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VERBAL BEHAVIOR MILESTONES AND INTENSIVE BEHAVIORAL INTERVENTION IN TRIPLETS WITH AUTISM

Suelen Priscila Macedo Farias [1]; **Nassim Chamel Elias** [1]

ABSTRACT

The Autism Spectrum Disorder is characterized by difficulties in communication and social interaction and restricted, repetitive and stereotyped interests and behaviors. Intensive behavioral intervention has brought promising results in the intervention with this audience. The objective of this study was to verify the effects of teaching multiple verbal operant on the development of repertoires in triplets within the spectrum at the age of 3 years and 6 months at the beginning of the study. The intervention lasted 12 months, for a total of eight hours a week, and was planned according to data from the first assessment. Pre- and post-test design was used. The results indicated that the intervention was effective, and the participant with the lower commitment acquired more repertoires. The difference in the results indicates that the gains obtained were not due to the passage of time, but indicates a relationship with the initial repertoires and the number of programs applied.

Keywords: Behavior Analysis; Language; Autism.

Marcos do comportamento verbal e intervenção comportamental intensiva em trigêmeos com autismo

RESUMO

O Transtorno do Espectro do Autismo é caracterizado por dificuldades em comunicação e interação social e interesses e comportamentos restritos, repetitivos e estereotipados. A intervenção comportamental intensiva tem trazido resultados promissores na intervenção com esse público. O objetivo foi verificar os efeitos do ensino de múltiplos operantes verbais no desenvolvimento de repertórios em trigêmeos dentro do espectro com 3 anos e 6 meses de idade no início do estudo. A intervenção durou 12 meses, num total de oito horas semanais, e foi planejada de acordo com dados da primeira avaliação. Foi utilizado o delineamento de pré e pós testes. Os resultados indicaram que a intervenção foi efetiva, sendo que o participante com menor comprometimento adquiriu mais repertórios. A diferença dos resultados indica que os ganhos obtidos não foram em função da passagem do tempo, mas indica uma relação com os repertórios iniciais e com o número de programas aplicados.

Palavras-chave: Análise do Comportamento; Linguagem; Autismo.

Marcos del comportamiento verbal e intervención comportamental intensiva en trillizos con autismo

RESUMEN

El Trastorno del Espectro del Autismo es caracterizado por dificultades en comunicación e interacción social e intereses y comportamientos restrictos, repetitivos y estereotipados. La intervención comportamental intensiva ha traído resultados promisores en la intervención con ese público. El objetivo fue verificar los efectos de la enseñanza de múltiples operantes verbales en el desarrollo de repertorios en trillizos dentro del espectro con 3 años y 6 meses de edad en el inicio del estudio. La intervención tuvo duración de 12 meses, en un total de ocho horas semanales, y fue planificada de acuerdo con datos de la primera evaluación. Se utilizó el delineamiento de antes y tras testes. Los resultados apuntaron que la intervención fue efectiva, siendo que el participante con menor comprometimiento adquirió más repertorios. La diferencia de los resultados indica que las ganancias obtenidos no fueron función del paso del tiempo, pero indica una relación con los repertorios iniciales y con el número de programas aplicados.

Palabras clave: Análisis de la Conducta; Lenguaje; Autismo.

[1] Universidade Federal de São Carlos – São Carlos – SP – Brasil; suelen_psicologia@yahoo.com.br; nchamel@terra.com.br

INTRODUCTION

The prevalence of cases of Autism Spectrum Disorder (ASD) has grown significantly worldwide, especially over the past few decades. According to the *Centers for Disease Control and Prevention* (CDC) of the United States of America, in 2014, the prevalence found of ASD was one in 59 children aged eight years. ASD is characterized by behavioral changes in multiple contexts that manifest since the beginning of growth and that cause varied losses in social interaction and communication with restricted and repetitive patterns of behavior and interest (APA, 2013).

Lovaas (1987) and Werner, Dawson, Munson and Osterling (2005) highlight that the identification of the disorder in early childhood provides early stimulation and a differential prognosis for these children. These authors demonstrated that the effectiveness of behavioral interventions, when well designed, systematized and intensive, allow a faster acquisition of target behaviors and, thus, promote a decrease in treatment costs for families and the government. In this sense, for this research, behavioral intervention was chosen, as it is a science with scientific proof of its effectiveness (Howard, Stanislaw, Green, Sparkman, & Cohen, 2014; Lovaas, 1987).

Lovaas (1987) conducted the pioneering study about intensive behavioral intervention applied to individuals diagnosed with autism. Participants were children with autism under the age of 4 at the start of the study, divided into three groups, an experimental group and two control groups. The experimental group, exposed to intensive behavioral intervention, was composed of 19 children. Each child was attended by an educator for approximately 40 hours a week. A control group, composed of 19 children, received behavioral intervention for a maximum of 10 hours a week. The other control group consisted of 21 children enrolled in care centers that did not use behavioral or intensive intervention. Different scales were used to measure the participants' repertoires before and after the intervention period, which lasted approximately two years. The results indicated that 47% of the children in the experimental group showed development close to that expected for a child with typical development in the same age group. On the other hand, only 2% of the children in the control groups showed development close to that expected for their age. Lovaas' (1987) data suggest that intensive behavioral intervention can produce significant behavioral gains for children with ASD when applied for at least two consecutive years.

In Brazil, the first and only study to date in this area was published by Gomes, de Souza, Silveira and Oliveira (2017). The objective of this study was to evaluate the effects of a year of intensive behavioral intervention on the acquisition of new behaviors by nine Brazilian children with autism, aged between 1 year and 3 months and 2 years and 11 months. Individual assessments were carried out using the Psychoeducational Profile - Revised (PEP-R) (Schopler, Reichler, Bashford, Lansing, & Marcus, 1990) and the Operationalized Portage Inventory (OPI) (Williams & Aiello, 2001), before and after the introduction of the intervention. These instruments measure children's development in different areas and allow comparisons to be made with the expected performance for chronological age. The intervention was conducted for approximately 15 hours a week at the participants' homes. The results, analyzed individually, indicated that the participants had new skills in all areas assessed, even to varying degrees. According to Gomes et al. (2017), considering the results obtained in the PEP-R, the

> lower performances were observed in the areas of cognitive and verbal cognitive performance, probably because these areas encompass skills ... directly related to the speech repertoire and they would need more time to be refined, beyond the first year of intervention. (pp. 383-384).

The results obtained by Lovaas (1987) and Gomes et al. (2017) are indicative of the effectiveness of intensive behavioral intervention applied to children with ASD. However, two issues still permeate this research area: the intensity of the intervention and the characteristics of the participants. Lovaas suggests 40 hours of weekly intervention for at least 24 months, while Gomes and co-workers obtained significant results with 15 hours of weekly intervention for approximately 12 months. In this sense, one aspect that must be taken into account for the results to be effective refers to the participants' initial repertoires, such as the presence of vocal verbal behavior (speech) and inappropriate behavior, among others. In the two studies cited, as they have the participation of several children, the individual characteristics and life history are little explored.

Considering the effectiveness of intensive behavioral interventions in children with ASD and the communication deficits present in this population, this study aimed to verify the effects of teaching multiple verbal operants simultaneously in the development of new repertoires in triplets with ASD aged 3 and 6 months at baseline. The intervention lasted 12 months and was conducted every day of the week, for a total of eight hours a week.

METHOD

Experimental Design

A pre and post-test design was used with the application of the VB-MAPP (*Verbal Behavior Milestones*

Assessment and Placement Program; Sundberg, 2008). The procedure was applied individually to each participant.

Participants

The participants were triplets diagnosed with ASD. The triplets were generated in two different placentas and in one placenta there were two fetuses of identical twins (T1 and T2), who were born first, they have greater impairments and were diagnosed with ASD at 2 years and 9 months by a neuropediatrician. In the other placenta there was only one fetus (T3), who was born last and was diagnosed with ASD at 2 years and 11 months by the same neuropediatrician; he has less compromises. Triplets were generated from *in vitro* fertilization and were born at 26 weeks of gestation via cesarean delivery. At the beginning of the research, they were 3 years and 5 months old, at the end, 5 years and 2 months.

T1 and T2 were diagnosed by the ICD F84.0, classic autism and global delay in neuropsychomotor development. They walked at 2 years and 4 months. Regarding motor coordination, they kicked the ball without proper direction, climbed on chairs, but did not climb stairs without support, ran with difficulty, did not take their mouths, made doodles, but did not sketch a human figure, did not stack objects and did not leaf through pages of books. As for cognitive skills, they did not relate objects to their use, they did not play hide and seek. Regarding socio-affective skills, they did not recognize family members. They did not have speech and did not have sphincter control.

T3 was diagnosed by the ICD F84.0, Autism Spectrum Disorder. He made little eye contact, did not follow orders and was late in verbal and non-verbal communication, had echolalia, auditory sensory dysfunction and food restriction, little use of imagination and symbolism. As for neuropsychomotor development, he ran, jumped, up and down stairs, but with difficulty. As for fine motor coordination, he made geometric shapes, made doodles, had difficulty handling cutlery, transferred liquids and objects from one container to another. As for language, he spoke loose words, did not retell stories, did not know male and female genders. As for cognition, he knew colors, was learning the notion of size and letters, assembled a puzzle, sang a song and made associations accordingly. All this information is in accordance with the report of the neuropediatrician at the beginning of the research.

Instrument

For the pre and post intervention measures, the VB-MAPP was used. According to Sundberg (2008), to develop the VB-MAPP, Skinnerian analysis (Skinner, 1957) of verbal behavior was considered to create a protocol for the assessment of social and language behaviors for children with ASD or similar delays and allows determining which of these behaviors are present or overdue. This information is used to list the behaviors that will be part of the teaching program for that child.

The VB-MAPP is divided into three levels, according to certain developmental milestones (Level 1: 0-18 months; Level 2: 18-30 months; Level 3: 30-48 months). Level 1 evaluates the repertoire of mands, tact, listener's behavior, visual skills and visual perception, playing independently, social skills, imitation, echoic and spontaneous vocalization. Level 2 continues to assess the skills listed above, in addition to assessing the listener's behavior in relation to the characteristic, function and class of stimuli (LRFCC), intraverbal skills and performance in group and routine situations. Level 3 assesses all the skills described above in addition to reading, writing and math. These repertoires can be measured by observing the child in a natural environment or in controlled situations and, depending on performance, the child receives "0", "0.5" or "1" point for the item being evaluated. When exceeding 5 points in a given operant, the child goes to the next level, that is, the child may be, for example, in Level 1 for mand and Level 2 for tact.

Procedure

After approval by the Human Research Ethics Committee (Opinion number 2.016.125) of the Federal University of São Carlos, the parents of the triplets were contacted to invite the triplets to participate in the research. After their agreement and signing the Free and Informed Term of Consent (FITC), the first assessment was applied using the VB-MAPP. The Term of Assent was not presented to the children, as it is understood that they did not have the minimum prerequisites for reading, understanding the content (even if presented orally) and the meaning of a Term of Assent.

The behavioral intervention programs were individually planned and modified according to the specific strengths and deficits of each participant according to each assessment by VB-MAPP. The first application was carried out before the intervention started. After eight months of intervention, the triplets were reevaluated by VB-MAPP to verify possible developments and monitor the participants' development. After four more months of intervention (12 months after the application of the first evaluation), a third evaluation was carried out with the VB-MAPP.

Intensive Behavioral Intervention

The programs were applied by two psychology students (Student A and Student B). Student A was in the 4th period of the course and Student B in the 8th period, at the beginning of the research. The students received

training in Applied Behavior Analysis by the first author to carry out the procedures in order to standardize the practice with the participants. The training lasted 40 hours, 10 hours of theory and 30 hours of practice. The practical activities were divided as follows, at the participants' home: 10 hours of observation by the first author applying the programs with the participants; 10 hours of observation and execution, in which there was intercalation between observing the first author applying the programs and applying the programs under the supervision of the first author; and 10 final hours of execution in which the students applied the programs under the supervision of the first author.

All the VB-MAPP applications were made by the first author. Student A performed the intervention with T1 and Student B with T2 and T3. The intervention was carried out every day of the week, from Monday to Friday, with 1 hour and 30 minutes for each child per day, totaling eight hours a week. The first author personally witnessed the application of the programs once a week at the participants' home and carried out supervisions of two hours a week with the students to discuss the development of the programs, the evolution of the participants, the change of protocols and the adoption of new strategies for teaching (when needed).

After the first application of the VB-MAPP, a multiple stimulus preference assessment was conducted (DeLeon & Iwata, 1996) to identify the items of greatest preference for each participant to be used as consequences in teaching trials. The preference assessment was repeated at the beginning of each week.

The teaching took place through the use of differential reinforcement and the introduction and fading out of prompts that aim to minimize the occurrence of errors and increase access to items of preference. For listener behavior programs, the prompt hierarchy was as follows: total physical prompt, light physical prompt, gesture prompt and no prompt. For language programs, the immediate echoic prompt was used, the echoic prompt after two seconds, the echoic prompt after five seconds and no prompt. The prompt fading out was conditioned to the performance of each participant. The learning criterion established as a condition for advancing in the teaching phases (new program or gradual withdrawal of the prompts) was that the participant had a percentage of 90% of independent correct responses in three consecutive blocks of the same skill.

Each program was presented in blocks of nine trials, all performed on the same day, initially with 10 minutes of intervention and 5 minutes of interval. This time was gradually increased to 20 minutes of intervention and 5 of interval for T1 and T2 and 30 minutes of intervention and 5 of interval for T3. The intervals were conducted based on the play repertoire identified by the VB-MAPP. Participants were encouraged to play in a functional and freely during the break.

The correct responses in each program produced access to the item of preference and social reinforcement ("great, you are very good, congratulations", followed by tickling) provided by the students. To guarantee the motivating operation and thus increase the chances of the items of preference maintaining the reinforcing value, on the days of the teaching sessions, the family was instructed to keep these items out of the reach of children.

Table 1 shows the skills indicated in the VB-MAPP and the programs applied to each participant. For T1 and T2, for the mand repertoire, the pointing response was selected, as they did not have vocal responses.

For teaching the responses contained in the programs, Discrete Trial Teaching (DTT) was used. The DTT consists of (i) getting the learner's attention, (ii) providing an objective instruction and materials (depending on the program), (iii) waiting for the learner's response, (iv) presenting differential consequences for correct and incorrect responses and (v) record the response. An intertrial interval in seconds determines the end of one trial and the start of the next (Smith, 2001).

RESULTS

The results of the first application of the VB-MAPP indicated that the triplets were at Level 1. T1 and T2 remained at Level 1 of the VB-MAPP until the third application, but they showed improvement in all repertoires of their programs. T3 reached Level 3 of the VB-MAPP in the third assessment. Boxes 1, 2 and 3 show, respectively, the results achieved by T1, T2 and T3 in the three applications of VB-MAPP. The light gray cells in the boxes correspond to the results in the first application; dark gray cells in the second application; and the checkered ones in the third application. In general, there are gains in all the repertoires evaluated for the three participants.

Figures 1 and 2 show the performance of T1 and T2, respectively, and Figures 3 and 4 show the performance of T3. From the record of the application of the DTT sessions, a cumulative graph was created in Excel, with each point corresponding to the number of correct responses in a block of nine trials added to the number of responses from the previous point. The responses recorded over the first 50 teaching blocks of each repertoire were used, as it already allows, by visual inspection, to identify the learning curve in each repertoire. It is noted, from the data presented in these figures, that T1 and T2 present more marked learning

Table 1. *Skills taught to each participant.*

VB-MAPP Skill	Participant	Program
Mand	T1 e T2	Pointing stimulus
	T3	Placing order using phrases
Tact	T1 e T2	Naming family members
	T3	Naming objects / actions
Listener Behavior	T1 e T2	Eye contact / Sit Suitable / Identification of family members
	T3	Eye contact / Sit Suitable / Identification of objects and object function
Visual Skills and MTS	T1 e T2	Look at object / Simple Matching
	T3	Look at object / Complex Matching
Independent play	T1, T2 e T3	Motor Imitation with Object
Social and play Behavior	T1 e T2	Follow Simple Instruction
	T3	Follow three-order instruction
Motor Imitation	T1 e T2	Gross Motor Imitation / Graphomotor Imitation (dashes)
	T3	Three-step Motor Imitation, Oral Motor and Fine Motor / Graphomotor Imitation (letters)
Spontaneous Vocalization	T1, T2 e T3	Echoic
Function, Class and Characteristic	T3	Identification and Naming by Function, Class and Characteristic
Intraverbal	T3	Conversation
Class Routine and Group Skills	T3	Imitation with objects / Follow instruction

curves since the beginning of the intervention for the repertoires of following instruction, visual contact and imitation with object; T3 presents learning curves since the beginning of the intervention for all repertoires.

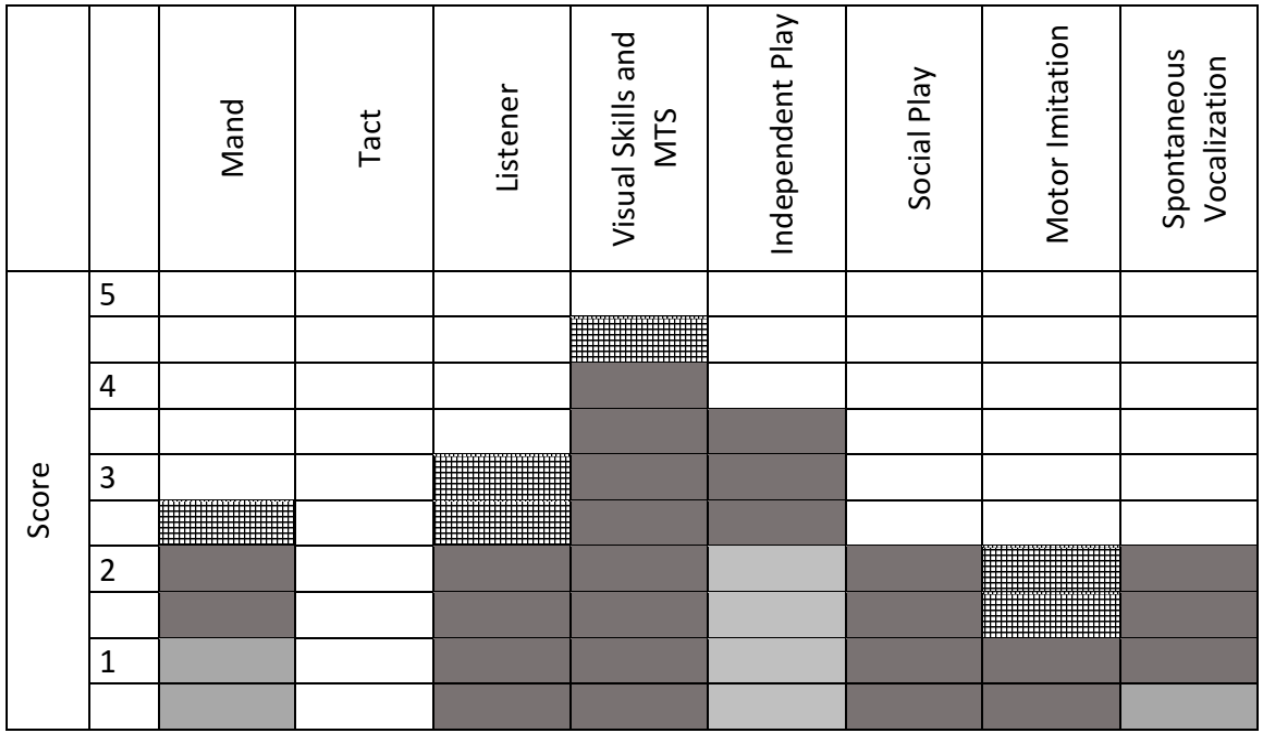
DISCUSSION

The improvement in the participants' performances identified in the VB-MAPP applications suggests the effectiveness and efficiency of intensive behavioral intervention. The difference in the results of T3 in relation to T1 and T2 indicates that the gains obtained were not only due to the passage of time (maturation), but it indicates a relationship with the initial repertoires and with the number of programs applied to each participant and the performance in each program. Bloh (2008) demonstrated the importance of the entry repertoire at the expense of age in teaching tact to five participants aged between six and 21 years, in which only those who had initial verbal repertoires reached the learning criterion.

The data of the present research replicate those found by Lovaas (1987) and Gomes et al. (2017), in which there is great variability among the final performances of each participant. In this sense, it can be inferred that the intensity of behavioral intervention depends on several individual and environmental factors and that it should not be defined in a single and universal way. In addition to corroborating the statement by Gomes et al. (2017) that the presence of speech (as it is the case with T3) may be related to the more accelerated acquisition of some repertoires, especially those that involve verbal behavior.

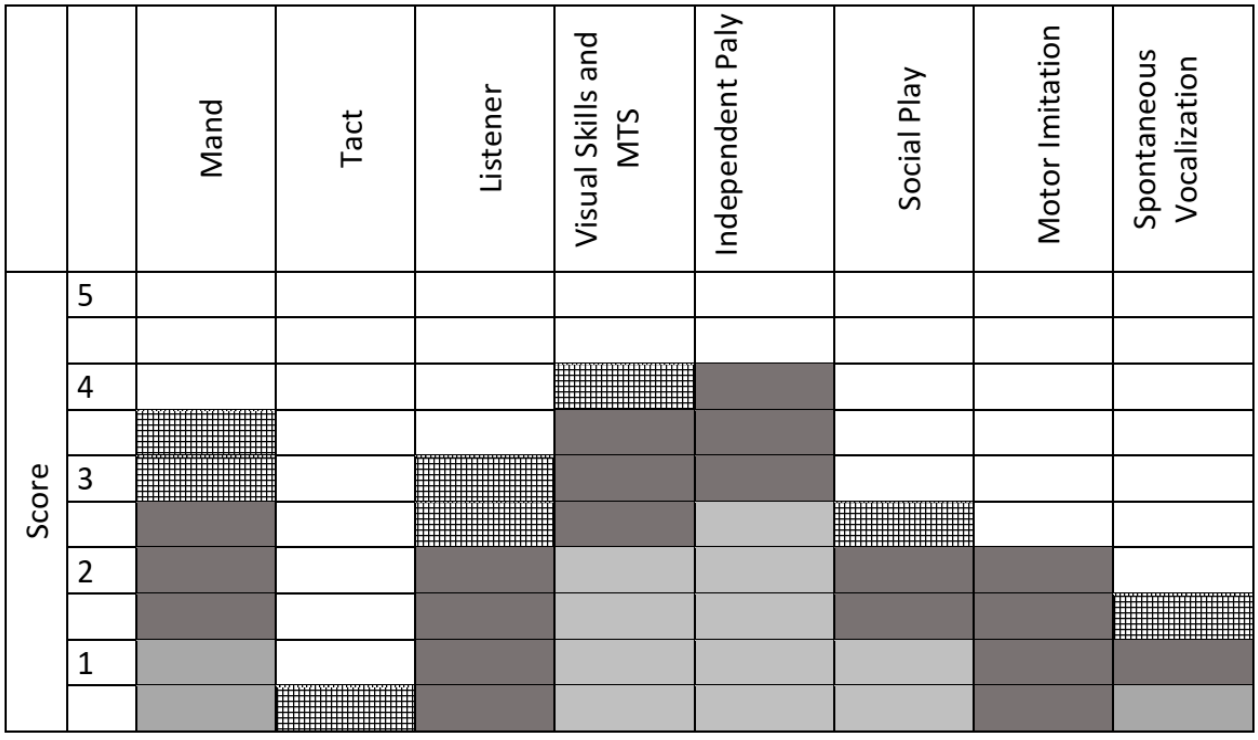
In this research, triplets were exposed to the same number of hours of weekly intervention. However, it is noted, according to the data in Figures 1 and 2, that the learning process of T1 and T2, with a diagnosis that indicates more severe initial deficits, is slower compared to T3, whose initial deficits are less pronounced. These idiosyncratic patterns have already been identified in the literature for acquiring new skills (Volkert, Lerman, Trosclair, Addison, & Kodak, 2008).

This difference in the acquisition of new skills may also be related to the acquisition of verbal repertoire. The participant who obtained the best results (T3) acquired echoic and mand repertoires (see Figure 3) in the first sessions, while the other two participants



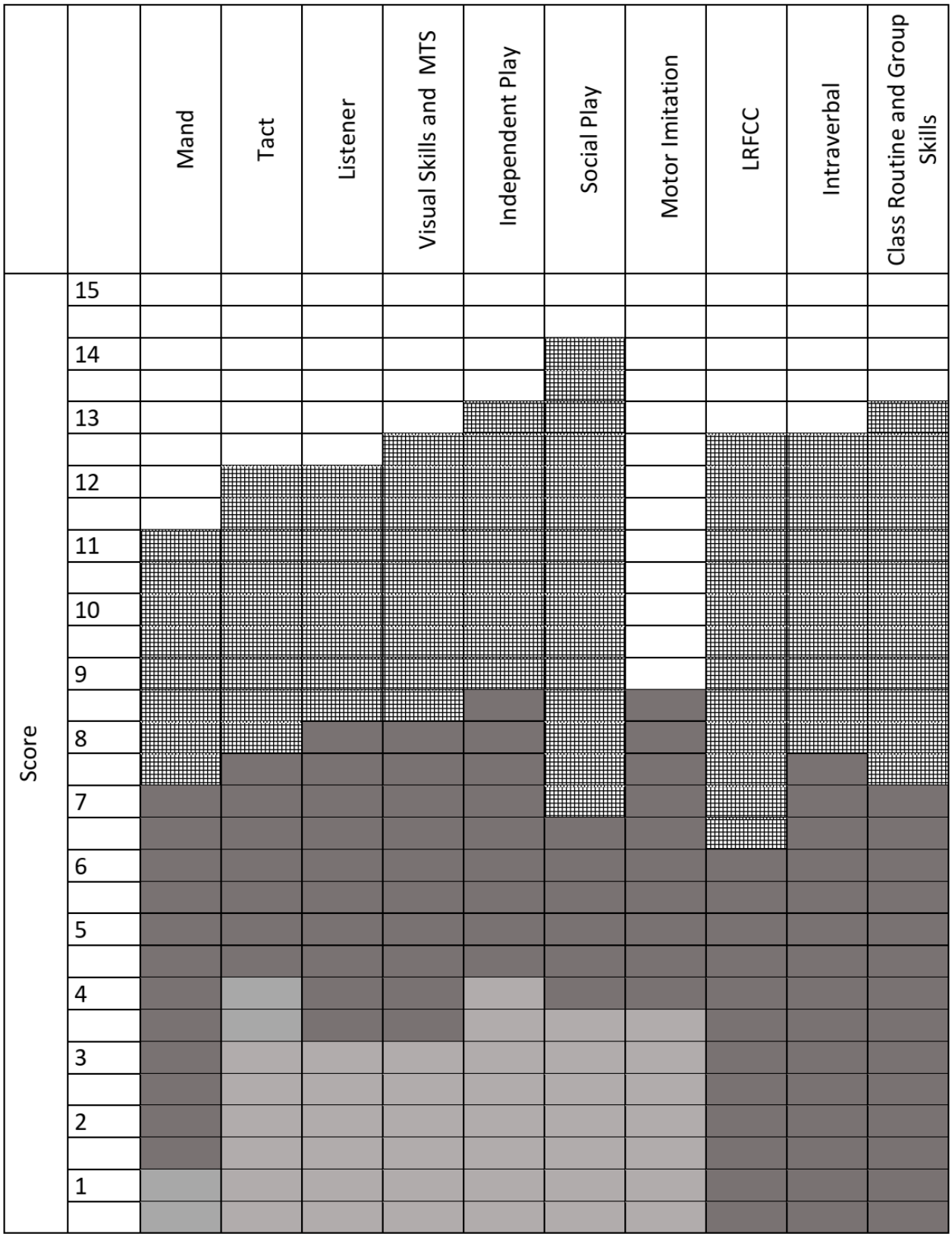
Box 1. *Results obtained by T1 in the three applications of VB-MAPP.*

Note: The light gray cells correspond to the results in the first application; dark gray cells in the second application; and the checkered ones in the third application.



Box 2. *Results obtained by T2 in the three applications of VB-MAPP.*

Note: The light gray cells correspond to the results in the first application; dark gray cells in the second application; and the checkered ones in the third application.



Box 3 *Results obtained by T3 in the three applications of VB-MAPP.*

Note: The light gray cells correspond to the results in the first application; dark gray cells in the second application; and the checkered ones in the third application.

showed evidence of the acquisition of these operants starting only from session 45 (see Figures 1 and 2). Some studies have suggested that success in this domain seems to be a strong predictor of better global results (Szatmari, Bryson, Boyle, Streiner, & Duku, 2003; Venter, Lord, & Schopler, 1992). Martone and Santos-Carvalho (2012) carried out a literature review about verbal behavior and autism and identified that the effectiveness of the teaching procedure was greater in cases where the participants had already acquired verbal behavior.

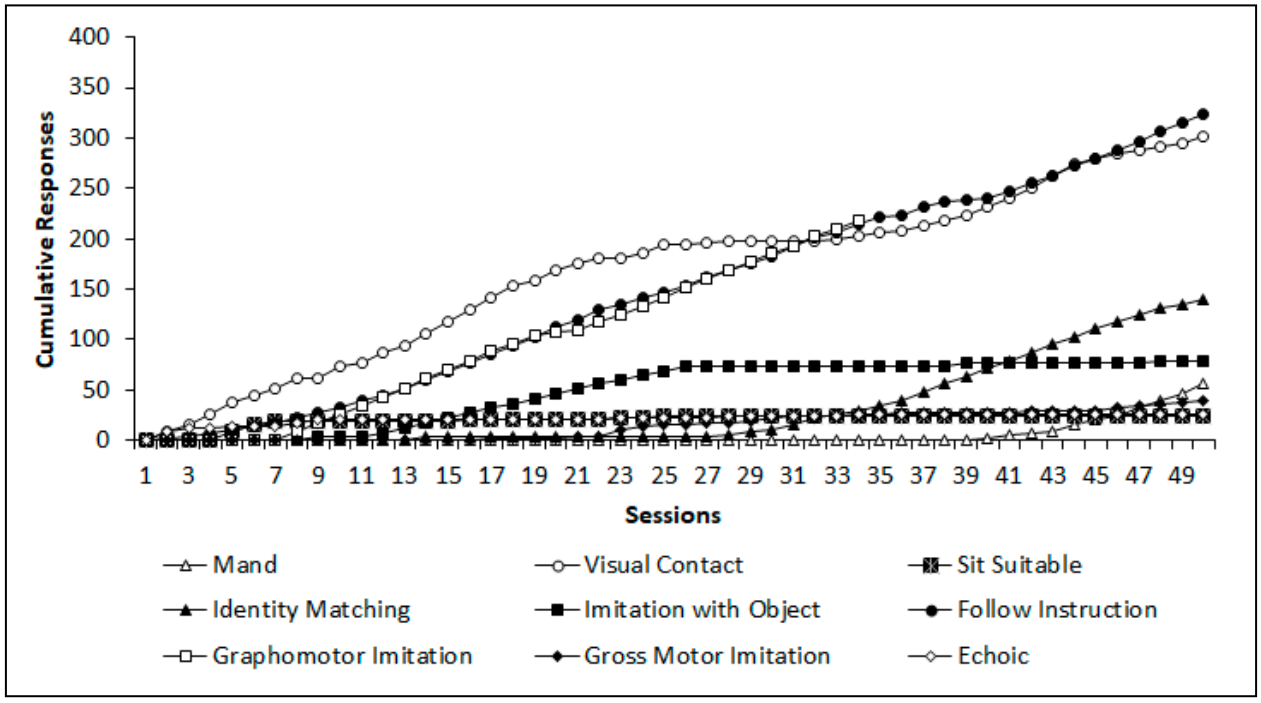


Figure 1. *Number of accumulated independent responses of T1 in the first 50 sessions.*

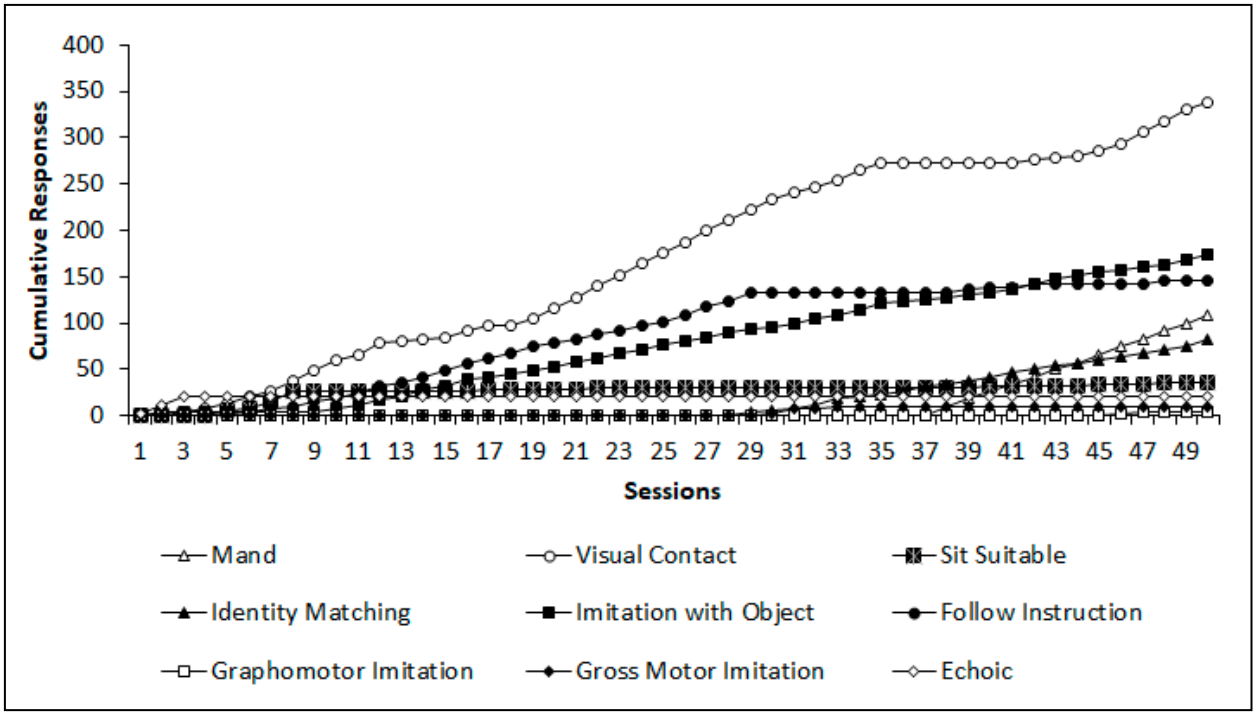


Figure 2. *Number of accumulated independent responses of T2 in the first 50 sessions.*

Additionally, T3 acquired all the skills present in VB-MAPP Level 1 and Level 2, which involved both speaker and listener repertoires. Although the acquisition of these repertoires, at the beginning of the acquisition of verbal behavior, occurs independently (Skinner, 1957), the integration between these repertoires can facilitate the learning of complex behaviors, such as reading and naming (Greer & Ross, 2008).

Sundberg and Partington (1998) suggest that the main focus of an intervention program for children with autism or communication deficits should be on the effective development of social and language skills, as many inappropriate behaviors decrease when the child acquires some language. Additionally, these authors

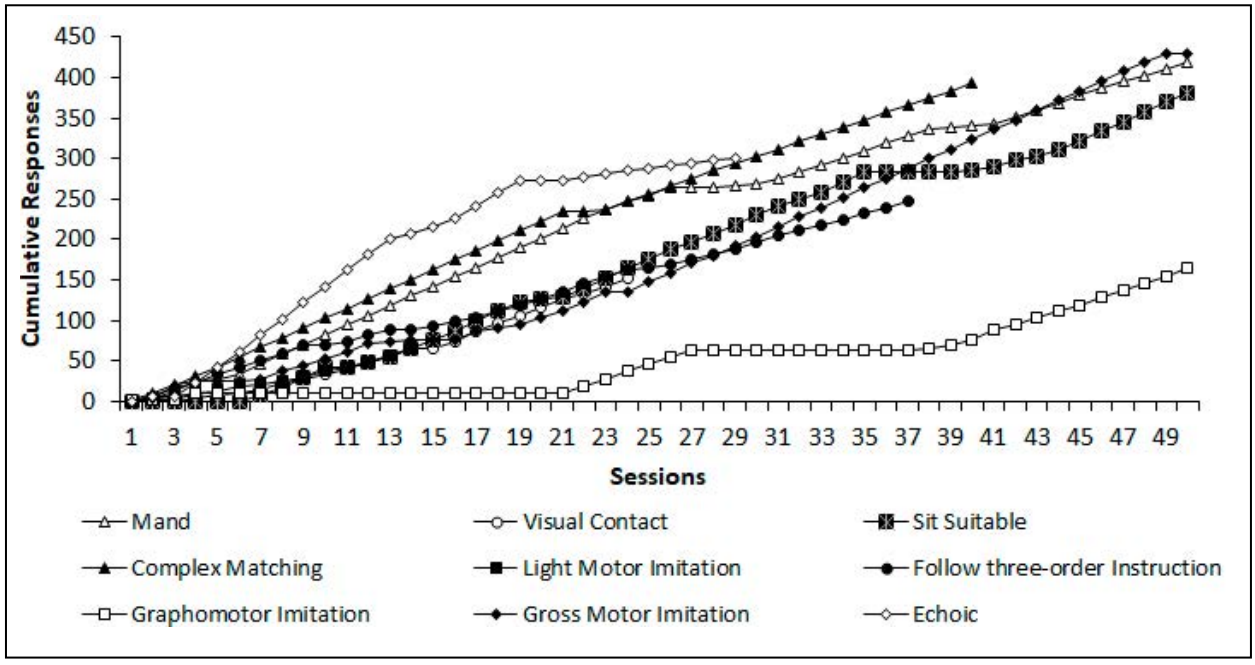


Figure 3. *Number of accumulated independent responses of T3 in the first 50 sessions for the initial repertoires.*

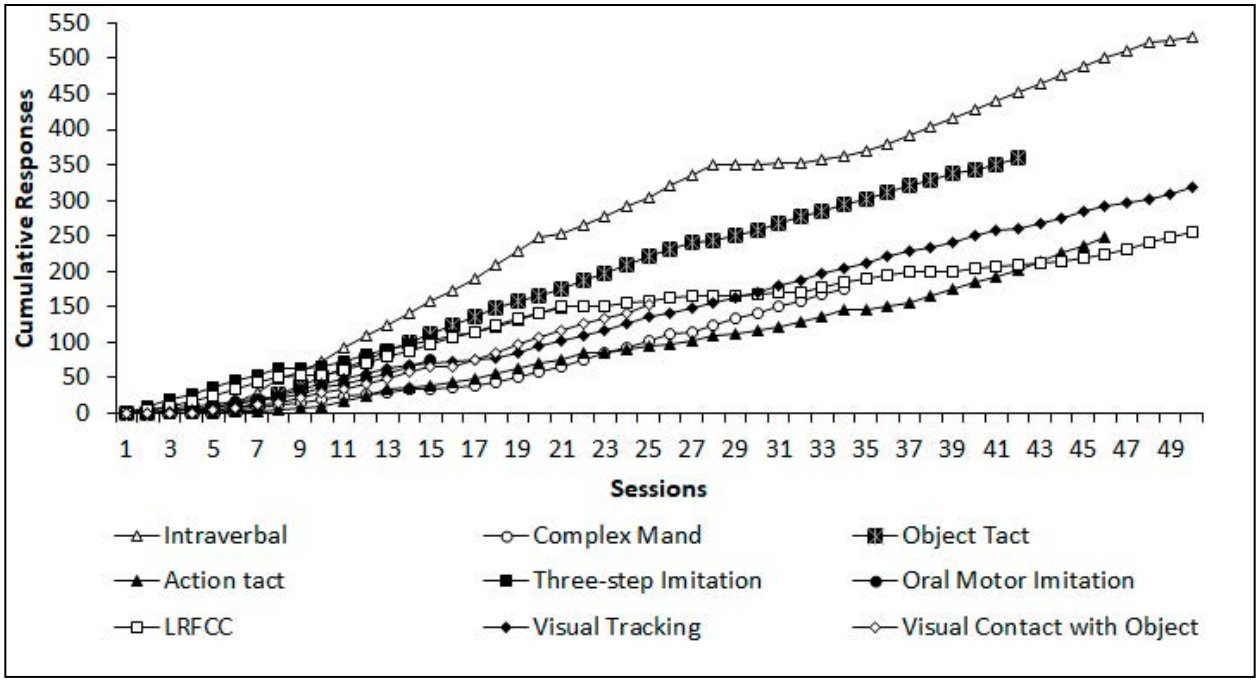


Figure 4. *Number of accumulated independent responses of T3 in the first 50 sessions for the most complex repertoires.*

also suggest that teaching an operant can facilitate the emergence of others, such as when the child issues a response under the control of the question "What is this?" (intraverbal) and an object (tact). In the present research, for example, when using the echoic prompt in the teaching of other verbal operants, it is possible that the vocal imitation repertoire has been strengthened, which may facilitate the acquisition of new topographies of vocal responses.

FINAL CONSIDERATIONS

It is understood that the objective of this study was achieved, the instrument chosen for evaluations and teaching planning (VB-MAPP) proved to be adequate and the behavioral intervention of eight hours a week produced important behavioral gains for the three participants.

The teaching of multiple operants allowed simultaneously a global development of the participants, mainly in the areas of language (for example, mands, tact and intraverbal) and social skills (for example, playing, following instructions and imitating others).

The main limitation of this research refers to the number of hours of intervention per week, especially when the participant has little verbal repertoire, essentially speech. Future studies may have a longer duration, especially when the participant has more severe deficits, such as the absence of speech. In addition, studies using experimental designs that exercise greater control over variables (with a control group or multiple baseline designs) can attribute greater value to the results found.

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