

Contextual Control and Generalization of Say-Do Correspondence. A Preliminary Study

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ABSTRACT

The purpose of this study is to analyze the conditions that permit the contextual control of correspondence and its generalization to stimuli under which correspondence was not explicitly trained. Eight typically developing preschool children participated in the experiment. Two sets of five easily recognizable and familiar stimuli were used as contextual cues for correspondence and non-correspondence training. Using instructions and differential contingencies for correspondence and non-correspondence, children were trained to do what they previously had said (say-do correspondence) with three elements of one set, and to do something different to what they previously had said (non-correspondence) with three elements of the other set. The remaining two elements of each set were then tested for their function as discriminative-like stimuli for either correspondence or non-correspondence. Results showed generalization of the two different forms of say-do relations for six participants out of eight. In most test trials, participants showed adequate correspondence or non-correspondence with untrained say-do sequences.

Key words: Say-do correspondence, contextual control, generalization, behavior-behavior relations, rule-following.

RESUMEN

El propósito de este estudio es analizar las condiciones que permiten el control contextual de la correspondencia decir-hacer y su generalización a estímulos bajo los cuales la correspondencia no ha sido explícitamente entrenada. Ocho niños de entre cinco y seis años de edad y con un desarrollo normal participaron en el experimento. Dos conjuntos de estímulos, familiares y fácilmente reconocibles, fueron utilizados como claves contextuales para el entrenamiento de la correspondencia y la no correspondencia. Se entrenó a los niños para hacer lo que previamente habían dicho (correspondencia decir-hacer) ante tres elementos de uno de los conjuntos, y para hacer algo diferente de lo que habían dicho (no-correspondencia) ante tres elementos del otro conjunto; para ello se utilizaron instrucciones y se presentaron contingencias diferenciales por la correspondencia y la no-correspondencia. Por último se evaluó la función discriminativa para la correspondencia y la no-correspondencia de los dos elementos restantes de cada conjunto. Los resultados mostraron la generalización de las dos formas de relación decir-hacer en seis de los ocho participantes. En la mayoría de los ensayos de prueba los participantes mostraron la relación decir-hacer esperada con secuencias decir-hacer específicas que no habían sido previamente entrenadas.

Palabras clave: correspondencia decir-hacer, control contextual, generalización, relaciones conducta-conducta, seguimiento de reglas.

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When we talk about say-do correspondence, we are referring either to the relation between what a person says they are going to do and then does, or to the relation between what they do and the later report about what they have done (Israel & O'Leary, 1973). From a functional behavior-analytic perspective this relation is understood as an arbitrary one, established through the differential reinforcement of say-do correspondence (e.g. Luciano, Herruzo, & Barnes-Holmes, 2001; Ward & Ward-Stare, 1990). Social reinforcement is usually provided for behaviors like fulfilling promises and telling the truth, however people only show this pattern of verbal regulation under certain circumstances. It could be said, then, that saying is predictive for doing for some behaviors and at particular times, yet not for others (Stokes, Osnes, & Guevremont, 1987).

Since the publication of the first study on the topic (Risley & Hart, 1968), numerous studies have focused in the improvement of correspondence training procedures in order to strengthen appropriate behaviors and to reduce or eliminate inappropriate behaviors in a diversity of populations (e.g. Luciano, Molina Cobos, & Gómez Becerra, 2000; Luciano, Vílchez, & Herruzo, 1992; Molina Cobos, Amador Castro, & Fernández Rodríguez, 2008; Osnes, Guevremont, & Stokes, 1987; Paniagua, 1985; Paniagua & Black, 1990; Paniagua, Pumariega, & Black, 1988; Rogers-Warren & Baer, 1976; Stokes, Cameron, Dorsey, & Fleming, 2004; Whitman, Scibak, Butler, Richter, & Johnson, 1982).

In principle, correspondence training should allow a change-agent (e.g. therapist, teacher, parent) influence multiple behaviors by simply controlling the appropriate verbalizations about them. This is based in the assumption that correspondence can be established as a generalized response class, whereby the individual's verbalizations about subsequent behavior will effectively control such behavior (i.e., s/he will do what s/he said s/he would), irrespective of the specific topographies involved and without the need of explicit reinforcement for each particular instance of say-do correspondence. Several studies have assessed generalization across topographies, settings, and persons (for a review see Bevill-Davis, Clees, & Gast, 2004), however only a few have explicitly programmed training procedures aimed at obtaining such result. Generalization has been established by training with multiple topographically different instances of say-do (e.g., Luciano *et al.*, 2001), and across different contexts or trainers (e.g., Guevremont, Osnes, & Stokes, 1986).

In the last years, interest in say-do correspondence has dwindled to the extent that some authors (e.g. Lloyd, 2002) have pointed out that research on the topic was almost abandoned after 1992. However, this statement may be a bit exaggerated (for a few recent studies see Lattal & Doepke, 2001; Luciano *et al.*, 2000, 2001; Luciano, Barnes-Holmes, & Barnes-Holmes, 2002; Molina-Cobos *et al.*, 2008; Stokes *et al.*, 2004). Indeed, some of the latest works provide new perspectives in the analysis of the nature of the say-do relation that add to previous conceptual accounts of this phenomenon (e.g., Baer & Dietrich, 1990; Deacon & Konarski, 1987; de Freitas Ribeiro, 1989; Matthews, Shimoff, & Catania, 1987). These new perspectives range from an animal model of correspondence to an analysis of this phenomenon based on a recent theory of language and cognition. Lattal and Doepke (2001) presented an experimental analogue with pigeons, where say-do correspondence was conceptualized as a particular instance of delayed matching to sample where the pigeon itself selects the sample (say) and

later the comparison (do) that matches it. Despite the obvious limitations of directly translating findings from the animal laboratory to human behavior in natural settings, the authors defend the potential usefulness of the analogue to identify and analyze relevant controlling variables. On the other hand, in a study with preschool children Luciano *et al.* (2001) used multiple-exemplar training to establish the generalization of say-do correspondence to novel, untrained topographies, either similar or dissimilar to the say-do topography that underwent explicit training. Results showed the generalization of correspondence with both types of novel topographies. In another recent study Luciano *et al.* (2002) adapted the multiple-exemplar training for its application to children with developmental disabilities. The authors explained the emergence of say-do correspondence to novel stimuli as a verbal event in the terms of Relational Frame Theory (Hayes, Barnes-Holmes, & Roche, 2001).

Considering the applied impact of establishing say-do correspondence as a generalized class, it seems obvious why research so far has focused exclusively on the conditions responsible for the formation and extension of a correspondence repertoire. However, a relevant aspect like the arbitrariness of the say-do relation has not been sufficiently explored. It is assumed that depending on each individual's say-do reinforcement history and the present circumstances, s/he will show either correspondence (i.e. doing matches saying) or non-correspondence (i.e. doing explicitly differs from saying). Yet, no attention has been paid to the conditions controlling the use of this repertoire under different circumstances. In our opinion, training non-correspondence explicitly can be a useful tool to gain a better understanding of the arbitrary say-do relation and its generalization.

The present study involves the training of both correspondence and non-correspondence in order to analyze the conditions under which a differential say-do relation might appear in the presence of stimuli under which it was not explicitly trained. In other words, how certain stimuli may become discriminative-like for doing the same that has already been said, whereas other stimuli may become discriminative-like for doing something different, even though no specific say-do relation has ever been explicitly reinforced under these stimuli.

METHOD

Participants

Eight children, five girls and three boys, of 5-6 years old, took part in the study. They were selected from the children summer school of Universidad de Almería on the basis of age and parental and own consent. According to the information provided by their teachers, they all showed normal verbal and motor development, without significant behavior problems. Additionally, they were observed in the context of the summer-school for a week previous to the beginning of the experiment in order to assess whether they fulfilled the basic requirements of the study: knowing the vowels and numbers from one to five, understanding the concepts same and different, and a basic self-descriptive repertoire (i.e. being able to describe what they would do and to report what they had done). None had participated in a psychological experiment prior to this study.

Setting, materials, and stimuli

The experiment was conducted in a laboratory at the university, which was divided into four rooms. Room 1 served as the setting for the assessment of stimulus relations, and there were a table and two chairs in it. Room 2, the say-setting, was the context where the children told the experimenter which game they would play with later. It was also the context where they received reinforcement or corrective feedback for say-do correspondence or non-correspondence. It was equipped with a table and two chairs. Room 3, the play-setting, had also a table and chairs, and an area with several games and toys used in different play activities (see below). Room 4, which served as a waiting room, was equipped with chairs, a television, a videotape player, and several cartoon videotapes. Additionally, there were one-way mirrors between rooms 1 and 2, and between rooms 1 and 3. These allowed the experimenters to observe the children's performance during all phases of the experiment.

Two pre-experimentally existing stimulus classes, each composed by five easily recognizable and familiar stimuli, were used to train and test two different forms of say-do relations. Class 1 was composed of the five vowels, whereas each stimulus in Class 2 was a compound of a vowel and a number from 1 to 5. A third set of stimuli (five abstract symbols) served as incorrect comparisons in a matching-to-sample (MTS) conditional discrimination procedure (see Table 1).

Ten 21×14.5 cm cards, each of them containing a different member of class 1 or 2, were used in the assessment of relations (see procedure, below). Ten identical cards were used in the say-setting as discriminative stimuli for either correspondence or non-correspondence. Fifteen cards (same size), each one containing a different member of class 1, 2 or 3, were used in the play-setting in order to assess children's recall of previously presented stimuli.

Additionally, sixty-six 29×21cm boards were also used during the assessment and strengthening of stimulus classes with the MTS procedure, 24 of them for training conditional discriminations, and 42 for testing untrained relations (reflexivity, symmetry, transitivity, and equivalence). Each board depicted four stimuli, one sample at the top-center and three comparisons: one at the bottom left, one at the bottom center, and one at the bottom right. The sample was always one member of class 1 or 2, whereas comparisons were elements from each of the three stimulus sets (one from each set).

Play activities

Children could get involved in play activities with the different games and toys that were freely available at the play-setting. These activities were defined as follows:

Table 1. Stimuli used in different phases of the study.

	Stimuli				
Class 1	a	e	i	o	u
Class 2	a1	e2	i3	o4	u5
Class 3	+	#	>	=	&

- Painting: using crayons to paint something on paper.
- Blackboard: using the available chalks to write or draw on the blackboard.
- Plasticine: playing with plasticine.
- Books: reading or browsing any of the several books of tales available.
- Wally: using a *Where's Wally*[®] book.
- Elephant: playing with a wooden puzzle depicting an elephant.
- Animals: playing game consisting of a board with animal-shape holes where to insert the corresponding toy animals.
- Shapes: playing with a game consisting of a cube with geometric-shaped holes on its sides, where to insert the corresponding plastic geometric shapes.
- Goofy: playing with a cardboard-made *Disney*[®] puzzle depicting *Goofy*[®].
- Building: playing with a building-blocks game.
- Cars: playing with any of the toy cars in the room.
- Basketball: playing with a toy basketball set (throwing a small ball to a small basket).
- Skittles: playing with a bowls-and-skittles set.

Measures and reliability

The primary measure was the type of say-do relation shown by children in each trial (either correspondence or non-correspondence). Say-do correspondence was defined as those instances where children played with the games they had said they would play with. Non-correspondence was defined as those instances where children played something different to what they said. No specific activity was targeted for intervention and no specific verbalization was trained (see Baer & Detrich, 1990; de Freitas, 1989). A secondary measure was the recall, in the play-setting, of the stimulus previously presented in the say-setting.

Experimenter 2, in the say-setting, recorded the child's first verbalization about what they would play with. Experimenter 3, in the setting for doing, recorded both the stimulus selected and the first playing activity the child got involved in. Experimenter 1 observed and recorded what happened in each setting. These data, collected during 100% of trials, served to calculate inter-observer reliability. Reliability was calculated as the number of agreements divided by the number of agreements plus disagreements, and it was 100% in all cases.

Design and experimental sequence

A within-subject design with between-subject replications was used. There were three experimental phases (see Table 2): in Phase 1, participants were exposed to a five-stage procedure for assessing and strengthening two pre-existing five-member classes whose elements would be used as discriminative and discriminative-like stimuli in the next phases. Although the stimuli in classes 1 and 2 were familiar and easy to categorize in two distinct groups, the usual conditional discrimination procedures employed in stimulus equivalence experiments (e.g., Sidman & Tailby, 1982) were used to assess stimulus classes. In Phase 2, six of the stimuli from Phase 1 were used for training two different say-do relations. A say-do-report correspondence training procedure (see Luciano *et al.*, 2001) with some modifications was used. Three stimuli from Class 1

Table 2. Schematic representation of the experimental sequence and stimuli used in different phases.

Assessment and strengthening of stimulus classes	Correspondence Training	Generalization Test
	Class 1 (a, e, o)	
Class 1: a-e-i-o-u	* Instruction to do what is said	
Class 2: a1-e2-i3-o4-u5	* Reinforcement of correspondence	Class 1 (i, u)
1. Identification of stimuli		Class 2 (i3, u5)
2. Grouping into two sets I	Class 2 (a1, e2, o4)	
3. MTS training	* Instruction to do something different to what is said	
4. Untrained relations MTS test	* Reinforcement of non-correspondence	
5. Grouping into two sets II		

were used for correspondence training. In their presence, children were instructed to do the same that they had said and received reinforcement for it (i.e. for showing say-do correspondence). Three stimuli from Class 2 were used for non-correspondence training. In their presence, children were instructed to do something different to what they had said and received reinforcement for it (i.e. for showing non-correspondence). In Phase 3, the generalization of either correspondence or non-correspondence to the remaining two members in each class was assessed.

Procedure

All participants went through the experimental procedures individually and in a single session, which lasted about two hours. They were told they were going to take part in a game where they could win a prize (regardless of their performance, at termination of the experiment all children received a book and a diploma). Once the participants arrived to the experimental context, they were introduced to the three experimenters. Then they entered Room 1 with Experimenter 1 and started the experimental session.

Phase 1: Assessment and strengthening of pre-experimentally established stimulus classes.

This phase comprised five different stages. In the first stage, Experimenter 1 placed ten cards on the table, each one depicting one of the stimuli from class 1 or 2, and asked participants for a different stimulus each time. They had to pick up the correct card in each case (e.g., “give me the card with a”). If children performed without errors, they went to the next stage. Otherwise they were excluded from the experiment. In stage 2 the experimenter placed the ten cards again on the table, and participants were requested to form two different groups with them. The target in this stage was to observe if children would spontaneously classify the stimuli into two different groups (Class 1 and Class 2). If performance was correct, children were socially reinforced (by saying, “Alright, these are the two groups, very well!”), whereas if they failed, they were requested to try again and were prompted to respond without errors. When children formed both groups correctly they passed to stage 3, an MTS training procedure. In each trial they were presented with a board containing a sample and three comparisons (e.g., sample: a; comparisons: e, e2, and #), and were requested to point to the adequate comparison. Four relations were directly trained for each class in random order (Class 1: a-e, e-i, i-o, o-u; Class 2: a1-e2, e2-i3, i3-o4, o4-u5). Correct responding (e.g., selecting e, and not

e2 or # when presented with a as the sample) was intermittently reinforced (by saying, "Very well, that's right"). Incorrect responding was always corrected immediately, so that the same board was presented again until correct performance. After completing a 24-trial block (three trials per relation with comparisons in different positions in each trial) without errors, participants passed to stage 4. Then, with the same MTS format, they were tested for reflexivity, symmetry, transitivity, and equivalence. Trials were presented randomly in blocks of 42 (one trial per relation per class). No differential feedback was provided for any specific performance. If participants failed any trial they returned to the previous stage. If they completed one block without errors, they passed to stage 5. In this stage, they were requested to form two groups with eight different cards, four from Class 1 and four from Class 2, and they were asked to say which stimulus was lacking in each group. If they responded correctly they passed to the next phase. If they failed, they were prompted to order each group in a sequence so they could more easily notice the lacking stimulus in each class.

Phase 2. Correspondence Training. This phase started after a five-minute break in the waiting room during which children watched cartoons on the TV. Before entering the say-setting, participants went into the play-setting in order to see the games which they could play with later. In each training trial one stimulus from Class 1 or 2 was presented. Training trials consisted of three parts: *saying*, *doing*, and *reinforcement of the say-do relation*.

- *Saying*: Children entered the say-setting and sat beside Experimenter 2. She gave them the following instructions:

"Do you remember the cards you've seen before? I'm going to show you some of them. When you enter the playroom, you must choose the card I'm showing you now, and give it to the person there. After that, you may play... When you see this card, what are you going to play with? You can choose any game you've already seen..."

When the stimulus on the card was a member of Class 1 (e.g., the letter a), children were instructed to play with what they had said. This is an instance of the interaction between child and experimenter:

- Experimenter: "O.K. You said you'd play basketball [for instance]. Now look, when you see this card you have to play with what you said. Which card have you seen?"
- Child: "a"
- E.: "And what are you going to play with?"
- C.: "I'm going to play basketball"
- E.: "Very well!"

When the stimulus on the card was a member of Class 2 (e.g., the vowel-number compound e2), children were instructed to play with something different. The interaction was as follows:

- Experimenter: "O.K. You said you'd play with the elephant puzzle. Now look, when you see this card, you have to play with something different. Which card have you seen?"
- Child: "e2"
- E.: "And what are you going to play with?"
- C.: "I'm going to play with the elephant puzzle."
- E.: "But you know that when you see this card, you say you are going to

play with something, but then you really play with something different.
Which card have you seen?"

- C.: "e2"
- E.: "And what are you going to play with?"
- C.: "I'm going to play with the elephant puzzle."
- E.: "Very well!"

For all participants, stimuli were always presented according to the same sequence: a1-a-o-e2-o4-e. After that, participants were conducted to the waiting room, where they remained for five minutes watching cartoons before entering the play-setting.

- *Doing*: Children entered the play-setting. Before they started playing, Experimenter 3 requested them to select the card they had already seen in the say-setting from a block containing fifteen cards (i.e. all stimuli from classes 1, 2, and 3). Then, they were allowed to play for five minutes. Meanwhile, the experimenter remained in a corner of the room without apparently showing interest in the child's activity. After that, Experimenter 3 told the children that they had to return to the say-setting and they would be allowed to play again later.

- *Reinforcement of the say-do relation*: When children showed correspondence (i.e. if they played with what they had previously said) in the presence of stimuli from Class 1, the trial was considered correct and reinforcement was provided. The dialogue was as follows:

- Experimenter: "What did you say you were going to play with when you saw this card ('a')?"
- Child: "I said I was going to play basketball."
- E.: "What have you played with?"
- C.: "I have played basketball"
- E.: "Have you played with what you said you were going to?"
- C.: "Yes, I have".
- E.: "Good! When you saw 'a', you had to play with what you had said, and you've done it. Now you can choose a sticker. Later you may change your stickers for a surprise present."

When children showed non-correspondence with stimuli from Class 2, that is, they played with something different to what they had said, the trial was considered correct too, and reinforcement was provided. The dialogue was as follows:

- Experimenter: "What did you say you were going to play with when you saw this card ('e2')?"
- Child: "I said I was going to play with the elephant puzzle."
- E.: "What have you played?"
- C.: "I have played basketball"
- E.: "Have you played with what you said you were going to?"
- C.: "No, I haven't. I've played with something different."
- E.: "Good! When you saw 'e2', you had to play with something different to what you had said, and you've done it. Now you can choose a sticker."

If the trial was correct, a new trial with a new stimulus was presented. When children showed non-correspondence with stimuli from Class 1, the trial was considered incorrect, their performance was not reinforced and they were exposed to correction trials in which they were presented with the same card and instructions until they performed correctly. The dialogue, then, was as follows:

- Experimenter: "What did you say you were going to play with when you saw this card ('a')?"

- Child: "I said I was going to play basketball."
- E.: "What have you played with?"
- C.: "I have played with the elephant puzzle"
- E.: "Have you played with what you said you were going to?"
- C.: "No, I haven't. I've played with something different."
- E.: "Oh, I'm sorry! When you saw 'a', you had to play with what you had said, and you haven't. Now I can't give you a sticker. You'll have to try again."

When they showed correspondence with stimuli from Class 2, the trial was considered incorrect as well, and children were exposed to correction trials until correct performance. The dialogue was as follows:

- Experimenter: "What did you say you were going to play with when you saw this card ('e2')?"
- Child: "I said I was going to play with the elephant puzzle."
- E.: "What have you played with?"
- C.: "I have played with the elephant puzzle"
- E.: "Have you played with what you said you were going to?"
- C.: "Yes, I have".
- E.: "Oh, I'm sorry! When you saw 'e2', you had to play with something different to what you had said, and you haven't. Now I can't give you a sticker. You'll have to try again."

There was no fixed number of trials for this phase. In order to pass to the next phase participants had to show correct performance with all the different stimuli presented (three of each class), but each participant was exposed to a variable amount of trials until they achieved this criterion.

Phase 3. Generalization test. In this phase we tested the generalization of the discriminative-like function for say-do correspondence or non-correspondence to the remaining stimuli in each class (u-i3-i-u5). Neither specific instructions nor differential contingencies were provided in any trial. After a five minute break in the waiting room, subjects started with this phase. Each test trial consisted of two parts:

- *Saying:* Subjects entered the say-setting and sat beside Experimenter 2, who told them that this time she would show them cards which were different to those they had seen in the previous phase. The rest of the trial was identical to training trials, with the exception that children were also explained that this time there would be neither specific instructions nor differential contingencies:

"This part is a bit different. Now I'm not going to tell you anything. I will only ask you about what you will play with later. And now, you won't get any stickers after playing. When you see this card, what are you going to play with? You can choose any game you've already seen..."

After that they stayed in the waiting room watching cartoons for five minutes.

- *Doing:* As in training trials, children had to select the stimulus shown in the say-setting. Then, they were allowed to play for five minutes. Once each child completed the four test trials, the experiment finished.

RESULTS

Although with some variability regarding the number of trials and prompts necessary, all participants successfully completed Phase 1 (assessment of stimulus classes). Participant 6 needed prompts to classify the stimuli from classes 1 and 2 into two groups. All other participants did it spontaneously without prompts. In the MTS training, all but two participants achieved the criterion in a single block. Participant 3 needed three training blocks to reach criterion while participant 4 needed two. Except for participant 1, all other participants performed successfully in the test for untrained relations once they had passed the MTS training stage. Despite passing MTS training in a single block, participant 1 failed in the test for untrained relations, and thus was retrained twice until performance was 100% correct in the test. In the last stage, participants 2, 5, and 6 needed a prompt to identify the stimulus lacking in each set. All other participants passed successfully without prompts.

Figure 1 shows the participants' performance in both the correspondence training and the generalization test. Each graph in the figure presents the results for one child. There was some variability among participants regarding the number of trials they needed to achieve the mastery criterion, that is, to obtain correspondence with the three stimuli from Class 1 and non-correspondence with the three stimuli from Class 2. Participant 1 just needed seven trials, whereas participant 5 needed eleven trials. In some cases (see participants 2, 3, 5, and 8) children needed additional trials, but this was not due to errors in performing in accordance with the trained say-do relation, but to the fact that they did not remember the stimulus previously presented in the say-setting. As for the generalization test, six participants out of eight showed say-do correspondence with the remaining stimuli from Class 1 and non-correspondence with the stimuli from Class 2. Only two of the children (3 and 6) did not perform correctly in the generalization test. Participant 3 showed say-do correspondence in all test trials, regardless of the stimulus presented in each trial, whereas participant 6 showed say-do correspondence in three of the four test trials.

Table 3 shows in detail the participants' performance in both the correspondence training and the generalization test. The table includes, for all trials (both correct and incorrect), the child's verbalization (say-setting), and the game they actually played (play-setting). Although the key outcome in this study is the generalization of contextual control of the say-do relation, it is also relevant to analyze the specific say-do topographies shown in the generalization test.

For participant 1, only in one of the four test trials the specific say-do topography (stimulus u: say basketball-do basketball) was explicitly reinforced during training. The other three topographies had no prior history of reinforcement in the experimental context. For participant 2, the specific say-do topographies observed in three test trials had been reinforced during training; in the fourth trial, however, the observed topography is just the contrary of a previously reinforced one. Although during training, whenever this child said she would play basketball she actually did, and received reinforcement for this say-do correspondence (under stimuli a and e), in this test trial she said she'd play basketball (under stimulus i3) and then played with the books (i.e. a correct instance

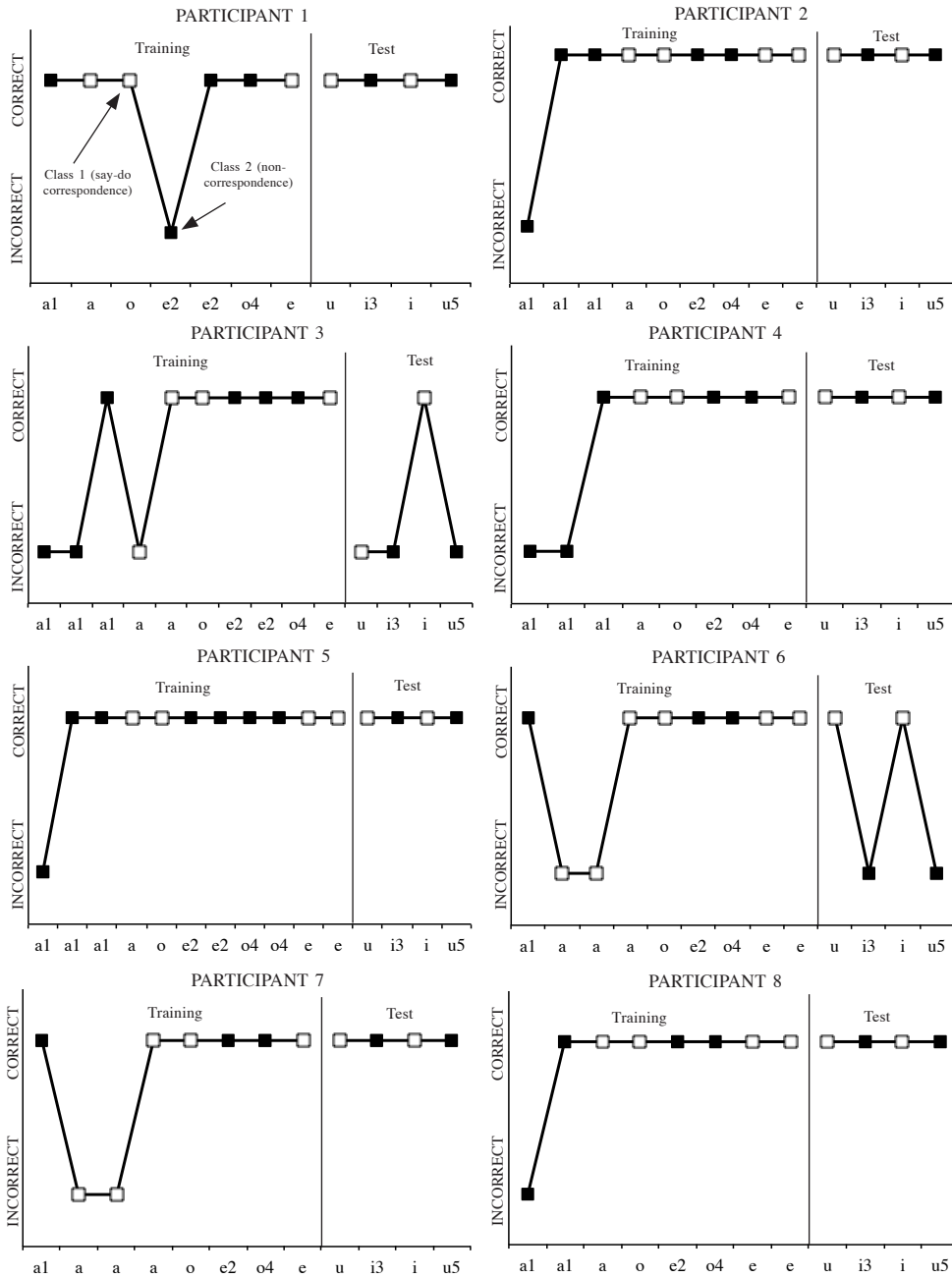


Figure 1. Data for the 8 participants during correspondence/non-correspondence training and generalization tests. The stimuli in each class are shown in the X-axis. Correct and incorrect responses are shown in the Y axis. For stimuli in Class 1 the correct response is say-do correspondence. For stimuli in Class 2 the correct response is non-correspondence.

Table 3. Specific topographies of saying and doing in both say-do training and generalization tests.

	Correspondence/Non-correspondence Training				Generalization Test				
	a1	a	o	e2	e	u	i3	i	u5
Child 1	Say-Plasticine Do-Building	S-Basketball D-Basketball	S-Plasticine D-Plasticine	S-Books D-Books S-Shapes D-Plasticine	S-Shapes D-Shapes	S-Basketball D-Basketball (Prev.)	S-Blackboard D-Blackboard (Nov.)	S-Blackboard D-Blackboard (Nov.)	S-Elephant D-Books (Nov.)
Child 2	S-Basketball D-Basketball S-Books D-Goofy S-Plasticine D-Wally	S-Basketball D-Basketball	S-Goofy D-Goofy	S-Plasticine D-Wally	S-Basketball D-Basketball S-Basketball D-Basketball	S-Goofy D-Goofy (Prev.)	S-Basketball D-Books (Opp.)	S-Basketball D-Basketball (Prev.)	S-Plasticine D-Wally (Prev.)
Child 3	S-Goofy D-Goofy S-Skittles D-Skittles S-Goofy D-Animals	S-Skittles D-Books S-Plasticine D-Plasticine	S-Cars D-Cars	S-Plasticine D-Elephant S-Plasticine D-Skittles	S-Cars D-Cars	S-Skittles D-Blackboard ERROR (Nov.)	S-Cars D-Cars ERROR (Prev.)	S-Paint D-Paint (Nov.)	S-Blackboard D-Blackboard ERROR (Nov.)
Child 4	S-Goofy D-Goofy S-Plasticine D-Goofy S-Animals D-Building	S-Building D-Building	S-Basketball D-Basketball	S-Paint D-Goofy	S-Basketball S-Skittles D-Skittles	S-Paint D-Paint (Opp.)	S-Cars D-Cars (Nov.)	S-Cars D-Goofy (Nov.)	S-Cars D-Elephant (Nov.)
Child 5	S-Basketball D-Basketball S-Basketball D-Elephant S-Cars D-Animals	S-Building D-Building	S-Building D-Building	S-Basketball D-Building S-Basketball D-Building	S-Basketball D-Basketball S-Basketball D-Basketball	S-Basketball D-Basketball (Prev. & Opp.)	S-Basketball D-Blackboard (Nov.)	S-Blackboard D-Blackboard (Nov.)	S-Basketball D-Blackboard (Nov.)
Child 6	S-Basketball D-Goofy S-Basketball D-Skittles S-Basketball D-Basketball	S-Basketball D-Goofy S-Basketball D-Skittles S-Basketball D-Basketball	S-Skittles D-Skittles	S-Books D-Goofy	S-Books D-Books S-Books D-Books	S-Paint D-Paint (Nov.)	S-Books D-Books ERROR (Prev.)	S-Wally D-Wally (Nov.)	S-Basketball D-Basketball ERROR (Prev.)
Child 7	S-Blackboard D-Goofy	S-Building D-Paint D-Paint S-Blackboard D-Blackboard	S-Plasticine D-Plasticine	S-Books D-Shapes	S-Elephant D-Elephant	S-Paint D-Paint (Nov.)	S-Paint D-Goofy (Nov.)	S-Wally D-Wally (Nov.)	S-Books D-Plasticine (Nov.)
Child 8	S-Wally D-Wally S-Elephant D-Basketball	S-Wally D-Wally	S-Elephant D-Elephant	S-Basketball D-Shapes	S-Blackboard D-Blackboard S-Wally D-Wally	S-Wally D-Wally (Prev.)	S-Wally D-Basketball (Opp.)	S-Basketball D-Basketball (Opp.)	S-Basketball D-Skittles (Nov.)

Notes: Bold-highlighted topographies represent correct trials; italics represent errors in the say-do relation; normal round-type represents trials where the participant was not able to remember (in the setting-for-doing) the stimulus presented to them in the say-setting. For generalization tests, abbreviations between parentheses indicate the type of specific say-do relation for that topography compared to training: previously reinforced relation (Prev.); novel relation (Nov.); opposite of a previously reinforced relation (Opp.).

of non-correspondence with a verbal topography whose prior reinforcement history was for correspondence). Participant 4 presents four novel (non-reinforced) specific say-do topographies during the generalization test. For two of these, the opposite say-do relation had been reinforced during training. Participant 5 presents three novel, non-reinforced topographies, and one with a history of reinforcement for both correspondence (stimulus e: say basketball-do basketball) and non-correspondence (stimulus e2: say basketball-do building; stimulus o4: say basketball-do cars). For participant 7, all four topographies observed during the test are novel, non-reinforced ones. Finally, for participant 8 there are one previously reinforced specific topography and three non-reinforced ones. Two of these had a history of reinforcement for the contrary say-do relation. In summary, of the 24 test trials observed for the six participants who showed generalization of contextual control of say-do relations, only 6 (25%) involved previously reinforced specific say-do topographies. In 18 trials (75%) the observed specific say-do topographies were novel (i.e. lacked a prior history of reinforcement) and indeed 5 of these had a reinforcement history for the opposite pattern of say-do relation. The remaining trials involved topographies with a reinforcement history for both kinds of say-do relation.

DISCUSSION

To our knowledge, this preliminary study is the first to analyze the contextual control of the say-do relation and its generalization to stimuli under which it was not explicitly trained. Most participants (6 out of 8) showed generalization of contextual control for say-do relations, that is, they did what they had said in the presence of stimuli belonging to Class 1, and they did something different to what they had said in the presence of stimuli belonging to Class 2, even though neither correspondence nor non-correspondence had been explicitly trained with them.

Another relevant finding is the generalization of such contextual control with novel topographies (i.e. specific say-do sequences that had not been explicitly trained) in most trials, and the fact that in 20% of the test trials, the generalized contextually controlled say-do relation was the opposite of that previously trained for the particular topography in that trial. This finding supports the view that participants abstracted the correct say-do relation applicable for each class of contextual cues through training, and applied it correctly in the tests regardless of the specific topographies (saying and doing) involved in each particular trial. This is indicative that say-do correspondence and non-correspondence can be understood as a generalized operant, as is the case with other complex repertoires like generalized imitation (Baer, Peterson, & Sherman, 1967) where individuals learn, through multiple-exemplar training, to imitate whatever a model does, regardless of its topography, and are eventually able to imitate topographies which have not been explicitly reinforced.

The types of contextual cues employed in this study lead to an explanation of the observed results in terms of stimulus generalization. Three simple stimuli were used for correspondence training (a, e, o), and three compound stimuli (a1, e2, o4) were used for non-correspondence training. Also, the tests were conducted with two simple (i, u) and

two compound stimuli (i3, u5). These formal (non-arbitrary) differences between both kinds of stimuli appear enough to explain the results in the generalization tests. This is consistent with the fact that most children were able to group stimuli correctly into two different classes at the beginning of Phase1 (stage 2), before any specific procedure (similar to those used for the formation of equivalence classes) was implemented to ensure the presence of two distinct stimulus classes. Future investigations should try to replicate these findings using arbitrary stimulus classes formed entirely in the experimental session (i.e. equivalence classes). This would allow for testing whether the contextual control of the say-do relation may transfer in accordance with an experimental history of arbitrarily applicable relational responding (Hayes *et al.*, 2001).

Besides, only two children (participants 3 and 6) failed the generalization tests. Participant 3 was the only one to fail to group the stimuli into two different sets (Phase 1, stage 2), and participant 6 took the highest number of training trials in the MTS procedure to reach criterion. This may be indicative that they did not discriminate properly both stimulus classes. Also, they mainly showed say-do correspondence in the presence of both types of contextual cues in the tests. Considering that the verbal community usually reinforces children's fulfillment of promises, it might be assumed that these two children had a more extensive history of reinforcement for correspondence than for non-correspondence. The limited number of trials in the experimental context may have not sufficed to change the functions provided by pre-experimental history. In any case, given that no baseline assessment of the say-do relation was conducted, it is not possible to know about our participants' pre-experimental say-do repertoires. Future studies should attempt to investigate these findings with populations lacking a say-do correspondence repertoire prior to the experimental procedures.

The findings in this study are consistent with the view of say-do correspondence as an instance of rule-governed behavior (e.g. Deacon & Konarski, 1987; Luciano *et al.*, 2001). The extension of correspondence to behaviors and contexts that share no common elements would be possible after the abstraction of a generalized correspondence rule like "In order to get (reinforcer) I have to do as I said" (Deacon & Konarski, 1987, p. 399) after multiple training instances where say-do correspondence is reinforced regardless of the specific topographies involved. Our results could be accounted for by the abstraction of a conditional generalized correspondence rule like: "In order to get (reinforcer), with the vowels I have to do as I say, and with the vowels plus numbers I have to do something different to what I say". The abstraction of this rule would be the result of multiple training instances where the instructions and differential reinforcement provided by the experimenter were put under control of each class of stimuli. Luciano *et al.* (2001) go a step further in attempting to explain how a generalized correspondence rule would work on the basis of the transfer of the stimulus properties of saying from the say-context to the do-context. According to this, the first time that someone says "I'm going to do X", this verbalization could have discriminative-like properties or derived discriminative functions for doing X, though actually there is nothing formally or physically in common with already trained say-do relations. This study shows how this discriminative-like function is conditional upon the context and how this contextual control may generalize/transfer to novel situations. Some failures typically observed

for the generalization and maintenance of correspondence could be explained by the competition of contingencies for correspondence or non-correspondence in different situations, rather than by a lack of verbal control. In any case, the foregoing is quite tentative and further research is necessary in order to test this rationale.

In summary, although research on say-do relations is not a popular topic currently, in our opinion correspondence training can be a useful strategy to study arbitrary behavior-behavior relations and rule-following. Specifically, the use of differential training in correspondence (training both correspondence and non-correspondence under different cues) together with the subject's choice of saying and doing (de Freitas Ribeiro, 1989; Luciano *et al.* 2001, 2002) appear to allow for a more precise analysis of the conditions that control that an individuals' saying be predictive or not for doing in novel situations.

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