Effects of Visual Demonstration, Verbal Instructions, and Prompted Verbal Descriptions on the Performance of Human Subjects in Conditional Discriminations

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A study was conducted to confirm prior results concerning the role of prompted verbal descriptions of visually demonstrated stimulus relations in the acquisition and transfer of identity, difference, and similarity-matching relations (Ribes et al., 1988). Four groups of human adults were trained with these three matching relations under four different procedures: (1) visual demonstration without response requirement, (2) verbal instructions, (3) visual demonstration plus prompted verbal description, and (4) visual demonstration plus verbal instructions. These procedures were presented at the beginning of the training period before subjects could respond to the experimental task. Although most subjects in the four groups acquired the conditional discrimination under the three matching relations, only those in the two instruction-related groups showed some intramodal and extramodal transfer in tests with stimuli that had not been used in training. These results suggest the importance of measuring extra-situational and trans-situational generalization, and raise the need to distinguish between formal and functional verbal factors in the regulation of human behavior.

Although rule-governed behavior (Cerutti, 1989; Hayes, 1986) and stimulus equivalence (Sidman & Tailby, 1982; Stromer & Osborne, 1982) have been dealt as two relatively independent fields of research, both have potential relevance to the role of verbal variables in the acquisi-

tion of complex behavior, such as that occurring in concept formation and problem solving situations. Although some kind of *functional* verbal behavior may often be involved in human performances on tasks such as those entailing conditional discrimination (Hayes, 1986), it seems that experiments that have examined formal presentations of verbal stimuli by the experimenter or that have used recording of self-descriptive utterances by the subjects do not warrant invoking rule-governed behavior as relational or thoughtful

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interactions (Critchfield & Perone, 1990; Ribes & Martinez, 1990).

Bennett (1971) and Ribes (1986) have pointed out that verbal factors as functional indicators of *rules* are to be identified and appealed to *only* when certain criteria are satisfied — that is, when subjects interact with contingencies not restricted to those being present moment-to-moment, and when their behavior shows properties that do not correspond to a single acting contingency. Otherwise, responses and stimuli, although “verbal” in form, do not differ from non-verbal discriminations in their functional properties regarding “non-verbal” events. Cerutti (1989) has also distinguished between instructions and rules in terms of the generality of stimulus control effects. In order to assess verbal factors as indicators of rule-governed behavior, it is necessary to introduce explicit procedures and tests that allow for the occurrence and evaluation of behavior under extra-and trans-situational contingencies.

A previous study (Ribes, Peñalosa, Moreno, Cepeda, & Hickman, *in press*) employed four variants of a second-order matching-to-sample procedure to analyze acquisition of conditional discriminations involving three types of stimulus relations: identity, similarity and difference. Training procedures without a response requirement, comprised the use of visual demonstration of the matching relations, verbal instructions about the possible relations to be found, verbal descriptions by the subject of the relations being visually demonstrated, and verbal instructions combined with visual demonstration. The procedures were used with elementary school children (10-12 years old) and with psychology college students (18-24 years old). The results of that study were two-fold. On one hand, adult performances were superior to those of children, with respect to both speed and asymptote of acquisition in the stimulus-relations dealing with similarity and difference. On the other hand, while children performed better under visual demonstration alone, reflecting some disruptive effects of verbally-structured procedures, adults

showed the best performance when verbal descriptions of visually-demonstrated relations were required. The data yielded by training sessions proved to be correlated with the results of tests for transfer to new stimulus sets. Children showed limited transfer in procedures that used new stimuli varying along the same modalities as those presented in the training sessions (e.g., color, shape). Nevertheless, no transfer was observed when new modalities were introduced (size). In contrast, adults showed better transfer in both intramodal and extramodal tests (e.g., color, shape and size), with the best performance occurring after training that established verbal descriptions of visually demonstrated relations.

In contrast to *a-posteriori* self-descriptions and to formal instructions prior to responding, explicit verbal recognition in describing presently observed stimulus relations may enable the subjects' discriminations to become independent of the ongoing particular events under which a set of discriminations was learned. This “detachment” regarding particular properties of events forming part of a contingency in the situation should promote further interactions with new particular conditions *as if* they were as those interacted with in verbal terms. “Rules,” “concepts,” “algorithms,” and similar formally expressed verbal devices would be the consequence of such behavior.

Since in the above described study the various training procedures were presented according to a within-subject design, some sequential interactions between procedures might have been possible. In order to replicate the findings regarding the role of explicit verbal recognition in promoting transfer of conditional discriminative behavior along extra-situational stimulus dimensions, an experiment was designed in which each training procedure was evaluated via a separate group of subjects. In addition, a simpler discriminative situation was used consisting of a first-order matching-to-sample.

METHOD

Subjects

Twenty students of introductory Psychology in the National University of Mexico, without experience or knowledge about conditional discrimination, volunteered to participate in the study. Their ages ranged between 17 and 22 years. Fifteen were females and five were males. They were randomly assigned to four groups during the experiment, and were asked not to communicate with each other about their participation in the study.

Apparatus and Setting

The experiment was run with four Commodore-128 micro-computing systems and Commodore-1702 monitors; the subjects worked in separate rooms isolated from noise or other distractions. Programmed stimulus displays were presented in the monitors screens, and subjects had to move a joystick that controlled a cursor underneath the comparison stimuli, and press in the position corresponding to the selected stimulus after the cursor movement. All responses with the joystick were automatically recorded by the micro-computer system.

Experimental Task

The experimental task consisted in a first-order conditional discrimination employing a matching-to-sample procedure

(Cumming & Berryman, 1965). Figure 1 depicts the basic stimulus arrangement displayed on the screen in which stimuli were constant in size, but varied in shape and color (excepting for test trials that evaluated extramodal transfer).

The stimulus arrangement included the simultaneous presentation of the four stimuli on the monitor screen. Centered above a lower row of three stimuli was the sample stimulus, which has to be matched by selecting with the joystick one of three comparison stimuli which appeared in the row below. The matching could be done according to three criteria: (a) identity (same shape and color), (b) similarity (same shape or color) or (c) difference (different shape and color) according to the experimental phase. The particular stimulus arrangement changed from trial to trial, and every session consisted of 56 trials: 36 training trials, 10 intramodal test trials and 10 extramodal test trials, in that order. During training trials, stimuli consisted in arrangements of four colors and shapes, and subjects were immediately told on the screen whether their selection was a correct or incorrect match.

During test trials different kinds of stimulus arrangements were used. In pre- and post-test sessions, trial arrangements were the same as those used in training trials. During the experimental phases, in intramodal test trials colors and shapes different from those in training trials were used, whereas in extramodal test trials, stimulus arrangements consisted of white figures varying in size and presented on a black background. Here, matching relations had to do with shape and size, being size the relevant modality. Modality refers to stimulus properties and not to sensory "input." During the test trials subjects did not receive immediate information about the correctness of their selections. Outcome information was only provided during training trials. Figure 2 shows the different stimulus arrangement that were employed.

Each trial lasted 15 seconds. If the subject responded before this time elapsed a new trial was presented. Intertrial intervals were 3 seconds. In the training trials, after

Fig. 1. Typical arrangement used in training and test trials.

PRE TEST POST-TEST AND TRAINING	INTRAMODAL TEST	EXTRAMODAL TEST
<div> </div> <div> </div> <div> </div> <div> </div> <div>RED BLUE GREEN YELLOW</div>	<div> </div> <div> </div> <div> </div> <div> </div> <div>VIOLET ORANGE GRAY BROWN</div>	<div> </div> <div> </div> <div> </div> <div> </div> <div>WHITE SHAPES OVER A BLOCKS BACKGROUND VARYING IN SHAPE</div>

Fig. 2. Shapes and colors used during the experiment.

the information indicating if the choice was correct or not, the current cumulative numbers of correct and incorrect trials were presented as well as the current trial number. This information was not included during the test trials. At the end of the session a text appeared on the screen indicating that the session had concluded, thanking the subject and informing him about the number of errors and correct responses in that session.

Design and Procedure

Training in responding. In the first session subjects were trained in the use of the joystick. The following instructions appeared on the screen: “Four figures will be presented on the screen, one at the center and three in the bottom. You must choose, among the figures in the bottom, that one you believe goes with the figure at the center of the screen. To do so, you have to

move this joystick (the experimenter pointing to the joystick). If you choose the figure at the right you must move the joystick to the right. If you choose the one at the center then you must move it to the front. And if you choose the one at the left side then you must move the joystick to the left.” Immediately after, the experimenter pressed a key to present a stimulus arrangement on the screen, and asked the subject to choose each one of the comparison stimuli. An arrow below each figure appeared when they were selected at a given time.

Experimental conditions. Table 1 describes the various test and training conditions to which the four experimental groups were exposed. Each group was exposed to a pre-test and a post-test session at the beginning and at the end of the experiment, as well as to three phases of specific training of four sessions each. All training sessions began

Table 1

Experimental and test conditions to which the four groups were exposed: VD (visual demonstration); INST (instructions); VD+VED (visual demonstration plus verbal description); INST+VD (instructions plus visual demonstration); IntraTest (intramodal test); and ExtraTest (extramodal test).

GROUP	1	IDENTITY				DIFFERENCE				SIMILARITY				14
		2	3	4	5	6	7	8	9	10	11	12	13	
I VD	P	VD				VD				VD				P
	R	INTRA TEST EXTRA TEST				INTRA TEST EXTRA TEST				INTRA TEST EXTRA TEST				O
II INST	E	INST				INST				INST				S
	T	INTRA TEST EXTRA TEST				INTRA TEST EXTRA TEST				INTRA TEST EXTRA TEST				T
III VED+VD	E	VED+VD				VED+VD				VED+VD				E
	S	INTRA TEST EXTRA TEST				INTRA TEST EXTRA TEST				INTRA TEST EXTRA TEST				S
IV INST+VD	T	INST+VD				INST+VD				INST+VD				T
		INTRA TEST EXTRA TEST				INTRA TEST EXTRA TEST				INTRA TEST EXTRA TEST				

with 36 training trials, followed by 20 test trials, 10 of which addressed intramodal transfer and 10 of which addressed extramodal transfer. The training phases consisted in different matching relations to be learned, with each group exposed to the same sequence of relations. The first phase dealt with *identity*-matching (stimuli sharing shape and color), the second phase involved *difference*-matching (stimuli differing in shape and color), and the third phase involved *similarity*-matching (stimuli sharing shape or color but not both). In the case of intramodal tests, the shape and color of the new stimuli remained as the functional modalities, while in extramodal tests they changed to new shapes with size as the functional stimulus modality.

The various groups differed in that each was exposed to a different training procedure: Group I to visual demonstration; Group II to verbal instructions; Group III to visual demonstration plus prompted description of stimulus relations; and Group IV to visual demonstration plus verbal instructions.

The training procedure and instructions for each group were as follows:

Visual demonstration. Subjects in Group I were exposed in the first session of each phase to a demonstrative trial of the corresponding kind of matching relation: identity, difference or similarity. During the demonstration trial, subjects did not have to respond in any particular way. They only had to observe the stimulus displays on the monitor screen. In order to demonstrate the relation the sample stimulus began flashing and afterwards the same occurred with one of the comparison stimuli while the rest remained constantly on. An arrow appeared below each of the comparison stimuli in successive demonstration within this trial to indicate what would happen if that alternative were selected. Thus, the demonstration involved one correct and two incorrect matchings with the same set of stimuli. Each demonstration in the trial ended with a text and one of two different buzzing sounds indicating that the matching correct or that it was wrong. After this demonstration trial subjects were exposed to a typical first-

order matching-to-sample situation for four sessions, thus completing a phase. The next phase began with a similar demonstration of the new matching relation, at the beginning of the first session of that new phase.

Verbal instructions. Subjects in Group II were exposed, at the beginning of the first session of each phase, to verbal instructions corresponding to the kind of matching relation to be performed. A text appeared on the screen describing the correct election to be made. For identity, the instructions were as follows: "On the screen will appear four figures, one at the center and three at the bottom. You must choose one at the bottom that is the same, in both shape and color, as that in the center." In the case for difference, the instruction changed, saying: "You must choose one at the bottom that does not share color and shape with that at the center." And for the case of similarity, instructions were: "You must choose one at the bottom that shares color or shape with that at the center." After the relevant instruction was given at the beginning of the first session of a given experimental phase, subjects were exposed to a typical first-order matching-to-sample procedure.

Visual demonstration plus prompted verbal description. Subjects in Group III received a training procedure similar to those in Group I, except that after information about an error or a correct match within the demonstration trial, subjects were asked by the experimenter about why that relation was correct or incorrect. The verbalizations were recorded by the experimenter.

Verbal instructions plus visual demonstration. Subjects in Group IV were exposed to a combination of the procedures for Groups I and II. At the beginning of the first session of each phase the subjects were first told to read the specific instructions and then they were exposed to a visual demonstration trial of the relevant matching relation.

RESULTS

Results are depicted in Tables 2, 3, and 4

and Figures 3 and 4. No omissions in responding were observed so the figures include only correct and incorrect responses.

The individual subjects' percentages of correct responding during training sessions in each group may be observed in Table 2. Excepting subjects 12 and 15 in Group III, the rest of the experimental subjects showed a high performance in the three matching relations, with terminal correct responding near or equal to 100%. Some difficulties may be appreciated in some subjects of Group III. In this group, which was exposed to the visual demonstration plus prompted verbal description procedure, Subjects 12 and 15 performed virtually without correct responses during training on the difference and similarity-matching relations. Performance during the identity-matching period was almost 100% correct in the four groups.

Table 3 describes the individual percentages of correct responses in the four groups in the intramodal test trials. Group II showed a very high performance excepting a low score for Subject 7 in the first session of the similarity-matching relation period. The second best group was group IV with just three low scores for Subjects 19 and 17 during the difference and similarity-matching relations periods respectively. Subjects 2, 3, and 4 in Group I, excepting for the identity-matching relation period, showed almost zero correct responses, while Subjects 1 and 5 showed variations between sessions, but with a terminal performance in the last session of 90 or 100% correct responses. Subjects in Group III showed a performance equal or close to 100% correct responses during the identity-matching relation period, but in the other two periods only Subjects 13 and 14 maintained their correct responding while the other three subjects (11, 12, and 15) had zero correct responses.

Table 4 describes the individual percentages of correct responses in the four groups in the extramodal test trials. As occurred during the intramodal test trials, all subjects in the four groups showed a performance close or equal to 100% correct

Table 2
Performance of each subject in the four groups during the training trials in the three experimental phases.

		TRAINING											
		IDENTIFY				DIFFERENCE				SIMILARITY			
SUBJECT		1	2	3	4	1	2	3	4	1	2	3	4
GROUP I VD	1	100	100	100	100	97	97	97	97	80	97	100	100
	2	100	100	100	100	100	97	100	100	83	92	89	97
	3	100	97	100	100	66	94	100	94	78	89	97	94
	4	100	100	100	97	89	100	94	97	83	92	100	100
	5	83	97	100	100	100	100	92	100	83	94	94	97
GROUP II INST	6	86	100	100	100	97	97	100	100	70	100	100	100
	7	100	97	100	100	97	100	97	100	94	69	97	94
	8	100	100	100	100	94	97	97	100	77	97	100	94
	9	100	100	100	100	100	97	100	97	94	100	100	97
	10	83	97	94	100	100	100	100	100	100	97	100	97
GROUP III VED+VD	11	100	100	100	97	50	97	97	100	88	97	97	92
	12	100	100	100	100	0	0	0	0	0	0	0	0
	13	100	97	100	100	100	100	100	100	94	100	100	100
	14	97	100	100	100	89	94	94	100	100	100	94	100
	15	100	100	100	100	0	3	0	0	3	0	0	0
GROUP IV INST+VD	16	97	97	97	100	97	97	97	97	100	100	100	100
	17	97	100	100	97	97	97	100	100	100	94	100	100
	18	100	100	100	100	97	97	100	100	100	94	100	100
	19	100	100	100	100	92	100	97	100	78	100	94	100
	20	100	100	97	100	100	94	100	100	97	94	100	100

Table 4
Performance of each subject in the four groups during the extramodal test trials in the three experimental phases.

		EXTRAMODAL TEST											
		IDENTIFY				DIFFERENCE				SIMILARITY			
	SUBJECT	1	2	3	4	1	2	3	4	1	2	3	4
GROUP I	1	100	100	100	100	0	50	60	60	10	60	50	40
	2	100	100	90	100	0	30	0	0	0	40	0	0
	3	100	100	100	100	0	0	0	0	0	0	0	0
	4	100	100	100	100	0	0	0	0	0	0	0	0
	5	100	100	100	100	0	0	0	0	0	0	0	0
GROUP II	6	100	100	100	100	100	100	70	80	70	60	50	20
	7	100	100	100	90	80	70	22	60	30	100	70	80
	8	100	100	100	100	30	0	0	0	30	0	0	0
	9	100	100	100	100	90	50	50	100	80	90	100	100
	10	100	100	100	100	100	90	100	100	100	100	100	100
GROUP III	11	100	100	100	100	0	0	0	0	0	0	10	0
	12	100	100	100	100	0	0	0	0	0	0	0	0
	13	100	100	100	100	60	60	80	60	80	80	100	100
	14	100	100	100	100	70	50	60	70	50	90	80	60
	15	100	100	100	90	0	0	10	0	0	0	10	0
GROUP IV	16	90	100	100	100	70	60	90	80	80	70	100	90
	17	100	100	100	100	90	0	0	0	30	10	50	60
	18	100	100	100	90	0	0	0	0	0	0	0	0
	19	100	100	100	100	70	40	70	90	20	90	90	70
	20	90	100	100	100	90	100	80	100	100	80	100	100

responses during the identity matching. In general terms, for the similarity and difference matching relations, performance was variable between subjects in the four groups. In Group I four subjects (2, 3, 4, and 5) responded near to zero correct performance. In Group III the same occurred with Subjects 11, 12, and 15. Only Subject 8 in Group II and Subject 18 in Group IV showed similar low scores. Subject 10 in Group II and Subject 20 in Group IV showed scores close or equal to 100% correct responses.

Figure 3 shows the percentage of choices of comparison stimuli corresponding to

identity, difference or similarity-matching relations during pre-test and post-test sessions. In the pre-test session the four groups tended to choose the identity-matching comparison stimuli at least 90%. In contrast, after the three training phases, the post-test session percentages showed an increased variability in selection for the four groups. Group I still preferentially chose the identity-matching stimuli, while groups II and III distributed their preference among the identity and the similarity-matching stimuli. On the other hand, group IV preferred the similarity-matching stimuli, with a similar secondary distribu-

Fig. 3. Preference of choice for the three kind of matching relations in each of the four groups during the pre-test and post-test sessions.

Fig. 4. Percentage of kinds of description in group III in the initial training trial of each experimental phase.

tion of preference for identity and difference-matching stimuli.

Figure 4 describes the percentage of occurrence of different types of verbal descriptions during the training phases for subjects in group III. Verbalizations were classified according to their reference to a relation (e.g., "...they are the same..."), a class (e.g., "...they have the same color..."), an instance (e.g., "...it's also a green circle..."), a position (e.g., "...it's located on the left side..."), an ambiguous criterion (e.g., "...they carry on the same sequence..."). Class and relation verbalizations were classified as irrelevant when the relations or classes referred to were not those being presented in the experiment. As it may be observed, relevant relation and class verbalizations reached 60 percent. Ambiguous verbalizations were 20%. It is noteworthy that instance referred verbalizations were almost negligible.

DISCUSSION

The findings of this experiment seem to

support the initial contention about the critical role of verbally-mediated stimulus relations in developing rule-type behavior.

The group trained under visual demonstration plus prompted description (group III) did not show the best performance in either training or test trials. These results differ from those obtained initially by Ribes, Peñalosa, Moreno, Cepeda, and Hickman (in press) using a within subject replication design with sequential treatments in a second order matching-to-sample situation. In second-order matching-to-sample an additional stimulus or stimulus compound is used to signal the properties regulating the matching relation between the sample and the comparison stimuli. Since our present findings were obtained under a simple, first-order matching-to-sample situation, we may speculate that the acquisition of relational behavior may be more difficult without the second-order stimulus compound, since verbal descriptions prompted during training do not depend upon the functional properties of the superimposed stimuli illustrating the relation between stimuli.

The only group where some subjects showed performance without correct responses during the training trials was the group that was exposed to the visual demonstration plus verbal description procedure (group III). In the same way, the performance of this group was relatively poor during intramodal and extramodal test trials, since only subject 13 and partially subject 14 seemed to have acquired relational responding to the various matching arrangements. The other group sharing visual demonstration also performed very poorly during both test trials, contrasting with groups II and IV, both sharing instructions, which showed a high performance in intramodal test trials and higher scores in extramodal test trials. Although these findings do not replicate the effect of the prompted verbal description procedure added to visual demonstration, they replicate our previous finding (Ribes, Peñalosa, Moreno, Cepeda, & Hickman, *in press*), in which adults, contrasting with children, seem to be poor followers of visual cues as compared to verbal cues.

Although our expectations were not confirmed regarding the effect of the procedure of visual demonstration plus prompted verbal description in first-order matching-to-sample, data seem to suggest some possible explanations.

First, prompted verbal description after a correct visual demonstration does not ensure that the subject is able to describe the stimulus relation contingency as an instance of a general rule, since the demonstration is done *within* the stimulus arrangement where the choice is to be made. This may explain why in second-order matching-to-sample the procedure seemed to be effective. The demonstration plus the verbal recognition was made with a separate pair of stimuli, different from those included in the choice situation, probably facilitating generality of stimulus control.

Second, the best groups, both in training and test trials were groups II and IV under verbal instructions, with a slight superiority of the latter associated additionally to visual demonstration. Contrary to what

occurs in second-order matching-to-sample situations, instructions may function as surrogates for properties of second-order stimuli during first-order matching-to-sample. Nevertheless, the receptive character of instructions, may not be sufficient to fully promote the emergence of relational interactions as measured by extramodal tests. It may be that some active self-descriptive performance, additional to the functional cues provided by instructions *and* visual demonstration, may be required for obtaining truly rule-guided behavior when instructions plus visual demonstration are presented in a situation where the stimuli are not varied enough (e.g., a single training trial).

The correct performance of the four groups in the identity-matching test trials, both intramodal and extramodal, seems to support that their behavior was controlled by situationally-bound significant visual factors. Ribes, Hickman, Peñalosa, Martinez, Hermosillo, and Ibañez (1988) have shown that identity-matching, unless being affected by explicit sequential training effects with other relations, seems to depend exclusively upon visual situational cues, probably strengthened by cultural practices regarding early socialization. The performance of the four groups in the pre-test session, in which responding concentrated mostly in identity relations, further supports this interpretation and suggests that correct performance under identity matching is not a reliable indicator of conditional discrimination as that term is usually understood.

The descriptions made by the subjects in group III (visual demonstration plus prompted verbal description) provide some evidence regarding the differential control of their performance. Most of the descriptions consisted in the recognition of relations or classes as conditions or rules for matching as contrasted with the description of particular instances that would characterize contextually-bound behavior. Relational descriptions, as indicators of rule-guided behavior, should consist in the identification of stimulus arrangements as cases of general relations

or classes. Otherwise, the description of stimulus arrangements as independent situations or instances, would not allow for the recognitions of such arrangements as particular variations of more general conditions. Although in this experiment a significant amount of verbalizations were classified as ambiguous, they always dealt with relations even when not considered as prescriptive according to the formal operations setting the matching criteria in the experiment.

It is difficult to know if these descriptions did regulate responding at all since in a previous study (Ribes & Martinez, 1990) self-formulated descriptions did not seem to rule *subsequent* matching-to-sample, although reports *after* performance did coincide with the behavior shown during the experimental situation. During training and test trials only three and two subjects, respectively, showed a discriminative performance in Group III. The five subjects in this group described visual demonstrations in terms of *relations* and *classes*, some of them following ambiguous criteria, with no correspondence to the formal criteria employed in designing the matching-to-sample situations in this experiment. There is no *a-priori* reason to assume that the only way in which subjects may discriminate in a matching-to-sample situation is to adjust their descriptions to those explicitly formulated as formal criteria by the experimenters. If this were the case, experiments would seem rather guessing-like situations in which subjects would try to imagine what was in the "minds" of the experimenters when they designed the experimental conditions as a problem-solving situation. Nevertheless, a lack of correspondence of the descriptions of some of the subjects in this group with actual contingencies controlling the matching situations must be assumed.

The findings in this study suggest that training procedures added to the standard matching-to-sample situation do affect acquisition and the kind of behavior thus acquired as shown in transfer tests. Providing visual demonstrations, instructions or any other "assistance" to experi-

mental subjects departs increasingly from simple procedural factors, bringing more complex previously-acquired repertoires into play. These supplementary conditions seem to influence the kind of verbal processes working in the experimental situation as the differential performances of the various groups in this experiment allow us to infer. This should induce caution in the interpretation of results obtained in conditional discrimination situations with human subjects, and should promote a more systematic approach to the various experimental procedures added in the conduction of such kind of studies.

Some initial questions arise from the findings of this study. If verbally-regulated interactions are facilitated by prompted verbal descriptions, or by instructions supplied by the experimenter added to visual demonstration of stimulus relations in second-order and first-order matching-to-sample respectively, would similar effects be obtained with a combination of prompted verbal description plus supplied instructions? Would these procedures be equally effective in both first-order and second-order matching-to-sample situations? Which would be the effect obtained with verbal descriptions, both reinforced and non-reinforced, added to response-produced visual demonstrations? The systematic experimental evaluation of training procedures using transfer tests might help to understand how verbally-regulated behavior becomes functionally autonomous from contextually-bound cues. Here it might lie the empirical clue for distinguishing truly rule-guided behavior from that exclusively controlled by formal verbal variables. The differential effects of verbal descriptions and instructions when added to visual demonstration of stimulus relations in different types of matching-to-sample situations seem to support this distinction.

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