and dealing with morphosyntactic rules, which have implications in phrasal structure¹⁻⁹.

The use of Mean Length Utterance – MLU¹⁰ as a measure of language development in children with DS corroborates these difficulties, and indicates frequent omission of grammatical morphemes, particularly of functional words, resulting in

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the use of shorter and simpler, telegraphic utterances^{2,7,9,11,12}.

To explain these alterations, studies have pointed out that, due to the cognitive deficit, children with DS have attention and working memory deficits, involving both auditory and visuospatial memory¹³⁻¹⁷. According to the authors, the short-term auditory memory directly interferes in expressive and receptive language in this population. The ability to remember phonemic sequences in a new word during vocabulary acquisition or the sequence of morphosyntactic components in an utterance is related to this type of memory^{13,15,16,18}. On the other hand, the short-term visuospatial memory, which processes information related to spatial and visual properties, is usually less impaired than the auditory memory^{4,16}.

Authors¹⁶ have mentioned studies in which pictures were used in the stimulation of the auditory span, and verified improvement in this type of memory. Other authors¹⁴ added that the visual context may also facilitate language comprehension in individuals with DS, emphasizing the simultaneous presentation of visual and auditory information might favor the stimulation of both types of short-term memory – visuospatial and auditory –, improving the comprehension of more complex utterances.

Studies¹⁹⁻²³ have shown that the presence of language difficulties and cognitive deficits is a relevant condition to indicate the use of systems and symbols from Augmentative and Alternative Communication (AAC) for this population, which includes, temporarily or permanently, individuals with DS. In other words, depending on the individual's profile of communication difficulties, the use of AAC could be a tool for language support or an alternative resource for language expression. Because its use is multimodal and respects the communicative abilities presented by the individuals, AAC may be indicated regardless of the manifestations that lead to language deficits. However, establishing the cognitive and linguistic development period of an individual with expression difficulties is a pre-requisite for its use, due to many systems and symbols that may be used according to age and cognitive performance^{21,23}.

Because the use of AAC systems values visual processing, they may also be effective as a transition to help children with cognitive deficits and oral language difficulties to understand the idea that words represent objects, persons, thoughts, and may be used to communicate experiences²⁴. Thus, the individual's communicative competence regarding expressive language and speech

production is improved, and short-term memory is stimulated.

According to some studies^{20,21,24}, AAC may be considered a facilitating resource in language development intervention in individuals with DS because it: aims communication effectiveness; provides independence, facilitating the solution of basic difficulties; supports social relationships, consequently opening educational, recreational, and vocational opportunities, among others. In a study with Brazilian children with DS and ages from five to eleven years who predominantly used gestural communication²⁵, AAC was used with the aim to develop expressive vocabulary, resulting in its expansion and improvement in the quality of interaction and communication.

Based on the observations regarding lexical and grammatical difficulties in individuals with DS and on the indication of AAC to promote better communication conditions, this pilot study had the aim to present and discuss the use of AAC as therapeutic tool in morphosyntax intervention in adolescents with DS.

■ METHODS

This research was approved by the Ethics Committee for the Analysis of Research Projects – CAPPesq of the institution under protocol number 0940/07, and was initiated after the legal guardians of each participant read and signed the Free and Informed Consent.

Participants were four adolescents with DS (two of each gender), with chronological ages between 13 and 15 years in the beginning of the study, and mental age between five and six years, according to the Primary Test of Nonverbal Intelligence – PTONI²⁶. All subjects were enrolled in speech-language therapy at the Laboratory of Investigation in Syndromes and Sensorimotor Alterations (LIFSASM) of the institution.

The following inclusion criteria were considered for selection of the subjects: karyotype for simple trisomy of chromosome 21; oral language as the main communicative mean; absence of associate morbidities, such as hearing loss, visual impairment, psychiatric and/or psychological disorders, and neurological disorders; cognitive development at the end of the pre-operative period; audiological results suggestive of normal social hearing; to be enrolled in a regular school.

Data collection consisted of two assessments (initial and final), with an interval of 12 months between them. During this 12-month period, each subject was submitted to approximately 30 weekly sessions of speech-language intervention.

For initial and final assessments, subjects were video recorded during 30-minute interactions with their caregivers, in a situation of symbolic play. The interaction with the caregiver was chosen over interaction with the therapist or a researcher because this is a relaxed circumstance of natural relationship, providing the opportunity to observe the use of elements approached during intervention in a situation other than therapeutic.

The first five minutes of interaction were excluded from analysis, because they were considered as a period of adaptation to the situation. The following 100 utterances constituted the speech sample, and were transcribed in specific protocol. The MLU was calculated regarding morphemes (MLU-m) – considering GM-1 and GM-2 – and words (MLU-w), as proposed in a previous study²⁷, with the aim to compare the assessments.

During the therapeutic intervention, it was used the Picture Communication Symbols – PCS (Mayer-Johnson LLC, 1981-2004), which is composed of pictographic symbols that are disposed in a board according to a syntactic structure (Figure 1). Thus, the intervention initiated with simple utterances (noun (N) + verb (Vb) + complement) that were gradually expanded, becoming more complex with the introduction of articles, pronouns, prepositions, and conjunctions. The order for this expansion was: use of articles (Ar) and prepositions (Pre) first and, after that, pronouns (P), and conjunctions (C). The pronouns also were introduced gradually, in the following order: personal (PeP), possessive (PP), and demonstrative (DP) pronouns. The conjunctions approached were the additive (and) and the causal (because).

The sentences were presented according to a previously determined context (here understood as semantic field). The different semantic fields and sub-classifications were presented in the following order: animals, food, clothing, places. Hence, if the therapist's aim was to approach the semantic field *food-fruits*, only the complement was changed (for example: The boy ate *apple/banana/grapes*), and the participant should name the symbols after the therapist's model. Depending on the objective of the therapist, only a few sentence components were modified during the activity, while others remained in order to stimulate its correct production. For example, when a certain sentence was presented in a context that involved the semantic field *food*, either the complement ("*The girl ate rice*"; "*The girl ate peanuts*"; "*The girl ate spinach*") or the article + noun ("*The boy ate rice*"; "*The girl ate rice*";) was modified.

It is important to note that the number of sentences approached in each therapy session varied with the context. Likewise, the sentences were repeated according to the difficulties observed in the participant's production. A new sentence was approached only when the participant had already mastered the previous one. All subjects followed the same therapeutic plan, however, their pace of learning was obeyed. Each therapeutic session was recorded in a specific protocol (Figure 2) created by the therapist to follow each subject's evolution.

Data were statistically analyzed using the Wilcoxon test, and a significance level of 5% was adopted.

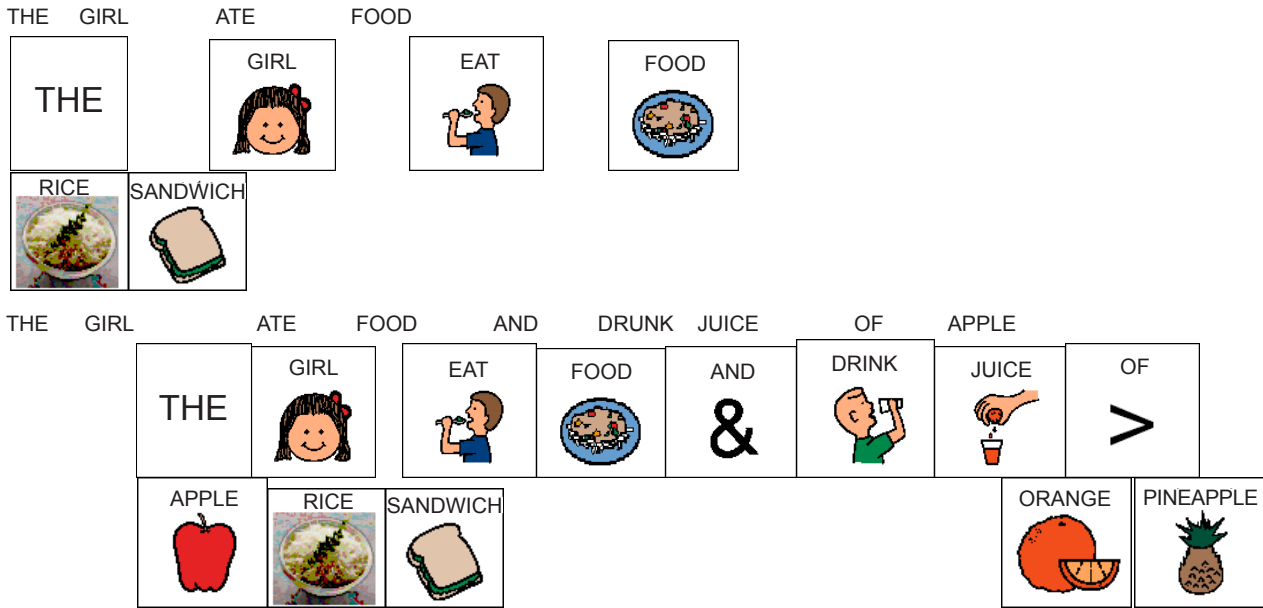


Figure 1 – Examples of the phrasal structures used during intervention

PROTOCOL OF MONTHLY FOLLOW-UP FOR ANALYSIS OF MORPHOSYNTAX

Name: _____

Date	Sentence	Difficulties observed

Figure 2 – Follow-up protocol

■ RESULTS

Table 1 presents the comparison between assessments for the variables MLU-m, considering both GM-1 and GM-2, and MLU-w. Although there was no significant difference, it was observed an increase in the number of morphemes and words from the initial to the final assessment.

The comparisons between assessments regarding the classes of words that constitute GM-1 are presented in Table 2. It was observed a higher number of N, followed by Vb and Ar. These numbers also increased in the final assessment, even though there was no significant difference.

Table 3 presents the comparisons between initial and final assessments regarding pronouns. There was also no significant difference between assessments, however, it was verified a decrease in the use of PP, little difference in the use of DP, and an increase with tendency towards significance in the frequency of PeP.

Table 4 presents the comparisons between both assessments regarding the conjunctions and prepositions, which are part of the GM-2. It was observed an increase in the use of C and Pre from the initial to the final assessment, although there was no significant difference between assessments.

Table 1 – Comparison between initial and final assessments regarding GM-1, GM-2, MLU-m, and MLU-w

	GM-1		GM-2		MLU-m		MLU-w	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Mean	251.0	318.3	22.8	38.3	2.7	3.6	2.1	2.6
Median	256.5	312.0	24.5	40.0	2.7	3.5	2.0	2.7
Standard deviation	30.7	72.4	6.9	12.2	0.3	0.8	0.4	0.6
Q1	237.8	285.0	20.5	31.3	2.6	3.3	1.9	2.3
Q3	269.8	345.3	26.8	47.0	2.8	3.8	2.2	3.0
N	4	4	4	4	4	4	4	4
CI	30.1	70.9	6.8	12.0	0.3	0.8	0.4	0.6
p-value	0.273		0.141		0.144		0.144	

Note: GM-1= grammatical morphemes type 1; GM-2= grammatical morphemes type 2; MLU-m= Mean Length Utterance in morphemes; MLU-w= Mean Length Utterance in words
Wilcoxon Test

Table 2 – Comparison between initial and final assessments regarding Ar, N and Vb

	Ar		N		Vb	
	Initial	Final	Initial	Final	Initial	Final
Mean	2.5	7.5	68.0	77.5	55.3	72.0
Median	2.5	7.5	67.0	77.0	53.5	68.0
Standard deviation	2.1	2.4	11.9	18.4	7.1	26.2
Q1	1.5	5.8	61.0	63.5	50.5	55.0
Q3	3.5	9.3	74.0	91.0	58.3	85.0
N	4	4	4	4	4	4
CI	2.0	2.3	11.7	18.0	7.0	25.7
p-value	0.068**		0.465		0.144	

Note: Ar= article; N= noun; Vb= verb
**= p-value with tendency towards significance
Wilcoxon Test

Table 3 – Comparison between initial and final assessments regarding DP, PP and PeP

	DP		PP		PeP	
	Initial	Final	Initial	Final	Initial	Final
Mean	5.8	5.3	4.8	1.8	3.8	14.3
Median	6.5	5.0	4.5	2.0	3.0	14.0
Standard deviation	1.9	5.1	3.9	1.3	3.1	7.4
Q1	5.3	1.5	1.8	1.5	1.8	8.5
Q3	7.0	8.8	7.5	2.3	5.0	19.8
N	4	4	4	4	4	4
CI	1.9	5.0	3.8	1.2	3.0	7.2
p-value	0.854		0.285		0.068**	

Note: DP= demonstrative pronoun; PP= possessive pronoun; PeP= personal pronoun

** = p-value with tendency towards significance

Wilcoxon Test

Table 4 – Comparison between initial and final assessments regarding C and Pre

	C		Pre	
	Initial	Final	Initial	Final
Mean	0.8	4.5	3.0	5.5
Median	0.5	3.5	3.5	7.0
Standard deviation	1.0	3.9	2.2	3.8
Q1	0.0	2.5	2.3	4.5
Q3	1.3	5.5	4.3	8.0
N	4	4	4	4
CI	0.9	3.8	2.1	3.7
p-value	0.109		0.273	

Noun: C= conjunction; Pre= preposition

Wilcoxon Test

■ DISCUSSION

Literature shows that children with DS have difficulties regarding morphosyntactic aspects, which are more evident as age increases, especially with respect to the use of words with syntactic function, such as articles, prepositions, and conjunctions. Not all of these studies are conducted with a numerous or homogeneous population, when considering the chronological age; moreover, the therapeutic procedures used in morphosyntax intervention are frequently not informed^{3,9,12,14,28}.

One of the concerns of the present study was to organize a research group that presented little variability regarding stage of cognitive development, chronological and mental age, such that the use of AAC as therapeutic procedure could follow a similar program, with similar chronology, for all participants. The fulfillment of these goals restricted the number of participants, but maintained the purpose to guarantee a homogeneous population and, therefore, consistency of the results. The research

was, then, conducted as a longitudinal pilot study that followed up the therapeutic process of the selected adolescents for 12 months, or approximately 30 sessions, and the data obtained suggest that the objective initially established was fulfilled. The type of study proposed found support in international literature regarding AAC. Although its importance is recognized, few references are found^{22,29}.

With the aim to verify the linguistic development, especially the morphosyntactic, we chose to compare the subjects' initial and final performances by assessing samples of natural spontaneous speech in an interaction situation of symbolic play, as indicated in literature^{12,28,30}. To assure such performance, the adolescents were assessed in dyads with their respective caregivers. The option for this procedure allowed observing the use of items approached in therapy, but in a familiar situation for the participants, since the caregivers can be considered the primary context for evaluation of the effects of therapeutic intervention. These comments are also found in studies directly related to the use

of AAC, with reference to the fact that the use of language depends on the context and, thus, the results obtained in therapy are not always observed in a familiar context^{24,31}.

The findings obtained from this comparison showed increase in the use of morphemes (MLU-m) and words (MLU-w). These results corroborate literature findings, which indicate the influence of age on the language development of children with DS, that is, despite of the difficulties, these subjects develop their language abilities^{3,5,7}. In this sense, the period of 12 months between assessments in this study can be considered a period of positive influence^{9,12,16,22}. There have been references in studies^{3,14} regarding the influence of the therapeutic process on the development of linguistic abilities in this population, although there are usually not enough information about the therapeutic model used. Concerning AAC, some authors have emphasized the idea of its positive influence on the communication development of children with DS regarding the outcome assessment of interventions that provide longitudinal data, as well as the results from programmed therapies^{22,29,31}. These reports corroborate the data obtained in the present study.

Studies^{3,7,12,31,32} have shown the importance to consider MLU as a measure of language development, both for morphemes and words, also for individuals with DS. The comparison between MLU-m and MLU-w provided data that, while corroborated by international studies^{32,33}, also reinforce findings of national studies with this same population^{7,9}. The variables showed compatibility between them, indicating their use as language development measure. This result was also found for DS individuals that speak Italian, which, like Brazilian Portuguese, is a Romance language³. The analysis of these two parameters, in the present study, indicated such development, as reported in literature, although the results were not statistically significant. That is, greater increase of morphemes related to words with semantic content and articles, represented by GM-1, than morphemes related to words with syntactic function, represented by GM-2^{3,5,7,9,12}.

Authors that study language in DS explain these findings based on the comprehension difficulties that these children and adolescents have, especially regarding morphosyntax. These difficulties are reflected on the poor use of elements that indicate relationship or connective elements, that is, elements with syntactic function, resulting in the production of telegraphic phrases¹⁻⁴.

Studies about language development in DS have reported that, among open class words (that is, words that carry meaning), nouns are acquired first

and in greater number than verbs, which also occur in typically developing (TD) children. Frequency of use by the adult, emphasis, and the relationship with concrete objects are among the factor usually indicated as facilitators for this development^{1,3,8,34}. On the other hand, verbs are related to actions or states, which are not always clearly perceived, and also have a syntactic structure function^{27,35,36}.

Regarding morphosyntactic development, authors^{1,5,34} also emphasize that nouns have flexional morphemes of gender and number, while verbs have morphemes of tense, mood, person and number, which makes their learning more difficult. Attention is also drawn to the position of these words in phrasal structure. Nouns usually have a final position, and verbs, medial position. This later occurrence could add more difficulties to children and adolescents with DS, since learning and use are related to the auditory working memory, which is hindered in this population^{13,15-18}. Participants' performance in the present study confirms these findings.

It is known that the article have the function of modifying the noun³⁷, and international literature have shown that articles are little used in utterances produced by individuals with DS⁵. Even though there are no national studies regarding this issue, it must be considered that Portuguese is a highly redundant language that marks gender, number and degree in many elements of a sentence (words), and that the omission of one of them does not necessarily imply lack of comprehension or syntactic-semantic information²⁷. In this sense, the present study showed that the use of articles tended to increase, suggesting that its syntactic function (with respect to its morphological aspects) was learned, since there is a direct relationship with the flexion of number and gender of nouns.

As for pronouns, literature mentions specificities in its use, which are related to the relations that are performed in the sentences, along with the other phrasal elements. However, there are no studies regarding its use in DS. Thus, this word class demands the processing of abstract language and knowledge about the pragmatic aspect of communication situations^{38,39}. The data obtained in the present study showed that, after the period of therapeutic intervention, demonstrative pronouns presented similar frequency when compared to the initial assessment, that is, they did not increase in quantity, which may indicate that participants substituted them by words of other classes, such as nouns and verbs, which increased in frequency.

The same was observed for possessive pronouns, which had fewer occurrences in the final assessment, while nouns, personal pronouns

and prepositions increased in frequency. In this case, possessive pronouns act as substitutes for prepositions, with the aim to facilitate reference to the relationship. The use of the structure “*é de (a)/ (o)*” (is his/hers) or “*é para o/a*” (is for the) for, for example, “*é do menino*” (is the boy’s) or “*é para o menino*” (is for the boy) implies the expression of the relationship between words, which is more difficult to be acquired than the reference provided by the possessive “his/hers”. Authors that have studied the acquisition of words with syntactic function in subjects with DS^{1,3} explain this difficulty by factors such as cognitive and auditory working memory deficits, as mentioned earlier.

Conjunctions, in turn, express semantic relations, which are based on the construction of the basic notions of time, space, causality, and functionality, with the objective to relate two or more thoughts translated by phrasal structures. The difficulties of individuals with DS regarding its use are justified by the same reasons indicated for other relational particles^{1,3,5,7}. The results obtained after therapeutic intervention in the present study showed an increase in the use of conjunctions, although the connective used with this function was “and”, which expresses continuity and contiguity of ideas. Intervention with the connective of causality (because) was initiated after the end of this study.

The search for studies regarding issues related to oral language intervention in DS, especially focusing the implementation of morphosyntactic performance considering the use of morphemes and relational words as well as phrasal structure, led to few studies directly related to this theme. It was also observed lack of systematicity and great variability regarding both the purposes and the population investigated⁹. Although AAC does comply with these variables, it may be used as an effective tool towards communication improvement for different populations, including subjects with DS. Studies specifically regarding DS are little frequent and mostly report the participation of small groups or case studies^{20,22,23,29}. In general, this population is included in studies about conditions that have intellectual deficits as a major feature and intervention results, either using communication boards or single symbols that substitute certain grammatical elements. Such studies report important gains, both by lexical expansion and use of phrasal structures.

The purpose of the present study was to systematize therapeutic intervention with longitudinal

application^{22,29,31,40} of a system that uses organized pictographic symbols in order to favor phrasal structure (PCS). The results obtained corroborate literature findings regarding the gain in oral communication through phrasal structures containing adequately organized elements such as articles, nouns, verbs, pronouns, preposition, and conjunctions^{20,22,29,31}. It can be argued that the repetition of phrasal structures with gradual and systematic introduction of slight modifications in syntactic elements, associated to the transparency and familiarity of the symbols, led to the implementation of auditory working memory, which has great influence on language issues presented by individuals with DS. These observations corroborate literature findings that report greater ease in visuospatial short-term memory and in the benefits brought by intervention with auditory working memory and language in this population^{13,14,16-18}.

This paper presented a pilot study that had the aim to contribute to important aspects related to language intervention in DS that, although much studied, are not well specified, even in international literature: the homogeneity of participant groups, the systematization of purposes for intervention regarding syntactic aspects, the implementation of proposals and longitudinal therapeutic programs. Although important from a scientific point of view aiming at clinical practice, the aspects highlight a weakness in the study conducted: the small number of participants. Hence, the analysis indicates the need for further reduplication and confirmation of the findings.

■ CONCLUSION

The results obtained showed that the AAC was an efficient therapeutic tool for adolescents with DS, allowing important gains in morphosyntax intervention. It favored the use of syntactic elements in phrasal structures, such as articles, prepositions, and conjunctions, which are difficult for these individuals. It is important to consider that this was a pilot study that identified the application of systematic tasks, their repetition with the introduction of controlled modifications, and the use of pictographic symbols as reinforcement for visuospatial and auditory short-term memory, which are important abilities to the development of language and oral expression.

RESUMO

Objetivo: apresentar e discutir o uso de comunicação suplementar e/ou alternativa como instrumento terapêutico no trabalho com a morfossintaxe em adolescentes com síndrome de Down. **Métodos:** estudo piloto que acompanhou longitudinalmente (doze meses) quatro adolescentes com idade cronológica entre 13 e 15 anos e idade mental entre cinco e seis anos. Foram consideradas as avaliações inicial e final, filmadas durante 30 minutos em situação de interação livre entre participante e cuidador. As amostras de fala foram analisadas a partir do cálculo da EME, quanto morfemas e palavras, para comparação entre as avaliações. Durante a intervenção terapêutica, todos os participantes foram submetidos ao mesmo procedimento. Foi utilizado o *Picture Communication Symbols (PCS)*, com os símbolos ordenados seguindo uma estrutura sintática simples (substantivo + verbo + complemento), ampliada gradativamente, na seguinte ordem de elementos: artigos, preposições, pronomes (pessoais, possessivos e demonstrativos) e conjunções. Cada sessão terapêutica foi registrada em protocolo específico. Foi realizado o teste de Wilcoxon e o nível de significância adotado foi de 5%. **Resultados:** apesar de não ter sido obtida diferença estatisticamente significativa, houve aumento do número de morfemas e de palavras entre as duas avaliações, representados pelos elementos trabalhados, incluindo preposições e conjunções, além de substantivos e verbos. Para pronomes pessoais foi verificada tendência à significância ($p=0,068$). **Conclusão:** o sistema de comunicação adotado mostrou-se uma ferramenta apropriada ao favorecimento do emprego de estruturas frasais com o uso de elementos com função sintática, como artigos, preposições e conjunções, de difícil utilização por indivíduos com síndrome de Down.

DESCRITORES: Síndrome de Down; Desenvolvimento de Linguagem; Linguística; Alterações de Linguagem; Adolescente

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