

ALTERNATIVE COMMUNICATION PROGRAM FOR A CHILD WITH CEREBRAL PALSY AND HIS COMMUNICATION PARTNERS: A MULTIPLE-PROBE DESIGN STUDY^{1, 2}

PROGRAMA DE COMUNICAÇÃO ALTERNATIVA PARA UMA CRIANÇA COM PARALISIA CEREBRAL E SEUS PARCEIROS DE COMUNICAÇÃO: UM ESTUDO DE DELINEAMENTO DE MÚLTIPLAS SONDAGENS

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ABSTRACT: Augmentative and Alternative Communication (AAC) for children with cerebral palsy is essential for their engagement in different contexts. Therefore, the purpose of this paper was to verify the effects of a program of AAC for a non-verbal child with cerebral palsy in three different contexts of daily life: school, home and rehabilitation settings. This study used a Multiple-probe Experimental Design. The participants were a child with cerebral palsy and three communication partners in their respective settings: teacher, mother and occupational therapist. The intervention consisted of the individualized process of theoretical and practical training directed at the communication partners and implementation of the AAC. After implementation of the intervention program, the results showed that the child and the communication partners successfully used AAC resources. The results indicate that the strategies adopted in the three contexts were effective and provided to the child and his communication partners an understanding of how to use the AAC effectively.

KEYWORDS: Special Education. Alternative Communication. Cerebral Palsy. Occupational Therapy.

RESUMO: A Comunicação Suplementar e/ou Alternativa para crianças (CSA) com paralisia cerebral é essencial para o seu envolvimento em diferentes contextos. Assim sendo, o objetivo deste artigo foi verificar os efeitos de um programa individualizado de CSA para uma criança com paralisia cerebral não verbal em três contextos da vida cotidiana: escola, casa e ambientes clínicos. Este estudo utilizou o delineamento experimental de múltiplas sondagens. Os participantes foram uma criança com paralisia cerebral e três parceiros de comunicação em seus respectivos contextos: professor, mãe e terapeuta ocupacional. A intervenção consistiu no processo individualizado de formação teórica e prática dirigida aos parceiros de comunicação e implementação da CSA. Após a implementação do programa de intervenção, os resultados demonstraram que a criança e os parceiros de comunicação usaram com sucesso os recursos da CSA. Os resultados apontam que as estratégias adotadas nos três contextos foram eficazes e proporcionaram aprendizado sobre o uso de CSA para a criança e seus parceiros de comunicação.

PALAVRAS-CHAVE: Educação Especial. Comunicação Alternativa. Paralisia Cerebral. Terapia Ocupacional.

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1 INTRODUCTION

Augmentative and Alternative Communication (AAC) is used by practitioners in an Assistive Technology intervention (Batorowicz, 2017; Manzini, 2017; Manzini, Cruz, & Martinez, 2017; Manzini, Martinez, & Almeida, 2015). AAC is used to compensate difficulties in communication and language skills, enabling engagement in occupations such as leisure, study, play, and social participation (Batorowicz, 2017).

AAC also enables the development of communication skills in contexts of everyday life (Sennott, Light, & Mcnaughton, 2016). One of the strategies is to increase the use of AAC in training the communication partners (Manzini, Martinez, & Almeida, 2015; Manzini, Martinez, Lourenço, & Oliveira, 2017). Its outcome can increase participation of users in the community (Bunning, Gona, Newton, & Hartley, 2014; Kennedy, 2010), and minimize communicative disorders in occupational performance (Costigan & Newell, 2009).

Studies addressing AAC have been conducted with children, youth, and/or adults with cerebral palsy (Dhas, Nsamuel, & Manigandan, 2014; Clarke, Price, & Griffiths, 2016; Griffiths & Addison, 2017). It is recognized that learning new communicative abilities is enabled when both children and communication partners can maximize the use of AAC in their contexts of family, school and rehabilitation settings (Clarke, Price, & Griffiths, 2016; Costigan & Light, 2010; Dhas, Nsamuel, & Manigandan, 2014; Kent-Walsh & Mcnaughton, 2009; Manzini, 2017).

Manzini (2013) developed an AAC intervention program for mothers of children with non-verbal cerebral palsy, using an experimental design with the individuals as their own controls in a clinical setting. The research identified an improvement in children's skills and communication repertoire. Mothers were able to use the AAC resources to more effectively communicate with their children, after intervention. Strategies adopted by mothers during intervention were generalized to their family environment after a follow-up.

Most intervention programs currently published were conducted in a single context, for example, at school (von Tetzchner, Brekke, Sjathun, & Grindheim, 2005), at home (Bunning, Gona, Newton, & Hartley, 2014), or in both contexts (Scopel, Souza, & Lemos, 2012). However, studies examining the effectiveness of AAC programs from three contexts simultaneously are unknown.

Our study is based on the hypothesis that the implementation of a personalized AAC program for a non-verbal child in three contexts of everyday life; home, school and rehabilitation settings simultaneously can increase their communicative repertoire and interaction (Manzini, 2017; Manzini, Cruz, & Martinez, 2017).

Our research used strategies of the Picture Exchange Communication System (PECS) by Bondy & Frost (1994). Those strategies used communication among the child and the communication partners through cards (Phase 1 of PECS). In spite of the PECS having been developed for people with autism spectrum disorders, current research shows its benefits in cerebral palsy (Almeida, Piza, & Lamônica, 2005; Evaristo & Almeida, 2016; Piza, 2002).

Our study is part of a Doctoral Theses that had the aim to develop, implement and analyze the effectiveness of a personalized program of AAC for a non-verbal child with

the diagnosis of cerebral palsy in three contexts of daily life: home, school and rehabilitation settings.

2 METHODS

2.1 ETHICS

This study was approved by the Human Research Ethics Committee of the Federal University of São Carlos, São Paulo, Brazil, under protocol number 922.817/2014. All participants agreed and signed the Terms of the Free and Informed Consent Form with all information regarding the research.

2.2 PARTICIPANT

The participant for this study was a 12-year-old boy with a diagnosis of cerebral palsy and his three communication partners in their settings: the child's mother (home), teacher (school), and an occupational student supervised by an occupational therapist lecturer (rehabilitation setting).

The child had a diagnosis of quadriplegic spastic cerebral palsy, Gross Motor Function Classification System level V (Palisano et al., 1997) and Manual Ability Classification System level IV (Eliasson et al., 2006). Before the intervention, the child only communicated using eye contact, facial expressions, general body language, babbling and crying; not often understood by the communication partners.

The child's mother was 40 years old, had not completed High School, and did not work outside of the home. The child's teacher was 45 years old and female, had a master's in Special Education, working for 15 years as a teacher at the child's school. The child's undergraduate occupational therapist was 22 years old and female.

2.3 INSTRUMENTATION

The following materials and equipment were used: a computer, a digital camcorder and camera, stationery material for manufacturing the low-cost AAC resources and the graphic symbols for the Boardmaker Speaking Dynamically Pro (Boardmaker[®]) software.

2.4 INSTRUMENTS

A set of four instruments were used in data collection:

- *Characterization protocol of the participants*: These gather demographic data of the participants such as: gender, age, level of education and occupation. It was developed by the first author of this study and is composed of four open, multiple-choice questions (Manzini, 2017).
- *Child's Communication Skills Interview*: Developed and pre-tested by the first author of this research, this instrument has three open, multiple-choice questions (Manzini, 2017). It identifies (a) the child's communication skills (i.e.: use of vocalization, verbalization, gestures, facial expressions, body movements); (b) Permit to identify the communication

partners with whom the child communicates (family members, friends, neighbors, teachers, and therapists); and (c) Allow to observe the feelings, wishes, and needs expressed by the child (pain, fear, sadness, happiness, thirst, hunger, and physiological needs). This instrument was applied to the communication partners prior to the intervention process to describe the previous repertoire of communication (Manzini, 2013).

- *Filming protocol for analysis of the probing and intervention sessions:* This protocol was developed for this study based on Bondy and Frost (1998) and Manzini (2013). It allows to observe and register the behavior of communication partners according to the level of assistance offered during an interaction and scores the child's behavior before the response provided during communication. The summary for both child and communication partner are described below:

The summary of the communication partner scores is:

- Score 0 - The activity starts without the participation of the child. No directed assistance is offered. The activities are presented with no stimuli or encouragement to elicit the child's response. Score 1 - The object/figure is shown verbally and/or with physical assistance through stimuli without allowing time for the child's response and/or responding to him/her.
- Score 2 - Total physical and/or verbal assistance is offered by the communication partners through stimuli. It is expected that the child can communicate by associating the object with the picture. Time is allowed for the response, but cues are not given.
- Score 3 - Partial physical assistance with verbal cues can be done encouraging the child to communicate associating the object-picture.

The summary of classification of the child's score is:

- Score 0 - does not respond to the stimulus presented by the partner.
- Score 1 - body movement, indicative gestures, facial expressions, and vocalization to communicate can be used (without using the AAC resource) in response to a stimulus.
- Score 2 - Using the AAC resource with total physical and/or verbal assistance, the child can show gestures/vocalization/babbling. It can be also observed the motor behaviors of: point, show, give, offer, blow a kiss.
- Score 3 - AAC resource can be used through partial physical assistance and/or verbal cues. The communication partner can offer 1 to 20 prompts for the child's interaction, and, at the end, the total number is scored in levels of performance (Manzini, 2017). For this analysis, all prompt opportunities are considered in which the object/figure is presented to the child with a following sentence, for example: Do you want to play with this balloon?
- *Choosing Figures Structured Interview:* This instrument was used to choose figures representative of meaningful activities in which the child would be interested in engaging in the three contexts (Manzini, 2013). This protocol was a semi-structured interview conducted with each communication partner and based on classifications of

the Canadian Occupational Performance Measure — self-care, productivity, and leisure (Law et al., 2009) — and food, drink, toys, places, and people (Bondy & Frost, 1998). After this interview, at least three activities were chosen in each category. The items of this interview are described below:

- Self-care activities included: preferable things to eat, drink, wear, and objects used for using the bathroom and hygiene. Productive activities were: toys or playfulness. Leisure activities were, i.e., watching television, doing homework, places that they would like to visit, and socialization; with people that they knew and talk to frequently.

2.5 PROCEDURES

This research used Multiple-probe Design to verify the intervention program outcomes (Gast, 201). This type of experimental design allows controlled, scheduled interventions and also provides learning opportunities for the research participants (Gast, 2010). Although this design is embedded in the context of experimental behavioral analysis, it has also been used in the fields of education and health to assess the effects of interventions (Gast, 2010). The experimental procedure comprised the phases of probing (P) and intervention (I). These were interspersed to identify the effects of the intervention program and measure its effectiveness.

The first probing or pre-intervention probing sessions registered the initial repertoire of the communication partners while offering an activity to the child using AAC. In the probing phase, it was possible to identify initial behaviors of the child to express an interest. The intervention sessions consisted of theoretical training, practical training, and application of AAC by the communication partners and the child. The post-intervention probing sessions registered whether the behaviors taught to the communication partners were maintained after the program ceased.

The program Communic_CP was conducted for 7 months over 21 weeks. Table 1 presents the timing for research data collection and the number of sessions with each dyad:

Dyad participants	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7
	NPS	NI	NPS	NI	NPS	NI	NPS
P 1 Mother and child	3	3	3	0	3	0	3
P 2 Occupational therapist and child	3	0	3	3	3	0	3
P3 Teacher and child	3	0	3	0	3	3	3

Table 1. Timing for research data collection.

Source: Prepared by the authors.

*P = Participants, NPS = Number of probing sessions, NI = Number of interventions.

2.5.1 COMMUNIC_CP - AAC PROGRAM

The program entitled Communic_CP was developed and tested in previous studies conducted in Brazil (Manzini, 2013; Manzini, Martinez, & Almeida, 2015). In our research, the intervention program was adapted to include health and education professionals; the child’s closest communication partners (Manzini, Cruz, & Martinez, 2017).

The Communic_CP program is designed for communication partners and it is divided into five stages: (I) Learning about the participants, (II) Theoretical training, (III) Practical training, (IV) Production of the AAC resource, and (V) the Final assessment of skills (Manzini, 2017). Table 2 shows all of the stages, objectives, and procedures for data collection and analysis of this program.

Stages	Procedures, resources and strategies
1. Learning of the initial repertoire of the communication partners and child	Description and documentation of the child’s communication skills. Pre-intervention probing sessions: detecting the initial repertoire of the dyad.
2. Essential concepts of AAC through a theoretical training for the communication partners	<p>Theoretical training started with mimic’s activities performed by the communication partners in the three everyday life contexts (home, school, and rehabilitation settings). These activities had the aim of enabling the communication partners to feel how to transmit one piece of information without speaking. These activities had the steps: (1) Draw a theme for communication by the communication partners and (2) Transmit the information drawn using mimics. After this, the researcher discussed the difficulties found during the activity and their relation with the everyday life of the child. Training offered theoretical of AAC comprised assistive technology resources for children communicational skills. The theory was presented in a lecture with an hour duration.</p> <p>(a) Guidance was provided to the communication partners to enable the child communication skills during play and (b) practical guidelines were offered for communication partners to enable them on how to offer objects or to present activities to the child using pictographic figures.</p> <p>The communication partners were trained to use one figure at a time. After selecting the activity, the communication partners removed the figure from the board and placed it in a sentence frame with Velcro®.</p> <p>The communication partner should present a physical object to the child through using tactile, visual, auditory, and verbal cues; to compare the communication picture with the corresponding object; and to offer the activity through encouragement such as verbal, physical, and imitation. This procedure had the objectives: to elicit the child to take the picture of communication; to encourage motivation for the activity, and to provide timing for child’s response.</p> <p>The child was trained to show interest in the picture related to the activity through a smile and/or grasping the picture from the board. The child should get the picture and give it to the communication partner. The child was taught to make the signal of shaking the head to express “no” if not motivated for the activity. The AAC were offered only during the intervention in the three different settings to control the experimental variables of the research, avoiding bias.</p>
3. Practical training: enabling the communication partners–child dyad to use AAC from an activity planned together by dyads and the researcher	<p>(a) Guidance was provided to the communication partners to enable the child communication skills during play and (b) practical guidelines were offered for communication partners to enable them on how to offer objects or to present activities to the child using pictographic figures.</p> <p>The communication partners were trained to use one figure at a time. After selecting the activity, the communication partners removed the figure from the board and placed it in a sentence frame with Velcro®.</p> <p>The communication partner should present a physical object to the child through using tactile, visual, auditory, and verbal cues; to compare the communication picture with the corresponding object; and to offer the activity through encouragement such as verbal, physical, and imitation. This procedure had the objectives: to elicit the child to take the picture of communication; to encourage motivation for the activity, and to provide timing for child’s response.</p> <p>The child was trained to show interest in the picture related to the activity through a smile and/or grasping the picture from the board. The child should get the picture and give it to the communication partner. The child was taught to make the signal of shaking the head to express “no” if not motivated for the activity. The AAC were offered only during the intervention in the three different settings to control the experimental variables of the research, avoiding bias.</p>

4. Making an AAC board with each communication partner	<p>A selection of pictures for the three AAC boards was done to be used at school, at home, and the rehabilitation setting with specific contents to each one.</p> <p>The communication partners were trained and encouraged to make an AAC board with contents of the routine of their own context using a laptop and the Boardmaker® software. The categories selected for the board were self-care activities (clothes, food, bathing, hygiene), productivity (play), and leisure (recreation and socialization). The boards were made using low-tech assistive technology and printed pictures. All boards used in this research were given to the three communication partners after the conclusion of the research for continuous use in their contexts.</p>
5. Assessment of the Communic_CP program: report of the communication partners and performance observation	<p>Post-intervention probing sessions documented the skills learned; final repertoire of the communication partners and the child. Also, the qualitative perception of the communication partners of the use of the AAC was registered.</p>

Table 2. Communic_CP Program intervention stages.

Source: Prepared by the authors.

All activities performed in the study were planned, and individual weekly meetings were scheduled with (a) the teacher, intending to update the lesson plans prepared at the beginning of the school year; (b) the occupational therapist, aiming to address the scheduled therapy goals; and (c) the mother, to consider the child's core interest within the home environment. From the interactions established in the weekly meetings between the communication partners and the researcher, the objectives, material, equipment, and thematic contents of each activity were defined.

The criteria of choosing the vocabulary to be presented in each card and activities related to it was established after meetings between the researcher and the communication partners. In these meetings, wishes, core interest, preferences, identified in the child's daily routine were considered.

Overall, the activities were related to children's music, painting, storytelling, drawing. For this, the following materials were used: books of the Three Little Pigs, histories of animals, Teddy bears, modeling clay, brushes and gouache paint, and pictures of AAC.

The Picture Communication Symbols – PCS was used to make the pictures through the Bordemaker Software. Colour pictures sized 6x6cm, printed and laminated with Velcro were used.

2.6 DATA COLLECTION

Data collection procedures refer to the probing and intervention sessions. Figure 1 illustrates the experimental design. Fifteen sessions were performed with each dyad (mother–child; teacher–child; therapist–child).

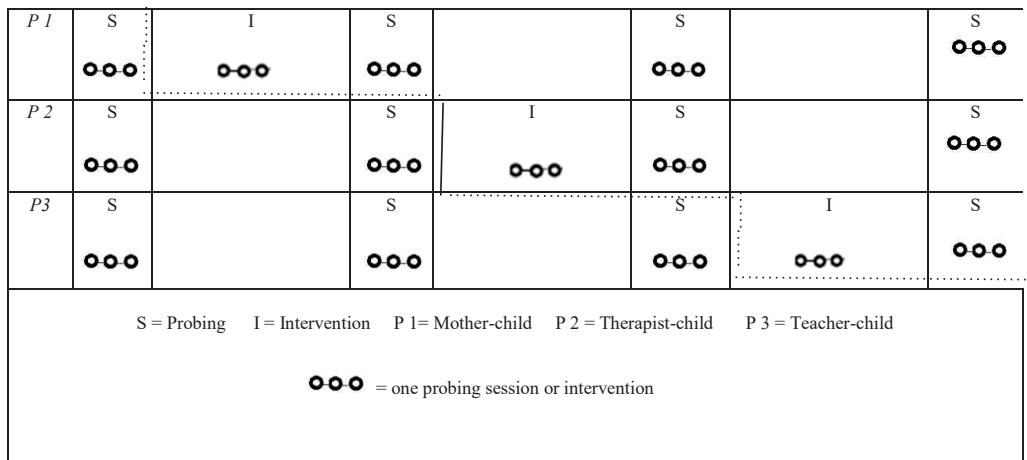


Figure 1. Multi-probe design figure based on Walter (2000).

Figure 1 shows that, at every nine probing sessions, at least three intervention sessions occurred until all participants underwent intervention. These sessions are interspersed to demonstrate that the behavior of each dyad only changes when the intervention starts. The probing sessions were done in the same week for all communication partners. The support and training provided by the researcher to the communication partners was a variable not dependent on the communication partners whereas the child’s behavior was a variable dependent on the support of the communication partners and researcher.

In this experimental design, to achieve stability, we considered that at least three consecutive baseline sessions must be performed, and the researcher was responsible for establishing stability criteria. Only after this stability, the intervention initiated. In the intervention sessions, stability criteria for phase change were also established. In this type of design, the quantitative of the intervention sessions was not determined; rather, criteria for phase change (Gast, 2010).

2.7 PRE-INTERVENTION PROBING SESSIONS

The initial probing sessions occurred without any therapeutic intervention. These sessions began with the following instruction provided by the researcher (Manzini, 2017) as follows: *“I have brought a set of materials to encourage (child’s name)’s communication skills. Please feel free to explore them. Conduct the session however you find most interesting. I cannot interfere with it”* (Researcher).

At each probing session, the researcher only directed the activity, explaining the materials that would be available. After giving the instructions, the researcher remained sitting in a corner of the room and only observed and film-recorded the session. In this phase, participants achieved stability to start the intervention if they performed below 30% in at least three sessions.

2.8 INTERVENTION

The intervention sessions consisted of the use of the AAC by the communication partners with the support (in the form of orientation, tips, corrections, and suggestions) of the researcher to improve the communication skills of the child from the use of AAC pictographic figures. However, it is recognized that AAC is composed of several strategies and procedures, in our study the strategies adopted were changing pictures to start the process of AAC implementation. Instructions were given by the researcher to promote interactions among dyads.

To foster communication with the child through AAC pictures, the communication partners were encouraged by the researcher to 1st) show the physical object to the child, 2nd) use the stimuli (tactile, visual, auditory, and verbal) that the object potentially provides to present its characteristics and function, 3rd) compare the communication pictures with their corresponding objects, 4th) present the activity to the child by means of assistance (verbal, physical, giving an example) with the intention that the child takes the communication figure or demonstrates interest in the activity, and 5th) allow time for the child to respond to the stimulus offered by carefully observing the child's behaviors such as: body movements, gestures, facial expressions, vocalization (Manzini, 2017).

Figure 2 shows the use of AAC with the three communication partners during intervention and shows the child's interaction and motivation to choose and taking a picture from the board.



Figure 2. Communication partners during AAC intervention (A) mother, (B) teacher and (C) occupational therapist.

Source: Personal archive of the authors.

It is important to emphasize the criteria adopted for further probing was based on the performance of the dyads with the ability to change the picture to communicate the activity desired. Only after the dyad showed they had learned those abilities, the researcher started the next probing session. In this phase, the participants reached stability to begin the post-intervention if they scored 50% in at least three sessions.

2.9 POST-INTERVENTION PROBING SESSIONS

In the post-intervention probing sessions, the activities were performed exclusively by the communication partners and without any support. The researcher only presented the materials available for the activities to the communication partners and proposed that they should stimulate the child's communication skills. These probing sessions occurred after the intervention and had the purpose of describing the final repertoire of the participants regarding

the AAC theme. In this phase, the participants reached stability to complete the research if they scored a performance of at least 60% in at least three sessions.

2.10 DATA ANALYSIS

Data on the performance of the communication partners and the child were assessed separately using the filming protocol for analysis of the probing and intervention sessions (Manzini, 2017). The communication partners' performance was analyzed according to the level of assistance offered to the child during a communication interaction (0 to 3 points) whereas the child's performance was analyzed according to the response given to the communication partners (0 to 3 points).

The scores were obtained by multiplying the number of opportunities provided by the communication partners (up to 20) by the maximum score (up to 3 points). Subsequently, aiming to understand the performance in the program, the score obtained was divided by the maximum score and multiplied by 100%. The data analysis methods relied on visual analysis of the graphical representation of the data.

2.11 RELIABILITY INDEX

Hersen and Barlow's (1977) reliability index was chosen to establish the agreement between the items of the observation sessions (probing and intervention). Inter-rater reliability assessment was performed separately in 25% of the sessions. The sessions were analyzed by the first author and a specialist in AAC. The last one received guidelines about the instrument used for data collection. The specialist was trained through the analysis of a random recorded intervention to practice how to score the episodes according to the protocol for analysis of probing and intervention sessions.

Calculation of the reliability index was conducted in four steps. (1) It was verified whether the researcher and specialist scored the same response option in each of the protocol columns considering the number of the opportunities scored for the three communication partners and child's responses based on Bondy and Frost (1998). (2) Agreement was considered if both marked the same number on the same opportunity whereas disagreement was considered if they marked different numbers. (3) The total number of agreements and the total number of disagreements were calculated separately. (4) The reliability index formula was applied based on the two totals.

The mean of the inter-rater agreement index in the scores of the probing and intervention sessions was over 80%, thus estimating reliability for the analysis (Hersen & Barlow, 1977).

3 RESULTS

Figure 3 illustrates the performance scores of communication partners and the child separately in the probing and intervention sessions. A total of 45 sessions were conducted, i.e. 15 sessions were held with each dyad (partner - child).

Figure 3 shows that the communication partners (mother, therapist, and teacher) presented small initial repertoire regarding ACC, identified in the three sessions with low variation (stability) over three weeks.

Although they used stimuli to present the activities or play with the child, the child's performance remained the same throughout the three probing sessions without AAC intervention. The communication partners' scores in the three pre-intervention probing sessions were nil (0%).

The intervention was provided in three sessions once a week over three weeks, and the AAC was introduced only in this phase. It is worth noting that, at the time the intervention sessions were started, abrupt, positive changes were identified in the behavior of the dyad, mainly with respect to the performance of the child, whose score in the probing stage was null. Stability was observed when the communication using the AAC reached 60% with higher levels when compared to before the intervention.

In response to the stimuli offered by the communication partners, the child started to use the AAC (with total physical and/or verbal assistance) by means of gestures (pointing, showing) and/or through physical assistance and/or verbal cues.

The post-intervention stage comprised three sessions. The scores remained higher than 60%. This score evidenced maintenance of the behaviors learned and successful performance of the dyad. It should also be noted that, in addition to learning in the way to enhance communication skills, identical scores were observed in the interactions within the dyads, which reveals maintenance of their synchrony.

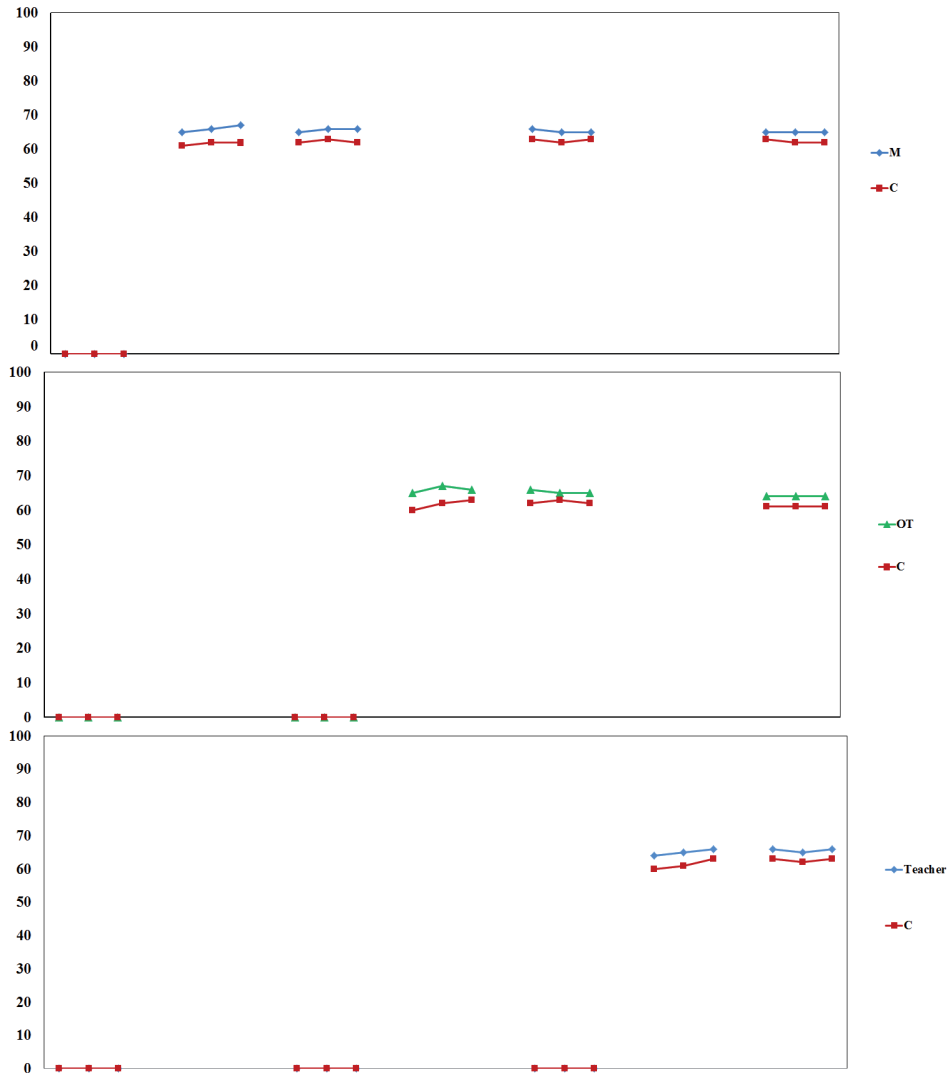


Figure 3. Percentage of communication partner and child performing using AAC.

Source: Prepared by the authors.

Captions: S 1 – Pre-intervention probing session; S 2 – Probing session; S 3 – Probing session; S 4 – Post-intervention probing session; Int 0 – Without intervention; Int 1 – First intervention session; C – Child; M – Mother; OT – Occupational Therapy

4 DISCUSSION

Children with cerebral palsy may present severe oral communication disorders, which can limit their performance of activities in each developmental context. It is essential to consider that communication skills are influenced by meaningful and functional contexts in which the child participates (von Tetzchner, Brekke, Sjathun, & Grindheim, 2005). These everyday contexts such as home, school, and rehabilitation settings promote basic, stable, and

relevant interactions (Deliberato & Sameshima, 2009). In our research, these interactions could be strengthened with an individualized AAC program, with similar findings from previous research (Manzini, 2017; Manzini, Cruz, & Martinez, 2017).

Regarding the use of experimental design, it was identified in our research that, in the pre-intervention probing sessions, the dyad presented low performance during the proposed activities. The communication partners' low scores in the three pre-intervention probing sessions can be justified by: (a) presentation of activities using objects without intentional offering to improve the child's skills and (b) presentation of the activities through association of the physical object with the communication figure without allowing response time for the child.

After intervention, a significant change was observed in the behavior of the participants. Our study design enabled to document the communication among dyads when using AAC to endorse an interpersonal interaction. The studies conducted by Evaristo and Almeida (2016), Manzini (2013) and Ronski et al. (2010) support our findings. Both studies used experimental designs to verify the effects of intervention programs using AAC. These authors reported that the use of experimental designs can guarantee a planned intervention, control the variables, and provide non-verbal children with the learning of new communication skills.

Almeida, Piza and Lamônica (2005) examined the effectiveness of the PECS Program on the communication of a child with cerebral palsy. The AB design documented that the child was able to go for all phases of PECS –Adapted and to use the communication board in school tasks.

Average scores of 60% were observed in the intervention stage. It was also possible to verify that the communicative interaction of the child emerged mediated by the use of AAC in this stage. The theoretical and practical training of the communication partners was essential for the synchronous communicative behavior of the dyad. Improvement in the quality of communicative interaction could be observed due to the communication partners offering physical and/or verbal assistance through stimuli, such as expecting the child to communicate matching the object to the figure and allowing time for response.

The effectiveness of PECs with a child and their communication partners could also be observed in the study of Evaristo and Almeida (2016). They verified the effects on the communication through changing pictures in association with a methodology of a functional curriculum (PECS-Adapted) in a pupil with cerebral palsy and her teacher and parents. This child enhanced her communicational skills and both; parents and teacher understood the relevance of using the AAC for the teaching-learning process.

In line with our findings, Dhas, Nsamuel, and Manigandan (2014) state the importance of collaborative working with parents and professionals when implementing AAC, and that this can enable children with cerebral palsy to communicate, engaging them in occupational participation in all everyday activities.

The support offered to parents, teachers, and others who interact with non-verbal children with cerebral palsy is essential for the acquisition of different competences. von Tetzchner (2009) highlighted the support provided to the adults that live closely with these children to improve their communicative repertoire, qualitative and quantitative. The

partnership established between adults can provide maintenance, reinforcement, generalization, and transference of the new communication skills of the child in their different contexts (Omote, 2003).

Our results also showed that, with theoretical and practical training, the activity of matching a pictographic figure to its corresponding object was effective, which enabled the dyads to use the AAC independence, functionality, and a low level of assistance. The survey by Desai, Chow, Mumford, Hotze, and Chau (2014) corroborates with these results. The study reports that the implementation of a communication device associated with a training program directed to students and their communication peers improved communication and participation in school activities, increased communicative abilities, and reduced the demand for assistance.

The findings of our research agree with the current evidence and contribute to reaffirming the importance of training communication partners to use AAC in the process of learning new communication skills by a child with non-verbal cerebral palsy.

5 CONCLUSIONS

The AAC program was characterized by a scheduled intervention added to standardized activities repeated in three development contexts, enabling assessment of the individual performance of each dyad. Our study showed that the strength of an intervention program for a child with cerebral palsy increased when different contexts interacted using this program with the same perspective. Consequently, there was an increase in the number of exposures of the child to the stimuli offered, and a greater chance of generalization of the strategies learned. The child's performance only changed after the performance of the communication partner changed.

Despite the positive results, some limitations were identified throughout our study. Among them, the following should be highlighted: (a) difficulty in finding family communication partners who authorized the study to be conducted directly in the home environment; (b) conducting the research in the home environment, which is exposed to many interferences (barking dogs, doorbell ringing, presence of several family members and neighbors, etc.); (c) the first author performed the intervention, evaluated the performance of the participants, and assessed implemented procedures to estimate criteria prior to data collection; (d) because it is a single case study, our data cannot be generalized.

Further studies should (1) expand the number and training of the child's communication partners in their development contexts: at home (siblings, neighbors, parents, relatives, and friends), at school (teacher and their assistants and pupil peers), and in the clinic (secretary, therapists and patients) and (2) consider using abstract concepts for the intervention with these children like pain, happiness, sadness, hunger, and tiredness, among others.

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