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). This study examined whether prior exposure to a relational reasoning task can influence participants’ performance on a classification task (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, Lee, & Markman, 2003).

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.

Results

Figure 1. Accuracy by condition on the analogical reasoning task, *F*(1,60) = 18.41, *p* = .001; *q* = .16. Error bars indicate the standard error of the means.

Figure 2. Accuracy by condition on the taxonomic reasoning task, main effect of reasoning task, *F*(1,42) = 5.55, *p* = .02; main effect of reasoning task, *F*(1,42) = 5.55, *p* = .02; interaction, *F*(1,42) = .76, *p* = .38. 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, Neebe & Thompson-Schill, 2016).

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.

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References


Design & Methods

88 Participants

Analogy With Distractor n = 34

Analogy No Distractor n = 30

Control n = 24


n = 14 n = 14 n = 15 n = 15 n = 15 n = 15

Figure 3. Study Design. Class. = Classification task; Inf. = Inference task. Mean age = 19.47 years; 51 males.

Figure 4. Accuracy by condition on the analogical reasoning task, *F*(1,60) = 18.41, *p* = .001; *q* = .16. 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) = .23, *p* = .16. Error bars indicate the standard error of the means.

Figure 6. Accuracy by condition on the experimental task: main effect of reasoning task, *F*(1,62) = 14.35, *p* = .001; *q* = .15; interaction, *F*(1,62) = 4.41, *p* = .04. 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*(1,76) = 3.38, *p* = .06; *q* = .02; main effect of experimental task, *F*(1,42) = 5.35, *p* = .02; *q* = .12. 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*(1,77) = .02, *p* = .83; (Analogies w/out distractors + Control) vs. Analogies w/ distractors, *F*(1,67) = .16; interaction, *F*(1,42) = .76, *p* = .34. 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*(1,62) = 20.25, *p* = .001; *q* = .19; interaction, *F*(1,62) = .41, *p* = .87. Error bars indicate the standard error of the means.

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Poster # 1110

55th Annual Meeting of the Psychonomic Society
November 20-23, 2014,
Long Beach, CA