




Generalization of the say-do correspondence in a child with autism spectrum disorder

Montoya-Rodríguez, María M.^a *, , Molina-Cobos, Francisco J.^b ; Ramón Cortés, Ana Isabel ^b 

Artículo Original 

Abstract

Say-do correspondence refers to the equivalence between what people say they are going to do and what they then do. This skill has been taught in diverse populations for decades to establish adaptive behaviors. This study sought to improve the results of previous studies that sampled participants with autism spectrum disorder. A single case study was designed with training based on the use of instructions to prevent errors and differential reinforcement, among other elements. In addition, the generalization of correspondences on pre-established classes of stimuli was evaluated using an express questionnaire. The results showed that the participant managed to establish the say-do correspondence and non-correspondence, as well as generalization to untrained stimuli. These findings are significant for the design of training procedures and generalization of saying-matching-doing in people with neurodevelopmental disorders.

Keywords: say-do correspondence, autism, stimulus classes, generalization.

Resumen

Generalización de la correspondencia decir-hacer en un niño con trastorno del espectro autista. La correspondencia decir-hacer hace referencia a la equivalencia entre lo que una persona dice que va a hacer y lo que luego hace. Esta habilidad ha sido enseñada en diversas poblaciones durante décadas para establecer conductas adaptativas. Este estudio buscó mejorar los resultados de estudios anteriores que tomaron muestras de participantes con trastorno del espectro autista. Se diseñó un estudio de caso único con un entrenamiento basado en el uso de indicaciones para prevenir errores y el reforzamiento diferencial, entre otros elementos. Además, se evaluó la generalización de correspondencias sobre clases de estímulos preestablecidas mediante un cuestionario ex profeso. Los resultados mostraron que el participante logró establecer la correspondencia y la no correspondencia decir-hacer, así como la generalización a estímulos no entrenados. Estos hallazgos son significativos para el diseño de procedimientos de entrenamiento y generalización de la correspondencia decir-hacer en personas con trastornos del neurodesarrollo.

Palabras clave: correspondencia decir-hacer, autismo, clases de estímulos, generalización.

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Say-do correspondence involves the relation between what individuals say they will do and then they do, or the relation between what they do and then report (Serrador-Diez et al., 2021). This coherence between what a person says he/she is going to do and what he/she finally does involves a verbal regulation strategy that makes it possible to modify behaviors without the need to establish a

direct contingency management, but through the person's own self-instruction (Freire & de Medeiros, 2018). The relevance of this ability has been demonstrated in many studies with diverse populations for several decades. These studies have demonstrated the benefit of the say-do correspondence training for increasing numerous positive behaviors, such as increasing recreational

^a Universidad Católica del Uruguay, Facultad de Ciencias de la Salud, Departamento de Psicología, Montevideo, Uruguay

^b Universidad de Almería, Facultad de Psicología, Departamento de Psicología, Almería, España

* Enviar correspondencia a: Montoya-Rodríguez, M. E-mail: maria.montoya@ucu.edu.uy

activities in older adults (Gómez et al., 2002), enhancement in school performance (Pino et al., 2019), play and social skills in children (Machalicek et al., 2009; Morrison et al., 2002; Rosenberg et al., 2015), increasing compliance during classroom transitions between activities (Huffman et al., 2015), listening skills in children with disabilities (Alsharif, 2020), and hygiene behaviors in children with developmental delays (Stokes et al., 2004). Say-do correspondence training has been shown to be effective for reducing negative and disruptive behaviors in children, adolescents and young people with or without disabilities (Herruzo et al., 2001; Luciano Soriano et al., 2000; Molina-Cobos et al., 2008; Rodríguez-Bocanegra et al., 2021; Ruiz-Olivares et al., 2010).

The application of the say-do correspondence procedure can influence self-regulation and autonomy in children with disabilities (Herruzo & Luciano, 2010). One characteristic of children with developmental disabilities, such as children with autism spectrum disorder (ASD) or intellectual disability, is the presence of disruptive behaviors such off-task behavior, refusal to move forward with the assigned activity, and escape from demands placed on them by others (Yang et al., 2017). Say-do correspondence training thus becomes a tool to increase self-control skills and reduce the disruptive behaviors present in this population (Molina-Cobos et al., 2008).

Considering say-do correspondence from a functional, behavioral analytic point-of-view, it could be understood as an arbitrary relation established through the differential reinforcement of say-do correspondence and non-correspondence using multiple exemplar training (Luciano et al., 2001). It should be noted that saying is predictive of doing only for some behaviors, in particular situations, and in the presence of certain stimuli. A relevant aspect addressed by previous studies has been the analysis of the conditions under which the correspondence repertoire is generalized. For example, Luciano et al. (2001) used multiple exemplar training to establish generalization of say-do correspondence to novel topographies in eleven typically developing preschool children. Hernández López et al. (2011) trained both correspondence and non-correspondence in eight preschool children with typical development and showed generalization of the two different forms of saying-doing relations for six of eight participants. In the case of samples of participants with developmental

disorders, the results on correspondence and non-correspondence generalization are not as encouraging. DiCola and Clayton (2017) tested correspondence and non-correspondence generalization through an arbitrary and unfamiliar class of stimuli in a sample of children with ASD. The study began with a sample of five children, although two of them failed to move forward to the correspondence training phase because they did not acquire the performance criterion in the previous stimulus classes training phase. Of the remaining three children who satisfactorily completed the stimulus classes training phase, only one managed to meet the criterion in the correspondence and non-correspondence training phase and, also, to show 100% accuracy in the generalization phase for correspondence and 67% for non-correspondence. The authors concluded that the use of prompts to prevent errors would have been a more efficient procedure to achieve better results given the characteristics of the sample. They also suggested that the use of non-arbitrary stimuli classes, although they may be beneficial, present an additional difficulty in the case of children with ASD.

For the purpose of overcoming the limitations of DiCola and Clayton (2017), this article aims to a) establish say-do correspondence using multiple exemplar training in a child with autism using corrective feedback and prompts to prevent errors, and b) assess generalization of the correspondence to untrained stimuli in a class of preestablished stimuli.

Method

Participant

The participant was an eight-year-old male with a formal diagnosis of ASD by a mental health professional. At the time the study was carried out, he was enrolled in a regular school. Three times a week he received home-based psychoeducational intervention focused on the area of language and cognition (vocabulary, temporal and spatial situation, and orientation, numerical concepts, personal and possessive pronouns) and in functional autonomy (brushing teeth, putting on and taking off shoes, preparing small meals).

Before beginning the say-do correspondence study, the experimenter assessed child's prerequisite behaviors. The participant showed a good repertoire of imitation. He could follow simple instructions and some complex ones with

movement, although following instructions was directly related to the motivation and interest in what was required of him. Regarding attention, he had difficulty in spontaneous attention and when required in contexts with a greater number of distractors or when the person who required it was not close to him. Regarding the level of disruptive behavior, the participant had very well-established behavior patterns in academic situations, being able to remain seated at the table once he was offered clear visual cues of what was expected of him. However, self-stimulatory and avoidance behaviors increased in contexts of little interest to the child or when the rate of reinforcement was lowered. Postural control improved when he was offered structured and interesting proposals (for example, with manageable materials), tending to carry them out independently. In the area of functional language, he showed a clear distinction in favor of his performance at the comprehensive level compared to the production of vocabulary. He had an optimal repertoire at the level of tacts and mands with everyday vocabulary (food, household objects, animals and vehicles) and intraverbal chains for basic knowledge questions such as his name and the names of relatives or acquaintances, the street where he lived, etc. He made requests with a correct format ("I want to see x", "I want to eat x"). However, the statements directed towards others used to be unspontaneous and most of them were known and repetitive expressions that he used appropriately according to the context and generally at the instigation of others (i.e., he emitted mands if they were preceded by the other's verbal instigation, e.g., "What do you want to eat?").

The Wechsler PreSchool and Primary Scale of Intelligence, Third Edition (WPPSI-III; Wechsler, 2002) was implemented to establish levels of verbal and nonverbal ability. The scores obtained were: Verbal IQ = 48, Performance IQ = 66, Processing Speed Quotient (PSQ) = 69, General Language (GLC) = 66 and Full Scale IQ = 50. All scores were below what is appropriate for their normative age. These results are consistent with other samples of children with ASD who obtain Verbal IQ < Performance IQ (Wechsler, 2011). This means that the participant had better performance in tasks that involved fluid reasoning, spatial processing, attention to detail and visual-motor integration compared to tasks that involved verbal reasoning and comprehension or attention to verbal stimuli. The score obtained in the Full Scale IQ is equivalent

to that obtained by children with moderate intellectual disabilities (Wechsler, 2011). However, it cannot be stated that the participant had diagnosis of intellectual disability since elements for its diagnosis were missing.

Ethical considerations

This study is part of the Functional Approach to perspective-taking in typical development and developmental disorders research line, whose project was approved by the Ethics Committee of the Catholic University of Uruguay and complied with Decree 158/19 of the Executive Branch of Government, which regulates research involving human subjects in Uruguay under legal procedures for the protection of the participants' identity. The parent's written informed consent and the participant's consent were obtained prior to his participation in the study.

Setting and Materials

Sessions were conducted in the child's home three days a week. Several spaces in a room were used at different times and for different behaviors. One space (2 x 2 m) was used for the verbal interactions between the child and the experimenter and other four rooms were used as settings for doing or performing the different behaviors during phases 3 and 4.





In order to evaluate the pre-existing stimulus classes, ten paper cards were used. They were 75 x 60 mm printed with the components of the two stimulus classes that were used (Figure 1). Class 1 (colors) and class 2 (letters) had five different elements (A1, B1, C1, D1, E1 and A2, B2, C2, D2, E2). Additionally, 15 pictures of objects, animals and food that were known to the participant were used during the assessment and training of the say-do correspondence (a hamburger, a ball, an orange, a banana, a cat, a dog, a frog, a pizza, a pencil, an eraser, a doll, a cap, a book, a car and a tent). Stickers and different materials (e.g., toys, chocolate, a tablet) were used for the token economy. A recording sheet was designed to record the participant's responses.

Design

A single-case design with pre-post measures was used for this study. The dependent variable was the correspondence or non-correspondence say-do on untrained stimuli.

Figure 1.

Pre-existing stimulus classes

	Class 1	Class 2
A		a
B		e
C		u
D		i
E		o

The independent variable was multiple exemplar training with corrective feedback and prompts to prevent errors. A within-subject analysis was used with the objective of reach the qualitative description of the procedures, not the quantity or standardization of the results.

To ensure the reliability of the data collected, the sessions were filmed. At the end of each session, the experimenter watched the video to check what was recorded on her recording sheets.

Procedure

Phase 1: Assessment of pre-experimentally established stimulus classes

The pre-existing stimulus classes were also evaluated in a similar way to that proposed by Hernández López et al. (2011), opting to use classes that were already established in the participants' repertoire. This phase comprised four different stages: 1) the experimenter placed one element of each class on the table and the child had to form groups with the rest following the sample, 2) the experimenter mixed up all the cards on the table and the child had to form groups according to the corresponding classes, 3) the experimenter mixed up all the cards (facedown) on the table and the child had to group them into their corresponding classes, 4) the child was given all cards and had to form two groups; all the cards were placed on the table (except for one from each class) unorganized

and facedown so that the child formed groups and was asked which were missing.

The participant performed one trial of each test. Feedback was not provided during testing. Passing from one test to the next required completion without errors.

Phase 2: Correspondence and non-correspondence training

Once it was verified that the stimulus classes were part of the participant's repertoire, we proceeded to train the correspondence and non-correspondence. This phase consisted of blocks of four trials. Each session was comprised of a maximum of two blocks. The participant had to pick/not pick the photo that says when a class 1/class 2 stimulus was present. A criterion of 100% correct answers without any kind of aid was established to consider the block as passed as well as two consecutive correct sessions of correspondence and non-correspondence to conclude this phase.

The phase began by training the correspondence. To do this, two photos were placed on the table and the participant was asked which one he was going to pick. Once he mentioned one of the photos, he was shown a card with a class 1 element randomly, that is, the orange, green or blue card (A1, B1 or C1) and he was asked to pick the photo he had mentioned:

“Experimenter: You have said you were going to pick the hamburger. Look at this card that I show you. Which is it?”

Participant: Green color

Experimenter: That's right, the green color, and that's why you're going to pick the photo you have mentioned. Which photo are you going to pick?”

Participant: The hamburger

Experimenter: Very good. Come on. Pick it.”

When the participant showed correspondence in presence of the class 1 stimuli, that is, he picked the photo he had previously mentioned, the trial was considered correct and was reinforced with a sticker that would later be changed to a support reinforcer (e. g., a toy, a chocolate, playing with a tablet). By handing out the stickers it was made clear that picking the photo he had previously mentioned was reinforced: “Very well, you have picked what you have said; you have said you were going to pick the hamburger and you have picked the hamburger”. Once the performance criterion of 100% correct answers was reached- without aid- in

two consecutive sessions of the say-do correspondence training, the non-correspondence training was presented.

In a similar way to the previous training, two photos were placed on the table and the participant was asked which one he was going to pick. Next, a card with a class 2 element was shown randomly (a card with the letter *a*, with the letter *e* or with the letter *u* was shown: A2, B2 or C2) and the participant was asked to pick the photo he had not mentioned:

“Experimenter: You have said you were going to pick the ball. Look at this card that I show you. Which is it?”

Participant: *a*

Experimenter: That's it, the *a*. That's why you have to pick the other photo. Which photo are you going to pick?

Participant: The ball

Experimenter: Since you have seen this card, even if you say that you are going to pick the ball, you have to pick the other photo.”

If the participant picked the photo he had previously mentioned (wrong answer), corrective feedback was given (“No, you have to pick the other photo”) and the trial was repeated incorporating any of the provided aids: either the experimenter pointed to the photo that the participant had to pick or physically guided the participant's hand towards the photo he had to pick. These prompts faded as training progressed. In case the non-correspondence trial was correct (that is, the participant said that he was going to pick one photo and picked the other one), the participant was given a sticker that he would later change for a support reinforcer, while he was told that, under those conditions (card with the letter *a*, with the letter *e* or with the letter *u*) it was correct for him not to pick the photo he had previously mentioned.

Phase 3: Time delay and change of setting between saying and doing.

Once the performance criterion was reached in the previous phase, the training context was changed, placing the doing behaviors in a different setting from where the saying was produced. In the first session of this phase, the photos that the participant had to pick were placed in different spaces of the same room. That is, the saying was carried out at the table where work had been done in the previous phases, however, as something new, the participant had to get up from the table and

search between the pair of photos that could be located on the bed, in a corner of the room or on another table. In the second session of this phase, the doing was moved to another room of the house. Both in the first and second session, the participant was previously informed where the photos were.

“Experimenter: You have said you were going to pick the frog. Look at this card that I show you. Which is it?”

Participant: *e*

Experimenter: That's it, the *e*. That's why you have to pick the other photo. Which photo are you going to pick?

Participant: The frog

Experimenter: Since you have seen this card, even if you say that you are going to pick the frog, you have to pick the other photo. Now the photos are in the restroom. Let's go find it.”

As can be seen from the above, the delay between the moment in which the participant mentioned the photo he was going to pick and the moment in which he had the opportunity to pick it (showing correspondence or non-correspondence) gradually increased, he went from moving within the same room to moving to another room in the second session.

Each session of this phase consisted of two blocks of four trials each. As it happened in the previous phase, the experimenter provided feedback and error correction for correct and incorrect responses, respectively. A criterion of 100% correct answers without any kind of aid was established to consider the block as passed and two consecutive correct sessions to conclude the phase.

Phase 4. Generalization test to the remaining stimuli in each class (class 1: yellow and red; class 2: *i*, *o*)

Once the mastery criterion in say-do correspondence was reached with the three class 1 stimuli and in non-correspondence with the three class 2 stimuli, the generalization of the two forms of say-do relation was evaluated with the two remaining stimuli of each class: D1 (yellow), E1 (red), D2 (*i*), E2 (*o*). No feedback or any kind of aid was provided during this phase. Two sessions were completed with a block of four trials each. As in the previous phase, the contexts of saying and doing were different.

Results

Figure 2 shows the participant performance in both the correspondence training and the generalization test. The main results for each phase are described below. The participant successfully completed phase 1 without prompts (assessment of stimulus classes). He did not need to repeat any tests in this phase. Regarding phase 2, the participant reached the correspondence criterion established a priori in two sessions, then non-correspondence training began in the third session. As shown in Figure 2, sessions three to seven had two blocks each; one of them for correspondence training and another for non-correspondence training respectively. The main difficulty was found during the training of the say-do non-correspondence, when there was a class 2 stimulus. When the participant was asked which photo he was going to pick, telling him to pick the one he had not mentioned, he rectified his previous saying. The participant needed eight sessions to achieve the mastery criterion, both with the three class 1 stimuli and non-correspondence with the three class 2 stimuli. In phase 3, the results remained 100% correct during two consecutive sessions as established in the procedure (sessions 11 and 12). Finally, data shows generalization of contextual control of say-do relations during two consecutive sessions (sessions 13 and 14).

Discussion

The purposes of this study were training both correspondence and non-correspondence in the presence of a stimuli discriminative class and testing the generalization of the say-do correspondence or non-correspondence to the remaining stimuli in each class. As a general result, it can be concluded that it has been possible to establish the say-do correspondence and non-correspondence with a child diagnosed with ASD after 12 training sessions. In addition, the participant showed generalization of say-do relations, that is, he picked the photo he had mentioned in the presence of stimuli belonging to class 1, and he picked a different photo to the one he had mentioned in the presence of stimuli belonging to class 2, even though neither

correspondence nor non-correspondence had been explicitly trained with him.

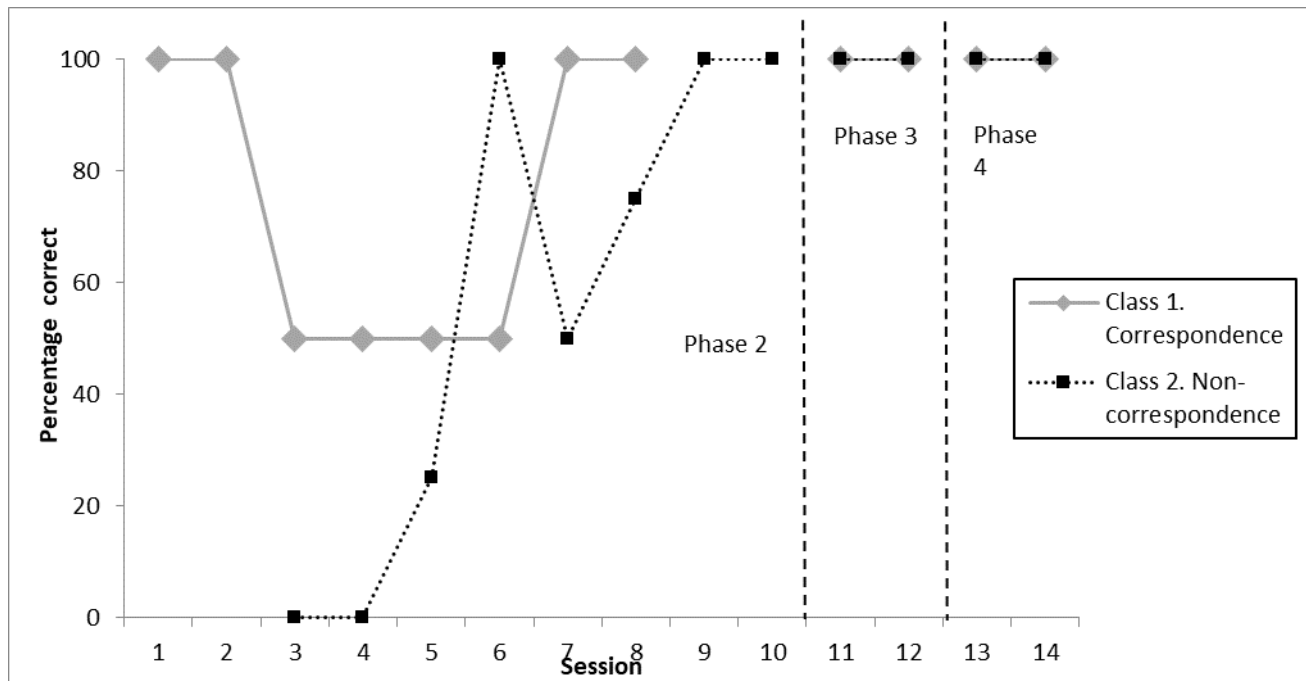
The procedure followed maintains the characteristics described in the literature on this subject (see, for example, the review by Herruzo and Luciano, 2010), although the most direct reference regarding the procedure is the publication by Hernández López et al. (2011), in which they establish the conditions that allow the contextual control of correspondence and its generalization to stimuli with which it is not directly trained. The main difference with that work, in which eight preschool-age children with typical development participated, is that in this study the child who participated was diagnosed with ASD.

According to the objective stated above, which proposed to overcome the limitations posed by DiCola and Clayton (2017), classes of stimulus that were already established in the participant's repertoire have been used and were, therefore, easy to discriminate, apart from being stimuli that barely share formal characteristics (colors on the one hand and vowel letters on the other), which contributes to facilitating discrimination. It should be noted that the stimuli of the two classes used by DiCola and Clayton (2017) were formally very similar (geometric figures in both cases), which would make it difficult for the participants to discriminate, in addition to the fact that said classes had been expressly established for carrying out the study, having very little history in the participants' repertoire; that is, it would be a weak, unstable repertoire.

Regarding the procedure followed, initially (phase 2), during the correspondence and non-correspondence training, both the participant's saying and doing occurred in the same context, in a sequence that assumes temporal contiguity between them. In the next phase, once the established performance criterion had been reached, this characteristic of the procedure was altered by incorporating a delay between saying and doing, in addition to the fact that they occurred in different places. It should also be noted that, after the participant's saying and the presence of the stimulus that should have indicated the correspondence or non-correspondence with the doing that would follow, a dialogue was established

Figure 2.

Participant's performance during correspondence/non-correspondence training and generalization tests



with the child in which he vocalized, again, his saying and his doing in a context in which the experimenter established the correspondence or non-correspondence between them.

The participant was immediately given the opportunity to do. This way of proceeding allows the saying to be updated, bringing it to the present together with indications that help to respond in correspondence or not in correspondence with what has been said (Luciano et al., 2002; Molina-Cobos et al., 2008; Serrador-Diez et al., 2021).

Regarding establishing a discrimination between correspondence and non-correspondence, it could be said that the fact of completing two training sessions in correspondence (reaching 100% correct trials in both) before starting the non-correspondence trials contributes to the latter being established faster and with fewer errors. On the one hand, because the trials are not mixed, thus reducing the probability of confusion and error, and on the other hand because the discriminative function of the stimulus that indicates the correspondence is established and strengthened throughout two sessions, which reduces the probability of error when starting to work with the stimulus that indicates the non-correspondence.

In addition to what has been said, in line with

what was suggested by DiCola and Clayton (2017), an attempt was made to reduce the number of errors made by the participant by incorporating prompts (for example, the photo that the participant had to pick was indicated or his hand was guided) as a prevention or in the trial following the appearance of an incorrect response. The use of errorless learning procedures has been widely supported in the literature as the most appropriate way of teaching, especially for children with developmental difficulties (Bloh et al., 2017; Lora et al., 2020). Additionally, when the participant made an error, corrective feedback was given aimed to point out the error and, mainly, indicating the alternative response, which would serve as an aid for the next trial.

An important aspect that should be noted is that, as was the case in the work by DiCola and Clayton (2017), in the training phase the participant managed to echo the instructions given by the experimenter (“You have to pick the other one.”) and equivalent verbalizations appeared during the generalization phase, when he saw the stimulus of the class. This is something that is repeated in experimental preparations of this type, which is an accurate reflection of how self-instructions arise after having experience with the instructions given by others (for example, Luciano et al., 2009). The

effects of verbal mediating responses on generalization of say-do correspondence and non-correspondence has been previously reported in the literature with typically developing children (Lima & Abreu-Rodrigues, 2010). The present study aims to expand the benefits of verbal mediation on correspondence training with people with cognitive disabilities.

As already mentioned, the design of the procedure has followed the guidelines established years ago in the literature referring to this subject and, more specifically, in the most recent works by Hernández López et al. (2011) and DiCola and Clayton (2017), trying to solve some limitations pointed out by the latter in their work children with cognitive disabilities. In view of the results obtained and considering the sequence of trials carried out, it could be said that the procedure would be promising for adapting trainings for people with cognitive disabilities. The most relevant aspects that have contributed to facilitating the discriminations involved in the task have been pointed out, reducing the number of errors and, thus, making it possible to maintain a high rate of reinforcement throughout the application of the procedure. Furthermore, verbalizations emitted between saying and doing must be taken into account, given that they may facilitate in producing or preventing correspondence. These questions must be considered for what it means with regard to the involvement of a participant with an ASD diagnosis in a task of these characteristics.

It is concluded that a useful procedure has been described for the training and generalization of the say-do correspondence with children with cognitive disabilities, although the results must be evaluated considering that only those of one participant are presented. In future research, these procedures for learning and generalizing conditional discriminations in children with developmental difficulties could be replicated by expanding the sample size.

Data availability

The entire dataset supporting the results of this study was published in the Open Science Framework (OSF) and can be accessed at https://osf.io/hb38w/?view_only=1ecb08879686476193d1da53ee16aa06

Analytical methods availability

The entire analytical methods that support the

results of this study are presented in the article.

Materials availability

The material used for this study are available upon request to contact author, María Montoya-Rodríguez (email: maria.montoya@ucu.edu.uy). The set of materials is not publicly available because they were not digital but cardboard cards.

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