Poster # 1110

# The Effects of Relational Reasoning on Category Learning

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## Background & Objectives

- Research on relational reasoning suggests that analogical associations can extend previously learned categories of information to new and, at times, initially abstract ideas (see Holyoak, 2012), a process that likely involves prefrontal cortex (Krawczyk et al., 2008; Morrison et al., 2004).
- This study examined whether prior exposure to a relational reasoning task can influence participants' performance on a classification (i.e., assignment of a label based on known features) relative to an inference (i.e., prediction of a feature based on known label and additional features) learning task (Yamuchi & Markman, 1998 Yamuchi, Love, & Markman, 2002).
- Additionally, we explored the impact of presenting semantically-related distractors during relational reasoning, to examine whether potentially more difficult analogical associations may shift participants' learning strategies toward inference and, thus, enhance performance on the classification learning task.

## Design & Methods

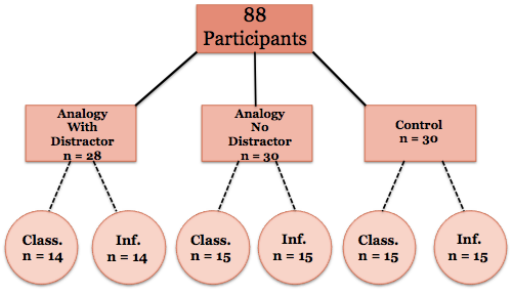


*Figure 1*. **Study Design:** Class. = Classification task; Inf. = Inference task. Mean age = 19.47 years; 53 males.

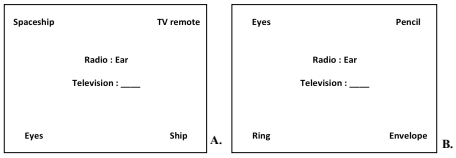


*Figure 2*. Relational reasoning pre-task with distractors (panel A) and without distractors (panel B) . Adapted from Krawczyk et al. (2008).

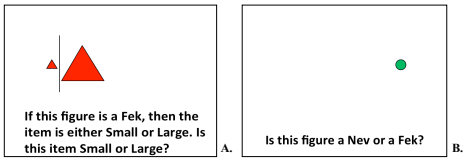


*Figure 3*. Examples of the inference (panel A) and classification (panel B) tasks. Feedback was provided after each trial. Adapted from Yamuchi and Markman (1998).

## Results

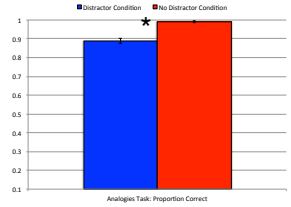


***Figure 4.*** Accuracy by condition on the analogical reasoning task, *$F(1,60) = 46.59$, $p < .001$, $\eta_p^2 = .44$. Error bars indicate the standard error of the means.

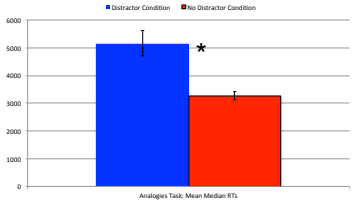


***Figure 5.*** Mean median reaction times by condition on the analogical reasoning task, *$F(1,60) = 18.41$, $p < .001$, $\eta_p^2 = .23$. Error bars indicate the standard error of the means.

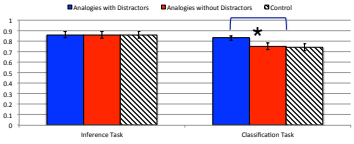


***Figure 6.*** **Accuracy by condition on the experimental task**; main effect of reasoning task $F(2,82) = 1.23$, $p = .30$, $\eta_p^2 = .03$; main effect of experimental task $F(1,82) = 14.35$, $p < .001$, $\eta_p^2 = .15$; interaction, $F(2,82) = 1.45$, $p = .24$, $\eta_p^2 = .03$ . Orthogonal contrasts, classification task: Analogies w/out distractors + Control, $t = -.21$, $p = .83$; (Analogies w/out distractors + Control) vs. Analogies w/ distractors, $F(1, 42) = 5.55$, $p = .02$, $\eta_p^2 = .12$. Error bars indicate the standard error of the means.

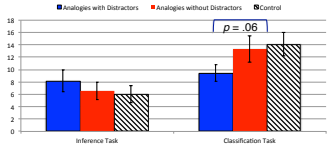


***Figure 7.*** **Block for 70% accuracy by condition on the experimental task**; main effect of reasoning task $F(2,78) = 0.34$, $p = .71$, $\eta_p^2 = .009$; main effect of experimental task $F(1,78) = 15.30$, $p < .001$, $\eta_p^2 = .16$; interaction, $F(2,82) = 2.29$, $p = .11$, $\eta_p^2 = .06$. Orthogonal contrasts, classification task: Analogies w/out distractors + Control, $t = -.31$, $p = .76$; (Analogies w/out distractors + Control) vs. Analogies w/ distractors, $F(1, 40) = 3.71$, $p = .06$, $\eta_p^2 = .09$. Error bars indicate the standard error of the means.

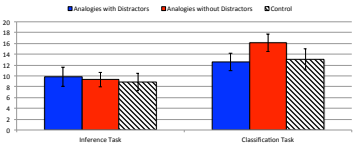


***Figure 8.*** **Block for 90% accuracy by condition on the experimental task**; main effect of reasoning task $F(2,70) = 0.65$, $p = .53$, $\eta_p^2 = .009$; main effect of experimental task $F(1,70) = 11.35$, $p = .001$, $\eta_p^2 = .14$; interaction, $F(2,70) = 0.79$, $p = .46$, $\eta_p^2 = .02$ . Error bars indicate the standard error of the means.

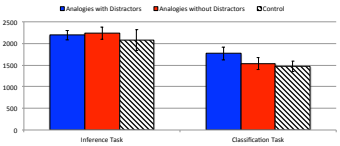


***Figure 9.*** **Mean median reaction times by condition on the experimental task**; main effect of reasoning task $F(2,82) = 0.88$, $p = .42$, $\eta_p^2 = .02$; main effect of experimental task $F(1,82) = 20.26$, $p < .001$, $\eta_p^2 = .20$; interaction, $F(2,82) = 0.41$, $p = .67$, $\eta_p^2 = .01$ . Error bars indicate the standard error of the means.

## Discussion & Future Directions

- In line with past research (Yamuchi & Markman, 1998; Yamuchi et al., 2002), the analyses of reaction time and accuracy measures revealed, overall, superior performance for the inference relative to the classification task.
- According to our hypothesis, exposure to relational reasoning enhanced classification learning, but only in the presence of semantically related distractors.
- These results suggest different, and possibly competing, systems supporting inference and classification learning, but they also highlight the potential flexibility of classification learning mechanisms (see Chrysikou, Weber, & Thompson-Schill, 2014).
- In follow up work, we are investigating whether a more difficult analogical reasoning task will strengthen the influence of relational reasoning on classification learning strategies.

## References

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