

Eficiência do ensino de linguagem expressiva e receptiva em crianças com transtorno do espectro autista

Efficiency of expressive and receptive language teaching in children with autism spectrum disorder

Eficiencia de la enseñanza del lenguaje expresivo y receptivo en niños con trastorno del espectro autista

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Resumo

Pesquisas em Análise do Comportamento Aplicada (ABA) investigaram a eficiência do ensino de linguagem receptiva e expressiva em aprendizes com Transtorno do Espectro Autista (TEA). Respostas de ouvinte por função, característica e classe (LRFFC) e intraverbais FFC são casos de linguagem receptiva e expressiva, respectivamente, que foram alvos de investigações. A literatura prévia demonstrou que o ensino do intraverbal primeiro foi mais eficiente, no sentido de que produziu um melhor efeito de emergência do LRFFC não ensinado relacionado, contrariando a recomendação de uma literatura tradicional, que sugere que habilidades receptivas, tais como o LRFFC, deveriam ser ensinadas primeiro. A presente pesquisa teve a meta de comparar a eficiência do treino de intraverbais e LRFFC também, considerando os efeitos sobre emergência de repertório não ensinado relacionado em duas crianças com TEA. A diferença em relação à literatura prévia foi que, durante o ensino de LRFFC, o tato (nomeação) de figuras envolvidas também foi ensinado. O propósito foi avaliar se o treino de tato aumentaria a eficiência do LRFFC. Os resultados revelaram que ambas as sequências instrucionais (ensino de LRFFC – sonda de intraverbal; ensino de intraverbal – sonda de LRFFC) estabeleceram a emergência no responder, considerando o repertório não ensinado relacionado para ambos os participantes. Entretanto, o ensino de intraverbal produziu emergência do LRFFC em menor grau para ambos. Os dados foram discutidos no sentido de que o treino de tatos, durante o ensino de LRFFC, provavelmente aumentou sua eficiência e de que habilidades pré-existent também influenciaram a eficiência do ensino.

Palavras-chave: Transtorno do espectro autista; Intraverbal FFC; LRFFC; Ensino de tatos; Ensino.

Abstract

Research in Applied Behavior Analysis (ABA) investigated the efficiency of receptive and expressive language interventions in learners with Autism Spectrum Disorder (ASD). Listener responding by function, feature and class (LRFFC) and intraverbal (FFC) are some types of receptive and expressive language, respectively, which were targets in investigations. The

previous literature demonstrated experimentally that teaching intraverbal first is more efficient, in the sense that it produced a better emergence effect of related untaught LRFFC in children with ASD, contrary to the recommendation by a traditional literature, which suggests that receptive skills, such as the LRFFC, should be taught first. The current research had the goal to compare the efficiency of intraverbal and LRFFC training as well, considering the effects on the possible emergence of related untaught repertoire in two children with ASD. The difference from the previous literature was that, during the teaching of LRFFC responses, the tact (labeling) of pictures involved was also taught, considering that this was a recommendation of previous research. The purpose was to assess if tact training would increase the efficiency of LRFFC training. The results showed that both instructional sequences (training LRFFC - probing intraverbal; training intraverbal - probing LRFFC) successfully established emergent responding, regarding the untaught related repertoire for both participants. However, intraverbal training produced emergence of LRFFC to a lesser extent for both. Data were discussed in the sense that tact training during LRFFC training probably increased its efficiency and that preexisting skills, regarding each participant, also influenced the efficiency of teaching.

Keywords: Autism spectrum disorder; Intraverbal FFC; LRFFC; Tact training; Teaching.

Resumen

La Investigación en Análisis de Comportamiento Aplicado (ABA) investigó la eficiencia de las intervenciones de lenguaje receptivo y expresivo en estudiantes con trastorno del espectro autista (TEA). Los oyentes que responden por función, característica y clase (LRFFC) e intraverbal (FFC) son tipos de lenguaje receptivo y expresivo, respectivamente. La literatura anterior demostró que la enseñanza intraverbal primero es más eficiente, en el sentido de que produjo un mejor efecto de emergencia de LRFFC no enseñado relacionado en niños con TEA, contrario a la recomendación de una literatura tradicional, que sugiere que el LRFFC debe enseñarse primero. La investigación actual tenía el objetivo de comparar la eficiencia del entrenamiento intraverbal y LRFFC, considerando los efectos sobre la posible aparición de repertorio no enseñado relacionado en dos niños con TEA. Durante la enseñanza de LRFFC, también se enseñó el tacto de las imágenes, considerando que esto era una recomendación de investigaciones previas. El propósito era evaluar si el entrenamiento de tectos aumentaría la eficiencia del LRFFC. Los resultados mostraron que ambas secuencias de instrucción (entrenamiento LRFFC - sondeo intraverbal; entrenamiento intraverbal - sondeo LRFFC) establecieron la respuesta emergente, con respecto al repertorio relacionado no enseñado para

ambos participantes. Sin embargo, el entrenamiento intraverbal produjo la aparición de LRFFC en menor medida. Los datos se discuten en el sentido de que el entrenamiento de tactos durante el entrenamiento LRFFC probablemente aumentó su eficiencia y que las habilidades preexistentes, con respecto a cada participante, también influyeron en la eficiencia de la enseñanza.

Palabras clave: Trastorno del espectro autista; Intraverbal FFC; LRFFC; Enseñanza de tactos; Enseñanza.

1. Introduction

Children with Autism Spectrum Disorder (ASD) commonly present impairments in the development of language and other repertoires. Specialized treatments are required to ameliorate deficits. Along the years, many studies based on Applied Behavior Analysis (ABA) were developed to produce skill acquisition and increase the efficiency of teaching. Several procedures are documented in manuals, which orient practitioners to conduct ABA interventions with learners with ASD and other cases of learning disabilities (Greer & Ross, 2008; Lovaas, 2003; Matos, 2016; Sundberg & Partington, 1998).

From a behavioral perspective, language represents a kind of operant called verbal behavior. In an episode between two people, a speaker emits a verbal response to a listener. This one then provides a reinforcing consequence, which selects and strengthens the speaker's response, increasing the likelihood with which the response will be emitted again in the future, under similar circumstances. As an example, consider the case in which an adult asks a child "what has wings?". The child says "bird". The adult, then, praises the child by saying "that is correct!". This three-term contingency represents a verbal operant behavior named intraverbal. The adult's question is a discriminative stimulus, which sets the occasion for the child's response. If the response is correct, it is differentially reinforced (Skinner, 1992).

Part of the repertoire regarding language skills is non-verbal. One important case for this article is related to listener responding by function, feature and class (LFFC). As an example, consider the case in which an adult presents an array with three pictures in front of a child, and the verbal stimulus "what has wings?". The child points (non-verbal response) to the picture corresponding to bird, and the adult delivers a reinforcer by praising him/her. This three-term contingency represents a successful example of non-verbal operant behavior, in the form of picture selection in the presence of the description of a specific feature. Put together, both this one and the aforementioned example of intraverbal involved responses to

instructions about function, feature and class of stimuli (FFC). Both examples involved a similar target (bird), but in one case, a verbal response was emitted (intraverbal FFC) and, in the other case, a non-verbal response was emitted (LRFFC). These are some of the repertoires usually addressed by intervention manuals on ABA to many learners with ASD, who frequently lack their acquisition (Greer & Ross, 2008; Lovaas, 2003; Matos, 2016; Sundberg & Partington, 1998).

Part of the intervention manuals on ABA, concerned with the teaching of targets regarding language and related repertoires, are based on Skinner's analysis of verbal behavior (e.g., Greer & Ross, 2008; Matos, 2016; Sundberg & Partington, 1998). In this sense, considering the examples previously presented, the intraverbal FFC represents a kind of speaker behavior and, the LRFFC, listener behavior. However, the traditional literature on ABA to ASD refers to them as cases of expressive and receptive language, respectively (e.g., Lovaas, 2003).

From the perspective of the traditional literature, there is a common recommendation regarding the teaching of receptive and expressive skills to learners with ASD and other cases of learning disabilities. This literature suggests a particular sequence of teaching, considering the recommendation that receptive responses should be taught first and that this may facilitate the acquisition of expressive responses later. Nevertheless, there was no empirical evidence to support this recommendation. Along the years, several applied studies were conducted to compare the efficiency of teaching, regarding procedures to train receptive and expressive skills to children with atypical development (not only children with ASD). Two important reviews were published (Contreras, Cooper & Kang, 2020; Petursdottir & Carr, 2011).

First, it is important to mention that the majority of the studies were related to other types of expressive and receptive skills. The expressive case corresponded mainly to a verbal operant called "tact", which involves the emission of a verbal response in the presence of a non-verbal antecedent stimulus, and the response is maintained by social reinforcement. As an example, consider the case in which an adult presents the picture of a dog to a child and asks "What is this?". When the child says "dog", the adult delivers verbal praise. The receptive skill in its turn involves the presentation of an array with, for example, three pictures and a verbal instruction to the child such as "show me dog". When the child receptively selects the picture of a dog from the array, the adult delivers praise. Petursdottir & Carr (2011) identified nine studies that compared two teaching sequences (teaching receptive responses followed by the assessment of emergence of expressive responses, and the opposite case) with the purpose of determining which sequence would be the most efficient. In this sense, they wanted to

determine the sequence that would demand less learning trials to the establishment of both receptive and expressive repertoires, and if the teaching of a particular repertoire would produce the emergence of the other without direct training (Cuvo & Riva, 1980; Hupp, Mervis, Able & Conroy-Gunter, 1986; Keller & Bucher, 1979; Miller, Cuvo & Borakove, 1977; Smeets, 1978; Smeets & Striefel, 1976; Watters, Wheeler & Watters, 1981; Wynn & Smith, 2003).

From the review by Petursdottir & Carr (2011), it was noted that only two of the studies involved children with ASD (Watters et al., 1981; Wynn & Smith, 2003). The other studies involved children and adults with intellectual impairments, but no ASD associated. Regardless of this fact, overall, none of the research supported the recommendation as to teach receptive before expressive language. Some limitations were pointed out, though, as to the fact that there was little information regarding the entry repertoires of the participants, for example. According to Petursdottir & Carr, because of this, it was not possible to discuss about the characteristics of the participants to whom the teaching of receptive language was not needed. Another limitation was the fact that, overall, the studies restricted their investigation to tact responses as forms of expressive language. Plus, regarding the receptive task, it was said that the arrays with pictures for selection responses involved few exemplars (two or three pictures), which might have increased the possibility of correct responses by chance, making the comparison of this teaching with the teaching of expressive responses more difficult. However, it was also said that the results were consistent with the cases in which the teaching of receptive responses was defined with arrays with five or more pictures for selection. Overall, despite the methodological limitations pointed out, the reviewed literature consistently produced results suggesting that teaching expressive responses first is more efficient than teaching receptive responses first, different from what was recommended by the traditional literature regarding this (Lovaas, 2003).

Contreras et al. (2020) conducted a recent review of investigations comparing the efficiency of receptive and expressive teaching. The search resulted in the identification of five articles from 2011 to 2017 (Bao, Sweatt, Lechago & Antal, 2017; Delfs, Conine, Frampton, Shillingsburg & Robinson, 2014; Frampton, Robinson, Conine & Delfs, 2017; Kodak & Paden, 2015; Sprinkle & Miguel, 2012). Different from the previous review (Petursdottir & Carr, 2011), all the studies were conducted having children with ASD as participants (21 children with ages ranging from 2 to 15 years old). They also compared expressive and receptive teaching of targets as to their efficiency, but one of them also compared the teaching of the two sequences (receptive to expressive; expressive to receptive)

to a condition in which a mixed training was held. In this case, the teaching of both receptive and expressive targets was conducted simultaneously, in the sense that blocks of trials for their teaching were administered in an alternated fashion.

Overall, Contreras et al. (2020) pointed out that the results replicated and extended the literature mentioned in the previous review (Petursdottir & Carr, 2011), suggesting that teaching expressive responses first is more efficient than teaching receptive responses first. In other words, teaching expressive skills produced a better emergence effect of untaught related receptive skills than the opposite sequence (training receptive responses and assessing the emergence of related expressive responses thereafter). Plus it is very important to mention that two of the studies described in the new review focused on teaching intraverbal FFC, regarding expressive responses, and LRFFC, regarding receptive responses (Bao et al., 2017; Kodak & Paden, 2015), which were also targets in the current study. Because of this, it is relevant to describe these studies in more details.

Kodak & Paden (2015) compared the efficiency of teaching intraverbal FFC (expressive language) and LRFFC (receptive language) to two children with ASD, with ages varying from 3 to 4 years old. The procedures of the study were conducted in the context of a clinic. Pretests were conducted for target definition across intraverbal and LRFFC baseline and training conditions. Four targets were defined for one participant and six for the other one. Targets referred to fill-in-the-blank statements for both LRFFC (e.g., "the person who keeps you safe is a ...") and intraverbal FFC (e.g., "the person who gives you medicine is a ...") tasks. The difference was related to the type of response in each case. Regarding the case of intraverbal, a vocal verbal response should be emitted (e.g., "pharmacist"). For LRFFC, a receptive selection response (e.g., pointing to the picture of a policeman) should be emitted. Baseline and training regarding both repertoires were implemented in sessions with 12 trials. Each participant had up to 5s to respond to each instruction in each condition. During training, each trial involving the teaching of LRFFC comprised the administration of an array with three different pictures and a statement, like the one presented as example, and if the child selected the corresponding picture from the array, he/she was praised by an experimenter, as well as access to a tangible preferred item was granted. In occasions in which errors were made, gestural prompts were provided as correction procedure.

During intraverbal FFC training trials, fill-in-the-blank statements, like the example presented, were provided. If the child emitted a correct vocal verbal response, it was differentially reinforced, like the other trained repertoire. Errors produced the presentation of echoic models of the correct response, so the participant could repeat them. Following

training of LRFFC and intraverbal FFC repertoires, probes of the untrained repertoire for each case were conducted to assess emergence. As a result, the intraverbal training demanded less learning trials to reach an arbitrary criterion, and it produced a better emergence effect of the related and untrained LRFFC repertoire for both participants. Training LRFFC targets resulted in the emergence of related and untrained intraverbal FFC for just one participant. During LRFFC training, the experimenter also took data on tact responses emitted by the participants when they selected the pictures (saying the name of pictures). Kodak & Paden (2015) suggested that tact responses during LRFFC training trials corresponded to intraverbal responses during the assessments of this repertoire. In the end, the authors suggested that future studies could teach tact responses during LRFFC training trials and assess the effects on the possible emergence of untrained intraverbal FFC.

Bao et al. (2017) compared three instructional sequences as to the teaching of LRFFC and intraverbal FFC in three children with ASD. As it was previously mentioned, the sequence consisted in the following: 1) teaching intraverbal FFC first, so emergence of related and untrained LRFFC could be assessed later; 2) teaching LRFFC first, so emergence of related and untrained intraverbal FFC could be assessed later; 3) teaching both LRFFC and intraverbal FFC simultaneously (mixed training). Sessions were conducted in a therapy room for one of the participants, and in the living room of a residence for the other participant. Each environment involved a table and chairs where an experimenter and a given participant were seated, facing each other. The participants were children with ages varying from 3 to 7 years old (a girl and two boys). The main dependent variable (DV) consisted of the total number of trials to achieve criterion regarding the LRFFC and intraverbal FFC repertoires. The secondary DV was the emergence of the untaught repertoire in each case. During the training of LRFFC, a trial involved the presentation of an array with pictures and a verbal instruction about function, feature or class related to one of the pictures (e.g., "show me transportation").

During the training of intraverbal FFC, a trial involved only the presentation of the verbal instruction for the emission of a vocal verbal response (e.g., "which class does the truck belong to?"). In each case, a participant had up to 5s to respond. A correct response in each task was reinforced with euphoric praise and delivery of a preferred item. If an error occurred, or no response was emitted during the time allowed, echoic prompts were given in the case of intraverbal FFC, and gestural or physical prompts were delivered in the case of LRFFC. The training of both repertoires was organized in sessions with 15 trials. In the case of two of the instructional sequences applied to the participants (teaching intraverbal FFC first; and teaching LRFFC first), when an arbitrary learning criterion was achieved, the related

untaught repertoire was probed for emergence (e.g., probing related LRFFC after criterion in intraverbal FFC training). Probes were also conducted with 15 trials, but differential consequences for correct and incorrect responses were not administered. Considering the case of another instructional sequence (teaching intraverbal FFC and LRFFC simultaneously – mixed training), blocks of trials related to the two repertoires were alternated until an arbitrary learning criterion was established for both cases. The three instructional sequences of the study were compared through the administration of an alternated treatments design.

In the end, the results in Bao et al. (2017) showed that the instructional sequence, consisting of teaching intraverbal first and probing LRFFC later, was the most efficient for all participants, considering the number of sessions necessary to meet the learning criterion. Besides, the authors pointed out that this sequence also produced the best emergence effect, regarding the related untaught repertoire, LRFFC. The mixed training sequence was the least efficient of all instructional sequences for all participants. Bao et al. suggested that this might have been due to the fact that blocks of trials of each repertoire were presented in alternated fashion during the teaching. They said that, if teaching trials of the repertoires were alternated in the same block, perhaps the result would be different. They hypothesized that increasing the temporal contiguity of the two response types could maybe speed up the acquisition of the repertoires.

Matos, Cruz, Carneiro & Matos (2020) conducted a recent research on the efficiency of intraverbal FFC and LRFFC training in children with ASD, although it was not mentioned in the review conducted by Contreras et al. (2020). Like Kodak & Paden (2015) and Bao et al. (2017) (considering two of the instructional sequences), Matos et al. trained intraverbal FFC (assessing the emergence of related untaught LRFFC later) and LRFFC (assessing the emergence of related untaught intraverbal FFC later). Two boys with ASD, 4 and 8 years old, participated. They were attended twice a week in the context of a Brazilian University-based research laboratory. By the time of data collection, both participants were able to emit hundreds of tacts and listener responses. They demonstrated generalized imitation and were able to show some repertoire consisting in selecting non-verbal stimuli, such as pictures and objects from arrays, under the control of instructions describing function, feature and class to which the stimuli belong. Besides, they also demonstrated some intraverbal repertoire, consisting in "fill-in-the-blank responses" (e.g., saying "chair" after the verbal antecedent "you sit on a...").

Through an initial pre-test, 12 targets were established for each repertoire (intraverbal FFC and LRFFC). In both tasks, the instructions were presented as questions to the children

(e.g., "what do you eat?"; "what has wheels?"). Like in previous research (Bao et al., 2017; Kodak & Paden, 2015), the difference between the repertoires was related to the presence/absence of pictures. In other words, LRFFC involved the selection of pictures from arrays and, intraverbal FFC, the emission of vocal verbal responses. Discrete trial teaching was conducted like in previous research. Criteria regarding differential reinforcement of correct performance and correction procedures were established in a similar manner as well. The criterion during the training of each repertoire consisted of 100% correct responses in two consecutive blocks with 12 learning trials. Along the training of each repertoire, several probes of the untrained related repertoire were conducted to assess emergence.

The results of the study showed that the training of LRFFC demanded fewer blocks of trials to reach criterion than training intraverbal FFC for both participants. However, the training of the intraverbal FFC produced better emergence effects, considering the emission of the untaught related LRFFC for both participants. LRFFC training produced emergence of intraverbal FFC for just one participant, in a manner similar to what was demonstrated by Kodak & Paden (2015). It is important to mention that in Matos et al. (2020), the participant, to whom emergence of intraverbal FFC was demonstrated, had already some of this repertoire in baseline (40%), while the other participant showed no responses in baseline. Anyway, the study corroborated data from previous literature (Bao et al., 2017; Kodak & Paden), suggesting that intraverbal training may be more efficient in producing the emergence of LRFFC.

Previously, Kodak & Paden (2015) suggested that, during the teaching of LRFFC to children with ASD, the tact of the selected pictures could be taught as well, in order to see if the introduction of this variable could increase the efficiency of LRFFC training in producing emergence of the related untaught intraverbal FFC repertoire. Previous literature also suggested that improvements on tact repertoire facilitate the acquisition of intraverbals (Grannan & Rehfeldt, 2012; Matos & Lima, 2018; Matos, Araújo & Silva, 2018; Miguel, Petursdottir, & Carr, 2005; Partington & Bailey, 1993; Petursdottir, Carr, Lechago, & Amalson, 2008; Sundberg & Partington, 1998). In the current study, the teaching of tacts was implemented during the teaching of LRFFC to see if this variable facilitates the emergence of intraverbal FFC, as suggested by Kodak & Paden. So this was one of the goals of the current research. The other goal was, in a manner similar to the research conducted by Bao et al. (2017), but without a mixed training sequence, to compare two instructional sequences through an alternating treatments design in two children with ASD: 1) teaching intraverbal FFC first, so emergence of related and untrained LRFFC could be assessed later; 2) teaching

LRFFC and tact of the pictures first, so emergence of related and untrained intraverbal FFC could be assessed later.

2. Materials and Methods

The current study was an experimental investigation, conducted in a research laboratory from a private University. An experimental research involves the manipulation of independent variables (IV), and assessment of their effects on a dependent variable (DV). As to this investigation, the primary DV consisted of the number of correct intraverbal FFC and LRFFC responses emitted correctly by children with ASD during training. Secondary DV corresponded to the number of responses related to untaught repertoires during the administration of probes (probing LRFFC after training intraverbal FFC; and probing intraverbal FFC after training LRFFC). The IV consisted of reinforcing correct performance and use of correction procedures, when necessary, during training of the repertoires. In the case of intraverbal FFC, when a correction was needed, a picture corresponding to the correct response was presented, so the child could verbalize its name. If this was not enough, the vocal model (echoic) of the correct response was delivered, so the learner could repeat it. In the case of LRFFC, when a correction was needed, it consisted of the presentation of gestural or physical prompt, in order to make a given learner point to the correct picture from an array, and in accordance with a verbal instruction specifying function, feature or class to which the stimulus portrayed by the right picture belonged.

In order to ensure experimental control of the IV over the DV, an alternating treatments design was implemented. Through this type of design, two or more procedures are alternated in rapid fashion and the results are compared with the purpose of determining which of the procedures is the most efficient. In the case of the current research, the efficiency was determined by the emergence of the untaught repertoire after delivery of both interventions. The case in which the number of responses emitted was greater, regarding the untaught repertoire, either LRFFC or intraverbal FFC, would be considered the most efficient one (Cooper, Heron & Heward, 2006; Pereira, Shitsuka, Parreira & Shitsuka, 2018).

2.1 Participants

Two boys with ASD, 4 and 7 years old, participated in the research. They attended a University-based research laboratory, under the supervision of the first author, and where they received interventions based on Applied Behavior Analysis (ABA) twice a week to develop non-verbal and verbal repertoires, and decrease undesirable behaviors. It is important to mention that both participants of the study, before data collection, demonstrated preexisting skills, regarding both of the DVs (LRFFC and intraverbal FFC), unlike the previous literature, which investigated the relative efficiency of training these repertoires (Bao et al., 2017; Kodak & Paden, 2015; Matos et al., 2019). The preexisting skills of the participants of the current study were determined through the use of the milestones assessment component from the Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP) (Sundberg, 2008). Along the investigation, pretests were conducted to determine unknown targets, regarding LRFFC and intraverbal FFC, for both participants.

2.2 Environment

During the course of the study, experimental sessions were held in the context of the Assessment, Research and Intervention in Autism Spectrum Disorder Laboratory (LAPITEA), situated in a private Brazilian University (CEUMA University). The room where data collection happened was equipped with a table and chairs, where an experimenter and a given child remained seated, facing each other.

2.3 Instruments and materials

Plasticized cards, measuring 6 X 3 cm and containing images related to day-to-day stimuli such as spoon, sink and bed, were used during the teaching of LRFFC and intraverbal FFC. Correct responses during both tasks along the study resulted in praise and tokens, which could be exchanged later for access to preferred items, such as toys. Specific datasheets for the research were organized to take data on the performance of each participant during assessments and interventions.

2.4 Procedure

The research involved three conditions, which are presented separately. First condition consisted of an initial assessment on LRFFC and intraverbal FFC to establish targets, regarding each repertoire, for each of the participants during training. Second condition was related to the teaching of LRFFC, and probing of the untaught related intraverbal FFC after a learning criterion was met. Third condition was related to the teaching of intraverbal FFC, and probing of the untaught related LRFFC after a learning criterion was met.

First condition. Initial assessment on LRFFC and intraverbal FFC. 36 questions related to both repertoires, LRFFC and intraverbal FFC, were administered to select four targets for each participant in the study. The questions are presented in Table 1.

Table 1. Questions used in the initial assessment to select targets for LRFFC and intraverbal FFC training for both participants of the study (P1 and P2). LRFFC involved the selection of pictures representing each of the responses in the second column. Intraverbal FFC involved the emission of vocal verbal responses related to the second column.

Question	Response
Where do you sleep?	Bed
What do you find on a bed?	Pillow
What do you turn on?	TV
What do you eat?	Apple
Where do you sit?	Chair
What do you answer?	Phone
What do you put on your feet?	Shoes
What do you drink?	Juice
What do you brush your hair with?	Hairbrush
Where do you study?	School
What do you blow?	Candle
What do you read?	Book
What do you write with?	Pencil
What do you color?	Drawing
What do you kick?	Ball
What do you play with?	Doll
What do you drive?	Car
What do you put on your head?	Hat
What do you wear?	Shirt
What do you put in the trash can?	Trash
Where do you wash your hands?	Sink
Where do you throw the trash?	Trash can
What do you close?	Window
What do you open?	Door
Where do you bathe?	Bathroom
What do you stack?	Blocks
Where do you live?	House
What barks?	Dog
What has pages?	Book
What makes meow?	Cat
What has feathers?	Bird
What has petals?	Flower
What slice?	Knife
What jumps?	Bunny
Who takes you to school?	Mom
Who hugs you?	Dad

Source: Authors (2020).

The assessment of each repertoire was organized in 36 trials, one trial per question. During each trial to assess LRFFC, an experimenter presented an array with three different pictures, and a question upon which a child should select the corresponding picture from the array (e.g., selecting a picture of bird after the question "what has wings?"). During a trial to assess intraverbal FFC, only the verbal question was presented, so a child could emit a vocal verbal response related to the question (e.g., saying "bird" after the question "what has wings?"). After the presentation of a question regarding each repertoire, the child had up to 5s to emit a response. In each case, differential consequences were not programmed for either correct or incorrect responses.

Second condition. Teaching LRFFC and probing intraverbal FFC. This condition was organized in three steps. First, a baseline was conducted to ensure that the participants were unable to demonstrate correct responses, regarding the four established targets for LRFFC and related intraverbal FFC repertoires. This step was similar to the first condition of the study, with no differential consequences for correct and incorrect responses. Since four targets were defined for each repertoire, baseline was conducted through blocks with 12 trials, three for each of the four established targets per repertoire. The second step was related to the teaching of LRFFC only. Blocks with 12 trials were administered in a manner similar to baseline, regarding this repertoire. However, correct responses produced praise by an experimenter and delivery of tokens, which could be later exchanged for access to preferred items, such as toys. Incorrect responses (or no response) were followed by a correction procedure. The experimenter first pointed to the correct picture from the array, so the child could do the same. If that was not enough, a physical prompt was provided, in the sense that the child's hand was gently placed over the correct picture. An arbitrary learning criterion was achieved when a child finished a block of trials with 100% correct LRFFC responses. After this, the emergence of the related untaught intraverbal FFC was probed. In this case, the task was similar to the one conducted in baseline, as to this repertoire.

Third condition. Teaching intraverbal FFC and probing LRFFC. This condition was similar to the previous one, but the sequence regarding the training of a repertoire, followed by a probe to check emergence of another, was the opposite. First of all, baseline of LRFFC and intraverbal FFC was conducted like in the previous condition. After a low performance was established, the teaching of intraverbal FFC only was administered. Correct responses produced the same differential consequences as in the previous condition (LRFFC

training). As previously described, incorrect responses resulted in the presentation of pictures, so the child could state their names. If necessary, vocal models (echoic) of the correct responses were delivered, so the child could repeat them. After an arbitrary learning criterion was met, consisting in the emission of 100% correct responses, the untaught related LRFFC was probed.

2.5 Experimental design

An alternating treatments design with an initial baseline (Barlow & Hayes, 1979; Cooper et al., 2006; Sindelar, Rosenberg & Wilson, 1985) was used to measure the effects of IV (reinforcement of correct performance and error correction) on DV (number of correct intraverbal FFC responses and correct LRFFC responses). The two treatments/interventions were administered in a rapid alternated fashion. The process was either initiated with the presentation of a block of trials to teach LRFFC, followed by a block to teach intraverbal FFC, or the opposite order (intraverbal FFC first, then LRFFC). The presentation order was randomized across sessions. When a learning criterion of 100% correct responses was established for both repertoires, a probe was conducted to assess emergence of the untaught related repertoire in each case. It was assumed that the intervention in which the emergence of the untaught repertoire was better would be considered the most efficient one.

2.6 Ethical procedures

The current research was approved by an ethics committee, in research with humans (authorization No. 3.584.016), from CEUMA University, Brazil, São Luís-MA.

3. Results

The current research involved the following order of data presentation:

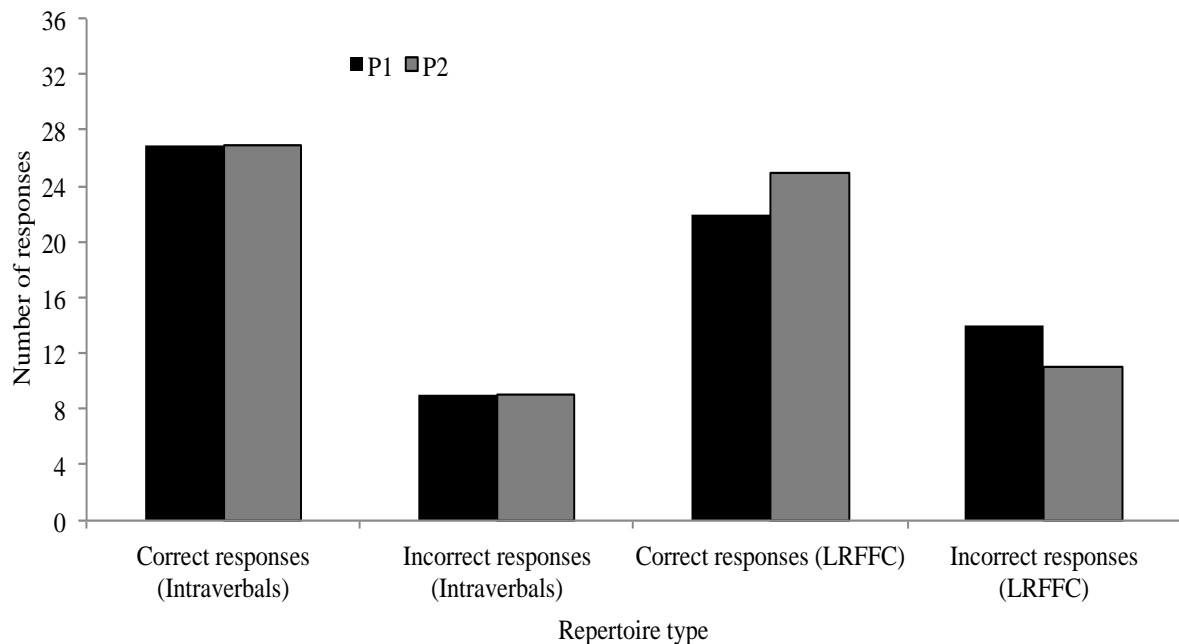
- 1) Data regarding the initial assessment, from the first condition, for target selection for P1 and P2 (Figure 1);
- 2) Data related to second and third conditions of the study, as to the number of correct responses across baseline, training and probe phases,

involving both LRFFC and intraverbal FFC targets, for both participants (Figure 2);

3) Data regarding the number of independent tact responses emitted by P1 and P2 during the teaching of LRFFC (Figure 3).

Next, Figure 1 is presented with the results from initial assessment for target selection for P1 and P2.

Figure 1. Initial assessment to establish unknown targets to be used during second and third conditions, regarding LRFFC and intraverbal FFC. Black bars and grey bars represent either correct or incorrect responses for P1 and P2, respectively.



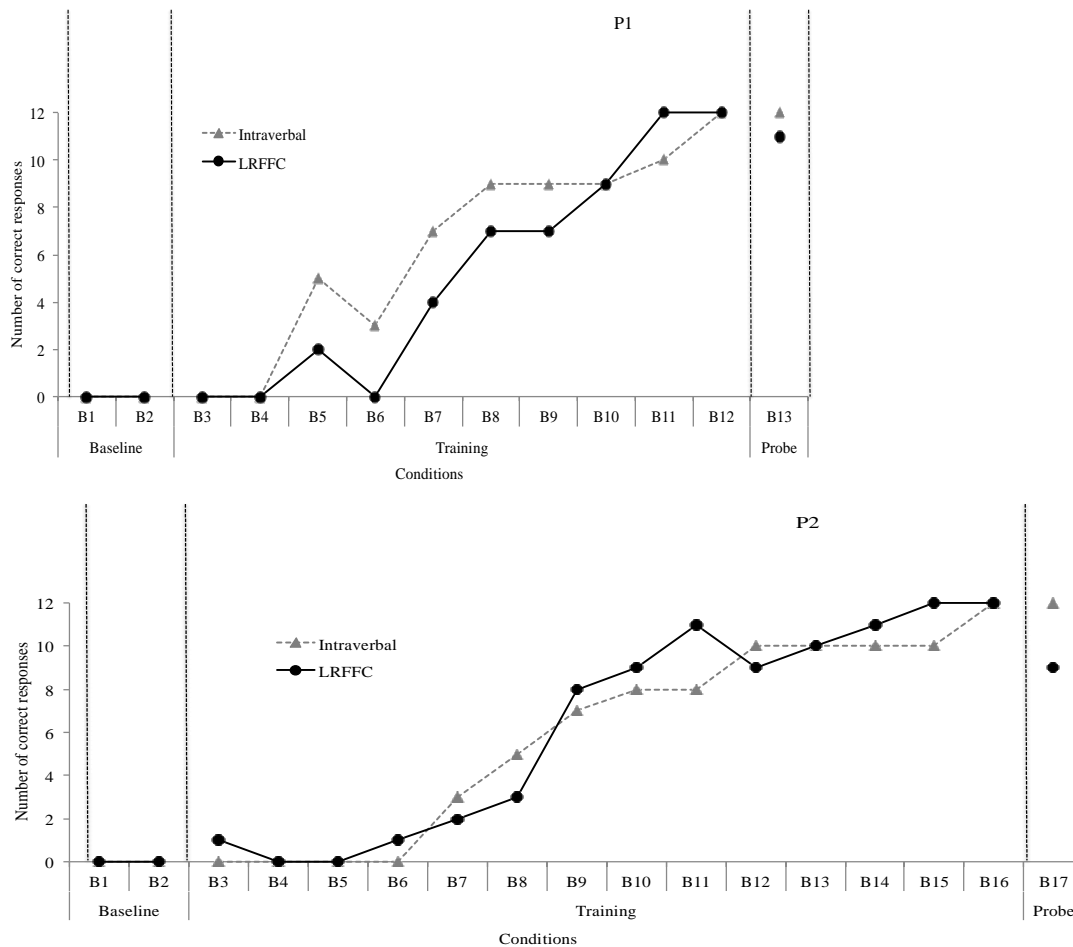
Source: Authors (2020).

Figure 1 shows that, during the initial intraverbal and FFC assessment for target selection, both participants P1 and P2 emitted 27 intraverbal FFC responses correctly out of 36 questions. P1 emitted 22 LRFFC responses correctly out of 36 questions. P2 emitted 25 LRFFC responses correctly out of 36 questions.

After the initial assessment was finished, four targets were established, considering each repertoire, for each participant. The targets were manipulated across second and third conditions. Figure 2 shows LRFFC and intraverbal FFC data, considering the selected targets

and across three phases (baseline, training and probe) from second and third conditions, for P1 and P2.

Figure 2. Number of correct LRFFC and intraverbal responses emitted by P1 and P2 during baseline, training and probe phases from second and third condition of the study. The upper graph represents data of P1 and, the lower graph, data of P2.



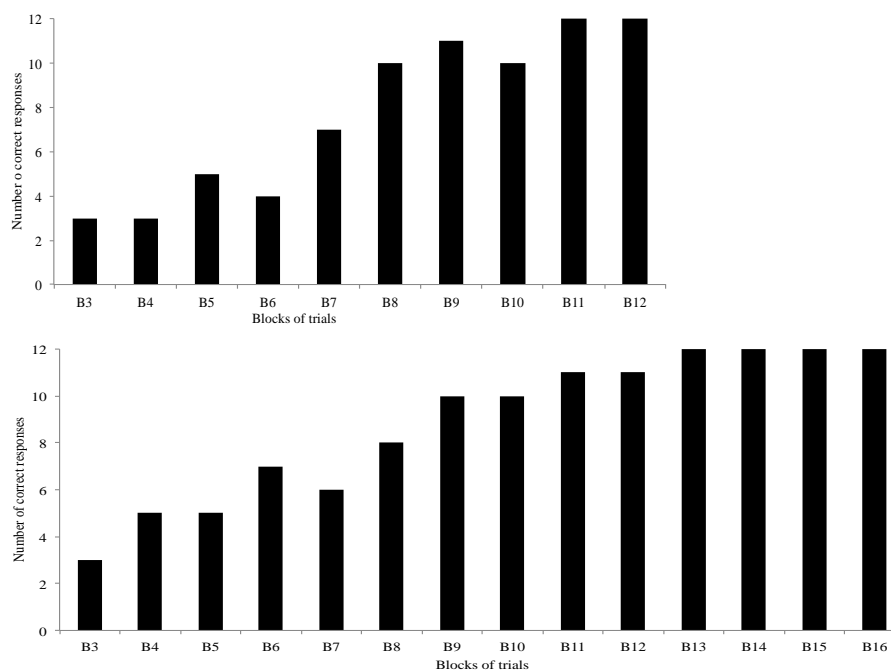
Source: Authors (2020).

First of all, Figure 2 shows that both participants, P1 and P2, were unable to emit LRFFC and intraverbal FFC correct responses during baseline, as it may be seen in the blocks of trials B1 and B2. During training for P1, when blocks of trials regarding both repertoires were alternated in rapid fashion, P1 reached criterion first for LRFFC (B11). It took nine blocks of trials for this. Criterion for intraverbal FFC was achieved in B12 for P1, considering that it took ten blocks for this. During the probe of the untaught repertoire, P1 emitted 11 LRFFC correct responses out of 12 trials, after intraverbal FFC training, and he also emitted 12 intraverbal FFC correct responses out of 12 trials, after LRFFC training. In other words,

there was emergence of the untaught repertoire in each case, considering that the emergence of the untaught intraverbal after LRFFC training was slightly better.

In the case of P2, when training commenced, it took 13 blocks of trials to reach criterion during LRFFC training, with the emission of 100% correct responses. It took 14 blocks to reach criterion during intraverbal FFC training. When the untrained repertoire was probed in each case, P2 emitted 12 intraverbal FFC correct responses, out of 12 trials, after LRFFC training. P2 emitted nine correct LRFFC responses, out of 12 trials, after intraverbal FFC training. Thus, the emergence effect was greater considering the instructional sequence related to the teaching of LRFFC, followed by a probe of intraverbal FFC for P2. Figure 3 shows the number of correct tact responses emitted by P1 and P2, along several blocks of trials, during LRFFC training.

Figure 3. Number of correct tact responses emitted during LRFFC training. The upper graph represents tact correct performance for P1 and, the lower graph, for P2.



Source: Authors (2020).

Tact training was held during the teaching of LRFFC repertoire for both participants P1 and P2. According to Figure 3, across ten blocks of trials for P1 and 14 for P2, the number of correct tact responses increased progressively. Until the last block for each participant, performance consisted of 12 tact responses out of 12 opportunities to respond.

4. Discussion

The literature on Applied Behavior Analysis (ABA), as to the experimental investigation of efficiency of teaching receptive and expressive language to learners with ASD and other cases of atypical development, suggests that a particular instructional sequence (teaching a expressive skill first and probing a related untaught receptive skill later) may be the most efficient sequence for many learners, unlike the recommendation from the traditional literature on the theme, which suggests the administration of the opposite instructional sequence (Loovas, 2003). Two important reviews (Contreras et al., 2020; Petursdottir & Carr, 2011) mentioned research with data indicating that the teaching of expressive skills first demands less learning trials for the acquisition of the repertoires, and produces better emergence effects of related receptive skills. As to the case of expressive language, the studies involved one of two types of expressive skills, also called verbal operant behaviors: tact and intraverbals (Skinner, 1992). A recent investigation, not mentioned by the review studies (Matos et al., 2020), also presented data, which suggested that teaching expressive language first may be the most efficient measure.

Part of the previous literature investigated more specifically comparisons between instructional sequences, regarding teaching intraverbal FFC (expressive language) first versus teaching LRFFC (receptive language) first (Bao et al., 2017; Kodak & Paden, 2015; Matos et al., 2020). It was established that teaching intraverbal FFC first was more efficient in producing the emergence of the related untaught LRFFC repertoire for most participants with ASD. The current research conducted a similar kind of investigation, regarding the efficiency of instructional sequences involving intraverbal FFC and LRFFC in learners with ASD. However, as to this investigation, although it is true that the sequence intraverbal FFC training - probing LRFFC successfully established the directly taught repertoire and the untaught one to some extent, it was no better than the opposite case (LRFFC training - probing intraverbal).

Previously, Kodak & Paden (2015) mentioned that future research could teach tacts of pictures during the course of LRFFC training, in order to assess its influence over the emergence of intraverbal FFC. The current investigation indeed suggests that tact training, during LRFFC training, facilitated the emergence of intraverbals in the two participants. However, the extent to which tact training influenced the emergence could not be determined, which represents a limitation of this research. It is important that future studies compare different conditions to teach LRFFC and assess the emergence of related untaught intraverbal FFC. One of the conditions could be related to the teaching of LRFFC alone (without

requiring the tact of pictures), and the other condition could involve the teaching of LRFFC plus training the tact of pictures. By comparing these conditions, as to their influence on the emergence of related untaught intraverbal FFC, data could indicate whether tact training would be critical for the emergence of intraverbals or not.

In the current research, the instructional sequence related to the teaching of LRFFC first was more efficient in producing the emergence of the related untaught intraverbal FFC repertoire in both participants P1 and P2. As to the teaching of intraverbal FFC first, the related untaught LRFFC also emerged, but to a less extent. In the case of the previous literature, teaching the intraverbal FFC first was the most efficient instructional sequence, considering the emergence of the untaught LRFFC, for the majority of the participants (Bao et al., 2017; Kodak & Paden, 2015; Matos et al., 2019). Considering the results of this study in particular, it is possible that they are related to each participant's preexisting skills, regarding LRFFC and intraverbal FFC. During the conduction of pretests, Both P1 and P2 emitted 27 intraverbals correctly out of 36 trials. Besides, P1 and P2 emitted 22 and 25 LRFFC responses correctly, out of 36 trials. As it may be noticed, both participants already possessed an expressive entry repertoire, regarding both intraverbal FFC and LRFFC, unlike previous literature on the efficiency of teaching.

In the study by Kodak & Paden (2015), although it was said that the participants possessed preexisting intraverbal and listener repertoire, the authors did not mention specifically the entry repertoire, regarding speaker and listener skills by function, feature and class (FFC). Considering that the targets were related to fill-in-the-blank responses (e.g., saying "chair" after hearing "you sit on a...", or selecting a picture of chair under the same verbal stimulus), it is possible that the participants were beginning learners, regarding LRFFC and intraverbal FFC repertoires. The participants from Bao et al. (2017) did not engage in LRFFC and intraverbal FFC responses in the beginning of the study, and the participants from Matos et al. (2019) showed limited LRFFC repertoire and no intraverbal FFC responses in the beginning of the research. Thus, because of all the information mentioned regarding the literature on the efficiency on LRFFC and intraverbal FFC training, it is believed that the participants from the current investigation were possibly more advanced learners.

It is very likely that LRFFC training produced a very significant emergence effect, as to the emission of 100% correct intraverbal FFC responses by both participants, because they were more advanced learners and probably had a long history of reinforcement with LRFFC tasks. It is important that future research replicate the procedures of the current one with more

participants, who should be advanced learners as well, with the purpose of testing the generality of the procedures with more participants, possessing more preexisting skills.

The participants from this investigation also presented significant levels of intraverbal FFC repertoire initially. According to a given literature (Matos, Aragão & Matos, 2019; Matos, Araújo & Silva, 2018), preexisting levels of intraverbal FFC may predict better emergence effects of more intraverbal repertoire after other skills, including LRFFC responses, are taught. It is possible that, if the participants did not possess any intraverbal FFC repertoire (or if they were beginning learners) before the beginning of the study, the results would be different, in the sense that maybe intraverbal training would produce a better emergence effect, regarding LRFFC responses. It is important that future research replicate the procedures of the current study with both participants who are advanced learners and those who are beginning learners, considering the repertoires by function, feature and class. An investigation could be conducted to check if training the tact of pictures during the teaching of LRFFC may influence the emergence of intraverbal FFC in beginning learners as well.

Another limitation of this study was related to the fact that there was no systematic data collection by a second observer, besides the experimenter, to determine an inter-observer agreement along the conditions of the research. However, the procedures of the research, including data collection, were always conducted by a well-trained experimenter in the administration of tasks related to discrete trial teaching to learners with ASD, showing good performance accuracy as to the administration of ABA procedures (Matos, Silva, Firmo & Matos, 2020).

The authors from the current research believe that, because of the preexisting skills of the participants (they are more advanced learners compared to participants from previous research), the receptive skill teaching (LRFFC training) was efficient in the sense that it produced emergence of the related untaught expressive skill (intraverbal FFC) without errors. Plus, it is also believed that tact training, during LRFFC training, greatly influenced the emergence of the untaught intraverbal FFC. In Applied Behavior Analysis (ABA), there has always been interest in conducting investigations on procedures that may increase the efficiency of the teaching of skills to learners with ASD. The authors from this research also believe that there is not an end to the investigation on procedures to promote development of learners with ASD and related disabilities. It is always important to conduct research on variables affecting the efficiency of teaching procedures, which may produce gains beyond what is directly taught, as it was the case of this study and the previous literature. Learning

more about variables, which might increase the efficiency of procedures is scientifically important, and it is also socially relevant, considering the possible implications for learners with atypical development, who demand effective interventions to become more functional and independent in society.

5. Final Considerations

In the current research, both instructional sequences, considering the teaching of LRFFC followed by probing the related untaught intraverbal FFC and the opposite case, produced the emergence of the untaught repertoire. However, the emergence of intraverbal FFC after LRFFC training was greater, and this did not replicate the previous literature, since intraverbal FFC training produced better emergence effect, regarding LRFFC responses. It is believed that teaching the tact of pictures during LRFFC training may have influenced the emergence of intraverbal FFC, although more investigation is needed on this. Future research should compare a condition, in which the tact of pictures is taught during LRFFC training, to another condition in which the tact is not trained. This would serve the purpose of determining if the training of tacts is needed or not across different learners, regarding the emergence of intraverbal FFC.

Besides, it is believed that the preexisting intraverbal FFC and LRFFC repertoire counted for the better emergence of intraverbal after LRFFC training, and that future studies could replicate the procedures of the current one with more participants, who might be advanced learners as well, to test the generality of the procedures. Besides, the procedures could also be investigated with participants who are beginning learners, in order to see whether training the tact of pictures during LRFFC training influences the emergence of intraverbal FFC or not. Overall, the results of this investigation showed, like the previous literature, that a given instructional sequence might benefit more a learner and that it is very important for his/her development. In Applied Behavior Analysis (ABA), the investigation on procedures, which may produce gains beyond what is directly taught, greatly benefit many learners with ASD, and other cases of atypical development, and this is socially important (Cooper et al., 2006).

Previously, in this study, it was said that it was not possible to determine the extent to which tact training, during LRFFC training, facilitated the emergence of intraverbal FFC. Because of this, more investigation is warranted. As suggestion, future studies should compare LRFFC teaching conditions with and without tact training. This should be conducted

with learners at different levels (both beginning and more advanced learners). It is believed that this may favor a better understanding of variables that may increase the efficiency of teaching for different learners with ASD, and at different levels, regarding preexisting skills.

References

Bao, S., Sweatt, K. T., Lechago, S. A., & Antal, S. (2017). The effects of receptive and expressive instructional sequences on varied conditional discriminations. *Journal of Applied Behavior Analysis, 50*, 775-88.

Barlow, D. H., & Hayes, S. C. (1979). Alternating treatments design: one strategy for comparing the effects of two treatments in a single subject. *Journal of Applied Behavior Analysis, 12*, 199-210.

Contreras, B. P., Cooper, A. J., & Kahng, S. (2020). Recent research on the relative efficiency of speaker and listener instruction for children with autism spectrum disorder. *Journal of Applied Behavior Analysis, 53*, 584-9.

Cooper, J. O., Heron, T. E., & Heward, W. (2006). *Applied behavior analysis*. Second edition. New Jersey: Pearson Merry Prentice Hall.

Cuvo, A. J., & Riva, M. T. (1980). Generalization and transfer between comprehension and production: A comparison of retarded and nonretarded persons. *Journal of Applied Behavior Analysis, 13*, 315-31.

Delfs, C. H., Conine, D. E., Frampton, S. E., Shillingsburg, M. A., & Robinson, H. C. (2014). Evaluation of the efficiency of listener and tact instruction for children with autism. *Journal of Applied Behavior Analysis, 47*, 793-809.

Frampton, S. E., Robinson, H. C., Conine, D. E., & Delfs, C. H. (2017). An abbreviated evaluation of the efficiency of listener and tact instruction for children with autism. *Behavior Analysis in Practice, 10*, 131-144.

- Grannan, L., & Rehfeldt, R. A. (2012). Emergent intraverbal responses via tact and match-to-sample instruction. *Journal of Applied Behavior Analysis, 45*, 601-605.
- Greer, R. D., & Ross, D. E. (2008). *Verbal Behavior Analysis: Inducing and expanding complex communication in children with severe language delays*. Boston: Allyn & Bacon.
- Hupp, S. C., Mervis, C. B., Able, H., & Conroy-Gunter, M. (1986). Effects of receptive and expressive training of category labels on generalized learning by severely mentally retarded children. *American Journal of Mental Deficiency, 90*, 558-565.
- Keller, M. F., & Bucher, B. D. (1979). Transfer between receptive and productive language in developmentally disabled children [Abstract]. *Journal of Applied Behavior Analysis, 12*, 311.
- Kodak, T., & Paden, A. R. (2015). A comparison of intraverbal and listener training for children with autism spectrum disorder. *The Analysis of Verbal Behavior, 31*, 137-144.
- Lovaas, O. I. (2003). *Teaching individuals with developmental delays*. Austin, TX: Pro-Ed.
- Matos, D. C. (2016). *Análise do comportamento aplicada ao desenvolvimento atípico com ênfase em autismo*. Porto Velho: AICSA.
- Matos, D. C., Aragão, M. C. M., & Matos, P. G. S. (2019). *Ensino com feedback instrucional em crianças com transtorno do espectro autista (tea): efeitos sobre categorizar*. In: IGS Arioli (Org.). *Psicologia da Saúde: Teoria e Intervenção* (pp. 169-182). Ponta Grossa: Atena.
- Matos, D. C., Araújo, C. X., & Silva, K. R. (2018). Ensino de tatos, respostas de ouvinte e efeitos sobre intraverbais em autistas. *Revista Brasileira de Terapia Comportamental e Cognitiva, 4*, 8-26.
- Matos, D. C., Cruz, I. N. C., Carneiro, A. C., & Matos, P. G. S. (2020). *Ensino de repertório de ouvinte e intraverbal em crianças com transtorno do espectro autista*. In: DC Matos (Org.), *A psicologia em suas diversas áreas de atuação 2* (pp. 14-26). Ponta Grossa: Atena.

Matos, D. C., & Lima, A. B. R. (2018). *Ensino de tatos e respostas de ouvinte e os efeitos sobre emergência de intraverbais*. In: DLO Vilas Boas, F Cassas, HL Gusso & PCM Mayer (Orgs.), *Comportamento em foco* (Vol. 7, pp. 140-153). São Paulo: Associação Brasileira de Psicologia e Medicina Comportamental, ABPMC.

Matos, D. C., Silva, F. M. A. M., Firmo, W. C. A., & Matos, P. G. S. (2020). Training psychology interns to teach verbal and non-verbal repertoires in children with autism spectrum disorder. *Research Society and Development*, 9, 1-24.

Miguel, C. F., Petursdottir, A. I., & Carr, J. E. (2005). The effects of multiple-tact and receptive-discrimination on the acquisition of intraverbal behavior. *The Analysis of Verbal Behavior*, 21, 27-41.

Miller, M. A., Cuvo, A. J., & Borakove, L. (1977). Teaching naming of coin values-comprehension before production versus production alone [Abstract]. *Journal of Applied Behavior Analysis*, 10, 735-736.

Partington, J. W., & Bailey, J. S. (1993). Teaching intraverbal behavior to preschool children. *The Analysis of Verbal Behavior*, 11, 9-18.

Pereira, A. S., Shitsuka, D. M., Parreira, F. J., & Shitsuka, R. (2018). *Metodologia do trabalho científico*. Santa Maria: UAB / NTE / UFSM.

Petursdottir, A. I., & Carr, J. E. (2011). A review of recommendations for sequencing receptive and expressive language instruction. *Journal of Applied Behavior Analysis*, 44, 859-876.

Petursdottir, A. I., Carr, J. E., Lechago, S. A., & Almason, S. M. (2008). An evaluation of intraverbal instruction and listener instruction for teaching categorization skills. *Journal of Applied Behavior Analysis*, 41, 53-68.

Sindelar, P. T., Rosenberg, M. S., & Wilson, R. J. (1985). An adapted alternating treatments design for instructional research. *Education and Treatment of Children*, 8, 67-76.

Skinner, B. F. (1992). *Verbal behavior*. Englewood Cliffs, NJ: Prentice Hall. (Obra original publicada em 1957).

Smeets, P. M. (1978). Establishing generative performance and cross modal generalization of the manual plural sign in a severely retarded deaf girl. *British Journal of Communication Disorders, 13*, 49-57.

Smeets, P. M., & Striefel, S. (1976). Acquisition and cross modal generalization of receptive and expressive signing skills in a retarded deaf girl. *Journal of Mental Deficiency Research, 20*, 251-259.

Sprinkle, E. C., & Miguel, C. F. (2012). The effects of listener and speaker training on emergent relations in children with autism. *The Analysis of Verbal Behavior, 28*, 111-117.

Sundberg, M. L. (2008). *The verbal behavior milestones assessment and placement program: The VB-MAPP* (2nd ed.). Concord, CA: AVB Press.

Sundberg, M. L., & Partington, J. W. (1998). *Teaching language to children with autism or other developmental disabilities*. Danville, CA: Behavior Analysts, Inc.

Watters, R. G., Wheeler, L. J., & Watters, W. E. (1981). The relative efficiency of two orders for training autistic children in the expressive and receptive use of manual signs. *Journal of Communication Disorders, 14*, 273-285.

Wynn, J. W., & Smith, T. (2003). Generalization between receptive and expressive language in Young children with autism. *Behavioral Interventions, 18*, 245-266.

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