Teaching Complex Intraverbals and Response Variability in Children with Autism Spectrum Disorder

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Abstract

Children with Autism Spectrum Disorder (ASD) commonly show difficulties in developing intraverbals. One case relates to providing the names of items belonging to categories (e.g., saying "ruler, sharpener and pencil" under the instruction "name some school items"). The goal of this investigation was to compare the effects of two procedures (differential reinforcement with and without instructive feedback) on the acquisition of intraverbals and production of response variability in two children with ASD. The variability consisted inthe emission of category item names under different sequences. As a result, the targets were established for both children. For one of them, the procedure without instructive feedback was slightly better because errorless intraverbal performance was established first. Demonstrations of response variability occurred in more teaching sessions. In the case of the other child, it was the opposite (the procedure with instructive feedback was better). Data were discussed as to possibilities for future studies.

Keywords: Autism spectrum disorder; Intraverbal; Instructive feedback; Response variability.

1. Introduction

Language development is crucial for all human beings in contexts where verbal interactions occur(e.g., home, school, and other sectors of society). However, in many children with an Autism Spectrum Disorder (ASD), language skills are impaired. Specialintervention methodologies are necessary to establish them. Empirical investigations in Applied Behavior Analysis (ABA) were conducted along the years regarding this issue, and evidence-based procedures were documented in manuals to assist practitioners and caregivers who should be trained as well to teach skills to their children with ASD (Greer & Ross, 2008; Matos, 2016; Sundberg & Partington, 1998).

Skinner (1992) defines language as verbal behavior, which is a kind of operant behavior shaped and maintained by mediated consequences. In a verbal episode, the speaker emits the verbal behavior, and the listener provides a reinforcing stimulus to strengthen the speaker's behavior. According to Skinner, there are several types of verbal behaviors. Among them, the case which is the most important for this study is called intraverbal. In this case, a verbal response is emitted in the presence of a verbal stimulus, without point-to-point correspondence, and the response is maintained by a social reinforcer (e.g., a given child says "car" under the verbal instruction "tell me the name of something that has wheels", and a teacher provides verbal praise).

Simple intraverbal forms, the first to be established in children´s repertoires, consist in responses to "fill in the blank" verbal stimuli (e.g., saying "go!" upon hearing "1, 2, 3 and…") and answering questions (e.g., saying "John"to the question "what is your name?"). Later in development, more complex intraverbals are acquired. One case relates to discriminations with compound stimuli (e.g., saying "shark" to "name a marine animal").

It is suggested that the behavioral process involved is called a verbal conditional discrimination, since the word "marine" alters the evocative function of the word "animal". Both words shall exert joint control over the response. This is also called an intraverbal emitted under convergent control because multiple verbal stimuli affect the strength of one response (Axe, 2008; Pérez-González, 2020; Sundberg, 2016).

The intraverbal may also be involved in a discrimination in which one verbal stimulus evokes multiple responses (e.g., saying "dog, cat and bird" to the verbal instruction "name some animals"). In this case, it is said that the responses are being emitted under divergent control. Besides, it is also possible the case in which both types of control occur (e.g., saying "shark, dolphin and whale" to the verbal instruction "name some marine animals"). The control of the intraverbal relation, therefore, is both divergent and convergent (Axe, 2008; Pérez-González, 2020; Sundberg, 2016).

In the literature, studies were conducted to assess the effects of procedures to establish intraverbals of saying the names of items according to categories, either under divergent or convergent control (or both), in children with ASD. Some studies assessed the emergence of these types of intraverbals after the teaching of other repertoires (e.g.,Cordeiro, 2020;Framptom&Shillingsburg, 2020; Grannan & Rehfeldt, 2012; Matos, Aragão& Matos, 2019; Matos &Lima, 2018; Matos, Araújo & Silva, 2018).

Grannan and Rehfeldt (2012) assessed the effects of teaching simple tacts (e.g., saying "dog" to a picture of dog and the question "what is this?"), category tacts (e.g., saying "animal" to a picture of dog and the question "what is a dog?"), and arbitrary visual pairing of pictures related to the same categories (e.g., pairing the picture of a dog to the picture of a cat) on the emergence of intraverbals of saying the names of items (e.g., saying "dog, cat and pig" in the presence of "name some animals"). Two children with ASD at the age of 5 participated. The intraverbals emerged for both.

Matos and Lima (2018) and Matos et al. (2018) conducted a similar investigation in children with ASD and other cases of learning disabilities. In the research by Matos and Lima with four children from 3 to 6 years old, all interventions were the same, except that the visual pairing was replaced by a task of pointing to pictures according to the dictated names of their categories. The results showed that intraverbals emerged for two children. In Matos et al., four children, from 4 to 8 years old, participated. For two of them, only tasks to teach tacts (simple and category) wereestablished. For the remaining children, tasks to teach listener repertoires (simple and category) were programmed.

A new feature in this study was that the teaching of simple repertoires involved the presentation of information regarding category names by an experimenter, and contingent to correct responses (e.g., the experimenter said "the dog is an animal" either after the child said "dog" to the picture of a dog or selected the picture of dog from an array after hearing "point to dog"). This procedure is called instructional feedback and it comprises the definition of secondary targets during the teaching of primary targets. In Matos et al., the primary targets were simple tacts and listener repertoires. Secondary targets were intraverbals. In the end, no child demonstrated intraverbal emergence.

Other studies also assessed the effects of instructional feedback, during the teaching of simple repertoires, on the emergence of intraverbals of saying category item names. Matos et al. (2019) conducted this kind of investigation in two children with ASD from 3 to 5 years old. Simple tact and listener responding were taught just as in the research by Matos et al. (2018). A probe to assess the emergence of intraverbals was applied every time a learning criterion was met during the teaching of a simple repertoire (tact or listener responding). Several intraverbal probes were conducted along the maintenance of simple repertoire training sessions. Intraverbal secondary targets emerged with variability in the case of one child (in this case, variability means that the child's performance was not free from errors). Cordeiro (2020) conducted a similar research in four children with ASD from 5 to 7 years old. However, only simple tact training was defined. Intraverbal probes were also conducted upon the achievement of criterion-level performance in several simple tact training sessions. The emergence of intraverbals was demonstrated by three of the children. In a research conducted by Framptom and Shillingsburg (2020), only maintenance listener responding training sessions were established, with the inclusion of instructive feedback, in two children with ASD from 7 to 8 years old. As a result, there was emergence of intraverbals for both.

Intraverbals, of saying the names of items according to their categories, were also taught through transfer of stimulus control procedures and differential reinforcement of independent performance. Besides, some studies were also concerned with the production of response variability. As an example, when someone presents a verbal instruction, such as "name some school items", a given child could say "ruler, pencil and eraser". When the same demand is presented to the child again, he/she could say "pencil, eraser and ruler".

The emission of the names under new sequences, in different opportunities to respond, represents response variability in this case, a kind of skill that many learners with ASD usually lack. Since the current research was concerned with direct intraverbal teaching procedures and the production of response variability through instructive feedback, it is important to describe the methodological aspects and results of previous studies (Carroll & Kodak, 2015; Matos, Vieira & Matos, 2020).

Carroll and Kodak (2015) compared the effects of two types of direct teaching, as to the acquisition of intraverbals and production of response variability, in two 5-year-old children with ASD. One of the interventions comprised the use of instructive feedback and, the other, did not. In this case, correct responses consisted of the emission of names regarding at least three items related to a given category and, if incorrect responses occurred, an experimenter provided the names of three items, so the child could repeat them. During different opportunities in which this correction procedure was needed, the experimenter provided the names under different sequences. In the case of the intervention, which involved the instructive feedback procedure, the only difference was that, when correct responses were emitted, the experimenter provided the names of three more items as additional information. These names were delivered under different sequences in different opportunities to respond as well. Trials to respond, in which incorrect responses were emitted, resulted in the same kind of correction procedure mentioned for the intervention without instructive feedback. The results showed that both children engaged in more new response combinations (more variability) regarding the intervention, which involved the instructive feedback procedure. Besides, the acquisition of intraverbals was better in this case.

Matoset al. (2020) conducted a replication of the study by Carroll and Kodak (2015), involving two children with ASD from 5 to 9 years old. Similarly, two direct teaching procedures (one with instructive feedback and the other without it) were compared, as to the acquisition of intraverbals and demonstration of response variability. One difference from the previous research was related to the fact that Matoset al. focused on intraverbals under both divergent and convergent control, while the previous research focused on the establishment of intraverbals solely under divergent control. Plus, in the study by Matos et al., the correction procedure did not consist solely in the presentation of names to the child. Pictures portraying the items were presented first, so a given child could label/tact them. They were presented in different sequences across several opportunities to respond. When a given picture was not enough to evoke a response, the name of the item was provided to the child. Regarding specifically the intervention with instructive feedback procedure after the emission of correct intraverbal responses, pictures and their names were presented under different sequences as information feedback. Children´s responses to the feedback were ignored by the experimenter.

The results showed that, in the case of the 5-year-old child, there was acquisition of intraverbals in 15 sessions. The acquisition rate was similar considering both interventions with and without instructive feedback. Besides, the authors pointed out that response variability was demonstrated, but data collection on this was not systematically taken, which was considered a methodological limitation of the study. As to the other child, no intraverbal responses were established because this participant showed prompt dependency to respond. In other words, the child only responded when pictures were shown during the implementation of correction procedures.

Considering what has been pointed out so far, the purpose of the current study was to extend the investigation conducted by Matos et al. (2020) with two more children with ASD. As in the case of the previous research, the focus wasthe establishment of intraverbals to say the names of items according to their categoriesunder both convergent and divergent control. Besides, data on response variability (the emission of item names intraverbally under different sequences) were systematically taken, so the effects of teaching procedures (with and without instructive feedback) could be assessed on intraverbal acquisition and the production of response variability as well.

2. Method

2.1. Participants

Two 6-year-old children participated in the research. Theywere both diagnosed with ASD and received Applied Behavior Analysis interventions twice a week in an assessment, research, and intervention laboratory from a private University in Brazil. In this context, an individual curriculum was implemented for each child, and it consisted of intervention programs to improve several impaired non-verbal and verbal repertoires.

By the time data collection was taken, both of the two participants showed the following repertoires according to skill tracking protocols (Sundberg, 2008; Partington & Mueller, 2013):1) tacting/labeling hundreds of non-verbal stimuli, including pictures, objects and actions; 2) generalized mands/making requests through varied sentences; 3) generalized matching of non-verbal stimuli to their equal or similar models;

4) over 100 responses in listener discrimination tasks by function, feature and class (e.g., selecting the picture of dog under the verbal instruction "show me an animal"); 5) reading/textual behavior by saying the names of, at least, 100 different words;6) several intraverbal types such as "fill in the blanks" (e.g., saying "go!" after "1, 2, 3 and..."), answering questions (e.g., saying "at school" under the instruction "where do you study?") and saying the names of items according to their categories solely under divergent control (e.g., saying "dog, cow and pig" under the instruction "name some animals").

2.2. Environment

The laboratory, where assessment and intervention procedures were implemented, consisted in a room equipped with a table and two chairs. Child and experimenter sat on the chairs facing each other. The experimenter was responsible for the presentation of stimuli and conduction ofdata collection regarding relevant intraverbal responses by each child.

2.3. Materials and instruments

Regarding the materials used with each child, they consisted of plasticized cards measuring 6 X 3 cm and containing pictures portraying two different categories (kitchen items and school items). Each category comprised six items, which were the following: 1) cutlery, pan, stove, refrigerator, plate and glass (kitchen items); 2)scissors, ruler, crayons, eraser, pencil and notebook (school items). Along the implementation of the interventions targeting the establishment of intraverbals, verbal praise was provided contingent to correct responses and, during intervals between intervention sessions, access to preferred activities (e.g., movies and games) was allowed. The experimenter also used datasheets with the purpose of measuring the child´s performance during assessment and intervention tasks.

2.4. Independent variables, dependent variables, and response definition

The independent variables of the research consisted of the manipulation of differential consequences contingent to correct and incorrect intraverbal responses of saying the names of items belonging to two different categories (school items and kitchen items). The differential consequences were the independent variables (IV) and the intraverbal responses, or prompted responses, were the dependent variables (DV). Targets corresponded to the emission of item names related to each of the categories. Considering the case of school items, if correct responses were emitted (e.g., saying “eraser, pencil and notebook” under the verbal instruction “name some school items”), the experimenter praised the child and provided the names of additional items (instructive feedback) as secondary targets (e.g., the experimenter said “scissors, ruler and crayons are also school items”).It is important to mention that, along several trials in which correct responses (the child emitted the names of at least three different targets) were demonstrated, the names of additional targets were presented under different sequences (e.g., “crayons, scissors and ruler are also school items”).

In the case of kitchen items, correct responses (e.g., saying “refrigerator, plate and glass” under the verbal instruction “name some kitchen items”) only produced verbal praise as consequence. As to the emission of an incorrect response (or no response) regarding both categories, the same kind of correction procedure was applied. In other words, ifcorrection was needed in a trial to name kitchen items (or school items), the experimenter presented the pictures representing each of six possible targets (one by one). After the presentation of each picture, the child had up to 5 s to say its name, otherwise the experimenter provided the item name so the child could repeat it. It is important to mention that, whenever a correction was necessary, the pictures (and their verbal models if needed) were provided under different sequences.

2.5. Procedure

Both research participants (P1 and P2) went through a baseline phase concerning the assessment of the main DV (intraverbals) and a treatment phase to teach two groups of intraverbal targets (one with instructive feedback and the other without it). Each phase is presented as follows:

First phase. Assessment of intraverbals to say item names belonging to two different categories. In this phase, a baseline was conductedto determine the entry intraverbal repertoires of the two children, regarding the two categories used. Each session consisted of 12 trials. Half of them was related to school items and, the other half, to kitchen items. During a session, the six trials related to one category were presented to the child first. Then, the remaining six trials, related to the other category, were presented. The trials were administered in a randomized order. In each trial, the experimenter presented a verbal instruction to the child (e.g., “name some school items”; “name some kitchen items”). After each trial, the child had up to 5 s to say names of items in a category. Saying the names of at least three items was defined as correct. No differential consequences were programmed for correct and incorrect performance. This baseline phase was discontinued once it was determined absence of the target intraverbal repertoires along sessions.

Second phase. Treatment. This intervention phase was organized with the same categories from baseline, and it involved the following steps: 1) teaching the names of school items, under intraverbal control, with instructive feedback; 2) teaching the names of kitchen items, under intraverbal control, without instructive feedback. Sessions in this phase were conducted in a similar manner as in baseline, that is, each session consisted of 12 trials (six trials for each category). However, differential consequences were established for correct and incorrect responses. As mentioned in the previous section, for both categories, incorrect responses resulted in the presentation of pictures, one by one, portraying six items, so the child could say their names. If necessary, the names would be provided so the child could echo them. Saying at least three item names in the school items category resulted in the provision of verbal praise andadditional item names by the experimenter as secondary targets (instructive feedback). Saying at least three item names in the kitchen items category solely resulted in the provision of verbal praise by the experimenter. It is important to mention that, after each intervention session comprising 12 trials (six with school items and six with kitchen items), the child could watch a preferred video for 30 s. For each child, several intervention sessions were administered along the experiment so that intraverbal variability, defined as the emission of different word combinations (item names), could be analyzed.

2.6. Experimental design

To ensure experimental control of saying category item names by the independent variables of the study (teaching intraverbals with and without instructive feedback), an alternated treatments design with initial baseline was established(Barlow & Hayes, 1979; Cooper, Heron &Heward, 2007;Pereira, Shitsuka, Parreira &Shitsuka, 2018; Sindelar, Rosenberg & Wilson, 1985). First, a baseline condition was implemented to ensure that both children didn´t show the target intraverbal responses of the study.During intervention, two blocks of six trials, considering the two categories trained (school items with instructive feedback and kitchen items without instructive feedback), were administered in alternated order to each child. Along several sessions, data were collected as to the emission of independent and prompted responses of saying item names in each category. After the end of data collection, the two procedures were compared as to their efficiency in establishing intraverbal targets and response variability defined by the emission of different word combinations.

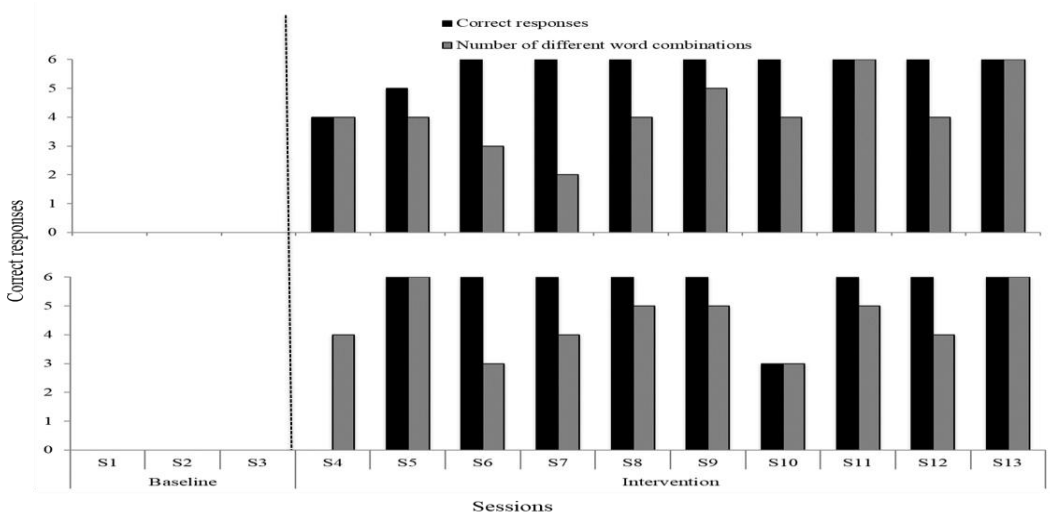
2.7. Ethical procedures

This study is derived from a project, which was approved by an ethics committee in research with humans (authorization No. 2.145.293) from CEUMA University, Brazil, São Luís-MA.

3. Results

Next, the results are presented considering the two procedures to teach intraverbals of saying category item names in the two children of the study, P1 and P2.Figure 1 shows intraverbal acquisition and establishment of response variability for P1.

Figure 1. Number of correct intraverbal responses (category item names) and number of different word combinations by P1 during the teaching of school items category with instructive feedback (upper graph) and kitchen items category without instructive feedback (lower graph).

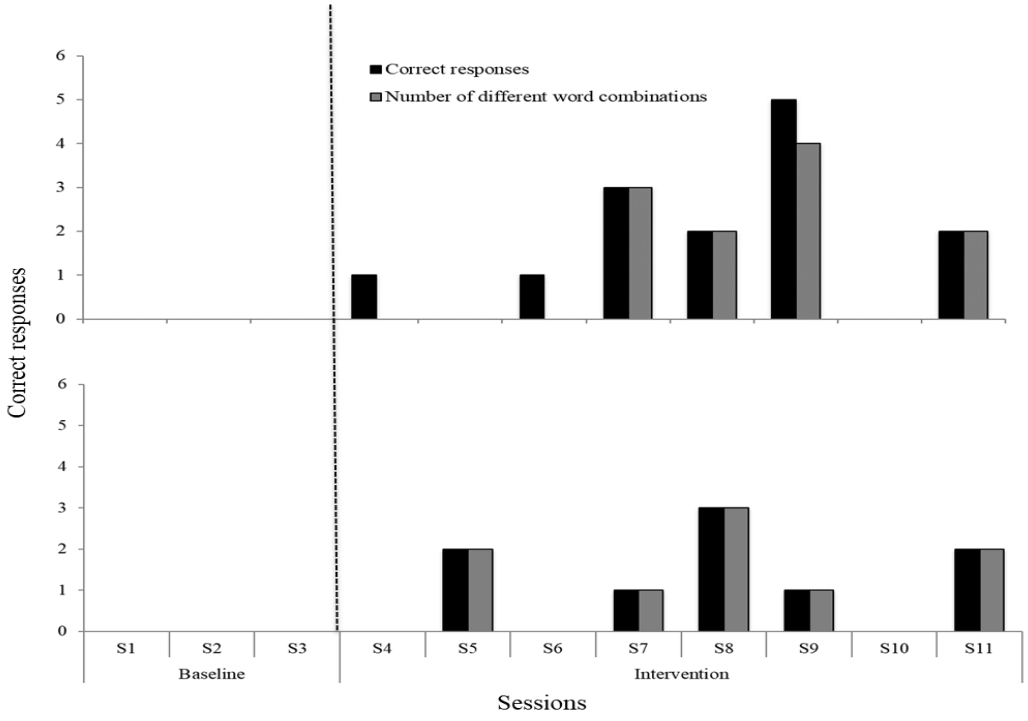


Source: The authors

As it can be seen in Figure 1, P1 did not show any correct intraverbal responses during the entire baseline phase (from session S1 to S3). Along most of baseline trials, the child repeated the experimenter´s verbal instruction or part of it (e.g., "name some school items"). When the teaching of both categories began, P1 was able to emit correct responses in all six trials related to school items first during the sixth session (S6) and, in the case of kitchen items, errorless performance was first demonstrated in the fifth session (S5). Along most of the remaining sessions, for both categories, no errors were committed again (except in the case of the session S10 for the kitchen items category). As to the production of response variability, Figure 1 shows that this was demonstrated by P1 in the case of both categories.

In most of the sessions, for both categories, from four to six different response combinations were emitted. In the case of school items category, the best results were shown in sessions S9, S11 and S13 with the emission offive, six and six different word combinations, respectively. In the case of kitchen items category, the results were slightly better, considering that during the sessions S5, S8, S9, S11 and S13, the child emitted six, five, five, five and six different word combinations, respectively. Figure 2 shows intraverbal acquisition and establishment of response variability for P2.

Figure 2. Number of correct intraverbal responses (category item names) and number of different word combinations by P2 during the teaching of school items category with instructive feedback (upper graph) and kitchen items category without instructive feedback (lower graph).



Source: The authors

In the case of child P2, no correct intraverbal responses were emitted during baseline phase. When intervention phase was established, the child demonstrated the acquisition of intraverbals along several sessions, but the gains were not fully maintained until the end of data collection. It was intended to implement more intervention sessions, but the semester was about to end in the University where the procedures were conducted. After that, P2 was no longer available for more sessions. Anyway, the data show that the child was able to emit correct responses for both categories. In the case of school items category, in session S9, P2 emitted five correct responses out of six trials, although this performance did not maintain in the following sessions.

In the case of kitchen items category, in session S8, the child emitted three correct responses out of six trials, but no maintenance or improvement was demonstrated thereafter. As to the production of response variability, it was also demonstrated by P2 along the intervention sessions for both categories. In the case of school items category, the best results appear to be shown in the sense that the child emitted from two to four different word combinations. In the case of kitchen items category, the child emitted from one to three different word combinations.

4. Discussion

Like previous investigations (Carroll & Kodak, 2015; Matos et al., 2020), this study produced intraverbal acquisition and response variability in two children with ASD through direct teaching. The two categories used consisted in school items and kitchen items like in Matos et al. For P1, once independent performance was achieved for all trials, no more errors were made overall (except in session S10 with kitchen items). As to response variability, it was demonstrated that six different word combinations were emitted in two sessions for both categories. This participant´s data indicate that both interventions with and without instructive feedback were effective and efficient in a similar fashion.

Data also suggest that teaching the kitchen items category without instructive feedback was slightly better, considering both intraverbal acquisition (errorless performance was established first) and the development of response variability (more sessions with emission of five or six different word combinations). This result did not replicate those produced in the study by Carroll and Kodak (2015) in which the procedure with instructive feedback produced a better effect, regarding acquisition of intraverbals and development of different word combinations, for both participants.

As to child P2, the eight intervention sessions, which were conducted with him, were not sufficient to produce independent performance and its maintenance. As it was argued before, the recess of activities at the University did not allow the resume of the intervention phase. Nevertheless, Figure 2 clearly showed that correct responses, regarding the acquisition of intraverbals, were emitted, although the performance was variable along the sessions.

That was the case of both categories taught. So, it is concluded that the teaching with and without instructive feedback was effective and that errorless performance probably would have been demonstrated through the administration of more intervention sessions.

Data from Figure 2 show that the emission of different word combinations (response variability) was established as well in several sessions. That happened for both categories. The resultssuggest thatteachingschool items category with instructive feedback was slightly more effective and efficient, since it was the procedure that produced the highest number of correct intraverbal responses and different word combinations in a session. However, it is also true that, in the case of the kitchen items category, response variability was demonstrated in more sessions than in the case of the other category. The results produced with P2, overall,are more like the case ofchildren from the study by Carroll and Kodak (2015).

Like the previous research (Matos et al., 2020),the current one is worth to discuss as to methodological limitations. First, the categories selected for the children with ASD who participated corresponded to items, which are part of children´s daily lives in general. Because of this, it was not possible to controlpossible extrinsic influences (e.g., verbal interactions at school and at home)on performance in this study. Therefore, this may be a variable, which may make the establishment of relations between the procedures used in the intervention phase, as to compare their efficacy and efficiency, more difficult. Like previously mentioned by Matos et al., future studies should control such variable by manipulating unusual stimuli that are not part of the daily lives of children.

Another important methodological limitation relates to data collection, which was conducted solely by the experimenter. Ideally, in some baseline and intervention sessions, data should also have been collected by a second observer unfamiliar with the purposes of the study. With these additional data, relations between data collected by the two observers, including the experimenter, would favor the establishment of an interobserver agreement, which is important to increase data reliability.

However, it is also important to consider that, by the end of the study, the children´s caregivers said that the children were morecommunicative in everyday environments about items related to the categories, which were used during the research. The caregivers recognized the relevance of the procedures to improve their children´s verbal development in natural environments, which served as a measure of social validity, important in studies targeting behavioral interventions based on Applied Behavior Analysis (Baer, Wolf & Risley, 1968).

Another limitation is related to something that Matos et al. (2020) also previously discussed in their study. That is, when errors were committed, or responses were not emitted during the available interval, up to two different types of prompts were administered. First, the experimenter presented pictures (one at a time) belonging to the category mentioned in a trial. After the presentation of each picture, the child had the opportunity to say (tact) its name. If that were insufficient to evoke a response, the experimenter presented the name out loud, so the child could repeat it (echoic prompt). It was not possible to determine which type of prompt was more efficient in the establishment of independent performance, demanding a smaller number of sessions.

Future studies should consider administering solely tact prompts for one category and solely echoic prompts for the other category. This way, it is believed that comparisons between the prompts will allow the definition of the most efficient type of prompt for a given learner.

In the literature, other studies were conducted with the goal of producing intraverbal acquisition and response variability, although the variable instructive feedback was not used. Petterson, Rodriguez and Pawich (2019) compared the effects of presenting two types of echoic prompts on the establishment of intraverbal response variability, under divergent control, in four children with ASD. The intervention comprised the manipulation of progressive prompt delay under two conditions, which were the following: 1) Restricted models (the names of the items were always presented under the same sequence for the learners); 2) varied models (the names of the items were always presented under different sequences). During the trials to establish intraverbals under both conditions, after a verbal instruction to emit the names of items in a category, the experimenter immediately presented the names of the items (zero second prompt delay), so the child could repeat them.

As soon as the child showed proficiency, prompt delay was gradually increased targeting the establishment of independent intraverbal responses. As a result, it was observed a temporary increase in the emission of different response combinations (variability) by the children in the condition regarding the provision of varied models. Besides, for two children, the acquisition of intraverbals was slower in this condition. The authors discussed the importance of conducting new studies on procedures, which the effect of producing response variability may be maintained over time. In the current study, maintenance sessions were not implemented, and it is unknown whether the children maintained the gains obtained during the intervention phase.

Besides, new studies could replicate what Petterson et al. (2019) did with new children with ASD, but the condition with varied models could also involve the provision of the names of additional items in each category in the consequence portion of successful trials (instructive feedback). The results could, then, be discussed as to the possibility of establishing long lasting intraverbal response variability in children with ASD.

Glodowski and Rodriguez (2019) also taught intraverbals of saying category item names in four children with ASD. A teaching condition was defined to teach intraverbal targets using a progressive prompt delay procedure. Prompts consisted of the presentation of scenic visual stimuli (scenes with three items in each category, presented simultaneously to each child). Initially, a scenic visual prompt was presented without any delay and, as soon as an arbitrary learning criterion was achieved, prompt delay was gradually increased to establish intraverbal responding. The effects of intervention were assessed on the acquisition of intraverbals and production of response variability. After data collection, it was concluded that the intraverbals were established in all children. Response variability was produced as well, but the effect was temporary because, along several sessions, the children began to emit the names of items under a same sequence.

Glodowski and Rodriguez (2019) also discussed the importance of conducting new studies, which may influence the production oflong-lasting effects (demonstration of response variability over time). Perhaps new studies should consider the combination of scenic picture prompts and instructive feedback to assess the effect on the emission of response variability and if it will be long-lasting. Instructive feedback could be, for example, manipulated in trials with the emission of correct intraverbal responses, which could result in the provision of additional names of items in each category for the learners.

5. Final considerations

In this study, both differential reinforcement with and without instructive feedback successfully established intraverbal targets,consisting in saying the names of items belonging to two different categories (school items and kitchen items),in two children with ASD (although not at criterion level for one of them). Besides, the production of response variability (representing the emission of item names under different sequences) was also demonstrated by the two children along several sessions, considering the two categories used. It is important that future studies investigate maintenance of response variability over time. Possible adaptations of procedures, based on discussions of methodological limitations in the literature, could be considered for the goal of producing long-lasting intraverbal response variability in children with ASD. In this study, although methodological limitations were a reality and should be addressed in the future, the caregivers reported that the procedures used were important for the development of language in their children's repertoire. Besides, the caregivers said that their children became more communicative about items, belonging to the categories of this study, in more natural environments.

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