

# Effects of instructed visualization on emergent conditional discriminations



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## Introduction

An associative concept is a stimulus class that is formed based on learned associations rather than visual similarities. For example, the numeral 3, the quantity 3 (e.g., three balls), and the spoken word “three” may be treated as equivalent even though there is no visual similarity between these stimuli (Zentall, Galizio, & Critchfield, 2002).

The formation of an associative concept does not require directly experiencing every relation between stimuli in the class; after learning a few of the possible relations, others may emerge without being trained (e.g., Sidman & Tailby, 1982).

One type of learning history that may lead to the formation of classes of visually dissimilar stimuli in humans involves acquiring word pair (Skinner, 1957) relations between verbal labels uniquely associated with each stimulus. This type of learning history has been modeled in studies with children and adults and found to create new conditional discriminations in matching-to-sample (MTS) tasks (e.g., Jennings & Miguel, 2017; Ma, Miguel, & Jennings, 2016; Petursdottir, Carp, Peterson, & Lepper, 2015).

It is possible that participants’ performance in these MTS tasks is mediated by their production of the trained verbal relations in test trials (Horne & Lowe, 1996; Ma et al., 2016). However, data from children do not support this hypothesis (1996).

The present study investigates a different type of participant behavior that could potentially affect MTS performance. Previous data from our lab suggest that performance on the MTS test may be mediated by the use of visual imagery during word pair instruction (Petursdottir et al., 2019). That is, participants may attempt to visualize the stimuli to be related in their absence (i.e., operant seeing; Skinner, 1953).

If this behavior facilitates subsequent MTS test performance, training sequence may produce an effect: participants should perform better if they acquire labeling relations between verbal labels and visual stimuli before they undergo word pair instruction (standard sequence) than if they acquire the word pair relations before the label relations (reverse sequence), as only the former sequence permits visualization of stimuli during word pair instruction. Previous studies from our lab found that participants in the groups that are able to visualize typically outperform the other group on the MTS test; however, many participants report not using visual imagery during word pair training (Petursdottir et al. 2019, Cox et al. in preparation). For this reason, the present study includes a third group of participants who received the standard training sequence and were instructed to visualize the visual stimuli during word pair instruction.

## Method

**Participants:** 75 adults were recruited from a psychology department human subjects pool.

**Setting and equipment:** The experiment was programmed in *SuperLab 5.0* and run on a laptop computer in a quiet room with an experimenter present who provided feedback on vocal responses during post-tests.

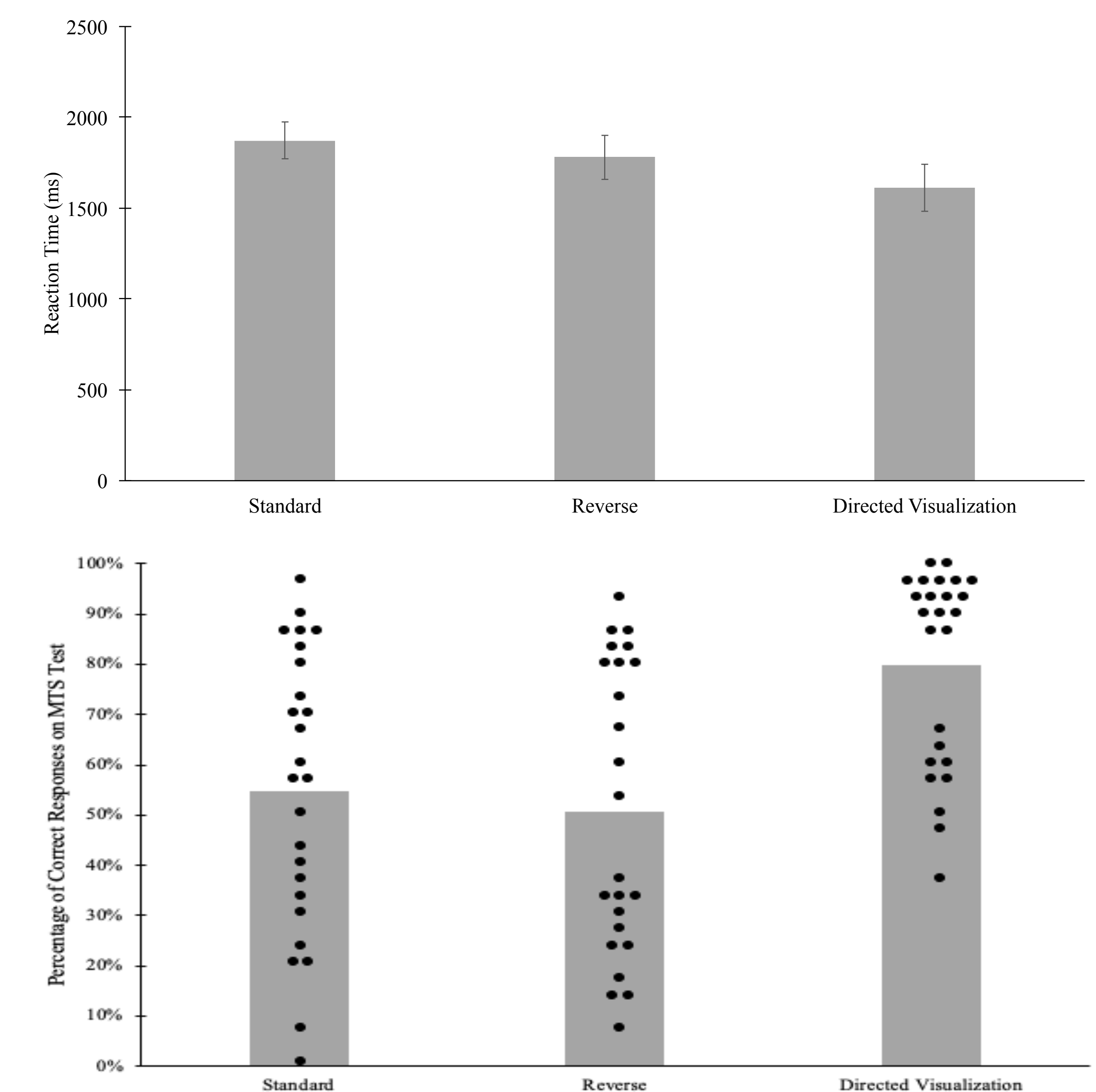
## Stimuli:

Experimental Stimuli				
	A	A'	B	B'
1		Orga		Rido
2		Huzo		Fodi
3		Luti		Poga

## Design:

Group	Baseline Training I	Baseline Training II	Post-test 1	Post-test 2	Post-test 3	Post-test 4
Standard (n = 25)	MTS label instruction (A-A')	MTS word pair instruction (A'-B')	MTS test	Reverse word pair (B'-A')	Baseline Retention (A-A', A'-B')	Listener test (A'-A, B'-B)
Directed Visualization (n=25)	MTS label instruction (A-A')	MTS word pair instruction+ instruction to visualize (A'-B')	MTS test	Reverse word pair (B'-A')	Baseline Retention (A-A', A'-B')	Listener test (A'-A, B'-B)
Reverse (n = 25)	MTS word pair instruction (A'-B')	MTS label instruction (A-A')	MTS test	Reverse word pair (B'-A')	Baseline Retention (A-A', A'-B')	Listener test (A'-A, B'-B)

## Results and Discussion



There was not a statistically significant effect of instruction type on MTS reaction time. There was, however, a significant difference of MTS accuracy between groups with the directed visualization group ( $M = 79.86$ ,  $SD = 19.92$ ) having overall higher accuracy than the reverse group ( $M = 49.47$ ,  $SD = 29.14$ ) and the standard groups ( $M = 54.67$ ,  $SD = 28.12$ ),  $ps \leq .001$ .

The effect seen here between the directed visualization group and the reverse group was hypothesized to reflect that correct matching in the reverse group depended on verbal problem-solving strategies that were unnecessary for the standard group because they had a visual representation of the correct response immediately available without verbal problem solving. The effect seen between the directed visualization group and the standard group was hypothesized to reflect that the standard group, while able to use visual imagery during word pair training, still used verbal mediation to solve the MTS task.

The results from this experiment support the notion that emerging relations between visual stimuli in associative concept formation is sensitive to the use of visual imagery during word pair training.

### References

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