Supplemental Material: Simple Label Mapping

## Introduction

The main investigation looked at how comprehension, vocabulary, and other related behavioral measures were related to individual differences in concept learning, both nonverbally and verbally. However, this experiment never tested pure label mapping, or the ability to attach a label to an image without any underlying conceptual knowledge. Thus, it is possible that poorer comprehenders simply have difficulty associating a spoken label with a visual item. Data collected for another study did test this label-mapping skill. Results from this investigation are reported in this appendix.

## Method

### *Participants*

94 adolescents (50 male; *M* age = 20.17, *SD* = 2.87, range = 13.5 – 25.92) participated in this task. All participants provided consent (if over age 18) or assent along with parental consent (if under 18), in accordance with the Yale University Human Investigation Committee.

### *Behavioral Methods*

In this experiment, reading comprehension was assessed using the KTEA (Kaufman & Kaufman, 2004). Decoding ability was calculated as the Basic Reading score from the Woodcock-Johnson III Letter-Word Identification and Word Attack subtests (Woodcock et al., 2001). This decoding score includes real word and nonword decoding. IQ was assessed using the Wechsler Abbreviated Scale of Intelligence II (WASI; Weschler, 1999). Finally, the Peabody Picture Vocabulary Test III (PPVT; Dunn & Dunn, 1997) was used to measure vocabulary.

### *Experimental Paradigm*

The experimental paradigm used in this study was similar to the explicit verbal training condition of the main study. Participants saw two fish on the screen and were asked, "Find the *[name]*." Participants then clicked on one of the two fish. If correct, the target picture would enlarge, the distractor would disappear, and participants would hear "That's right. That's the *[name]*." If incorrect, participants would hear "Try again" and be allowed to select again. This experiment was separated into blocks of X trials. Participants continued the experiment until their accuracy in a given block reached a criterion of 90 percent. Thus, the measure of performance on this task is blocks to criterion, with more blocks representing slower learning.

The fish images used in the experiment were chosen to be visually distinguishable but have no highly salient features. Each fish image was paired with its own unique label. The spoken labels were CVC constructions. Labels did have some overlap in both onset and rhyme, as this overlap was of interest to the original investigation, but comparisons between overlapping and non-overlapping items are not of interest to the current investigation and thus will not be discussed.

**Results**

Note that not all subjects completed all behavioral measures. Thus, degrees of freedom reported may be lower than expected based on the full sample. Performance on the label mapping task and reading comprehension were strongly correlated, $r(74) = -0.45$, $p < .001$. Decoding was also strongly correlated with performance on the experimental task, $r(72) = -0.46$, $p < .001$, as was verbal IQ, $r(78) = -0.38$, $p = .0006$. Nonverbal IQ correlated strongly as well with performance, $r(78) = -0.37$, $p = .0009$. Finally, vocabulary also was significantly correlated with task performance, $r(72) = -0.36$, $p = .002$. Thus, blocks to criterion was negatively correlated with all of these behavioral measures.

To investigate the relationship between these behavioral measures and label mapping performance, multiple regression was conducted. In the first step, label mapping was predicted from basic reading score. To determine if reading comprehension over and above decoding predicted label mapping ability, reading comprehension was added as a second step. This second model was significant, $F(2, 64) = 12.19$, $p < .001$. However, an ANOVA comparing the second model to the baseline model using only basic reading was only marginally significant, $F(1, 64) = 2.99$, $p = .09$. Thus, reading comprehension does predict performance on the label mapping task over and above decoding ability, although this pattern should be interpreted cautiously.

**Discussion**

This supplemental investigation aimed to find out whether the ability to label novel spoken labels to images is related to reading comprehension ability over and above decoding. Reading comprehension predicted a significant amount of variance in performance on this label mapping task over and above decoding skill. However, reading comprehension and decoding together may not have significantly more predictive power than decoding ability alone. Thus, reading comprehension is related to label mapping ability, but the relationship between label mapping, decoding, and reading comprehension is not entirely clear. The current task did include phonological competition, used to investigate other questions. Thus, decoding (a skill involving phonological processes) may have played a larger role in this specific test of label mapping, obscuring some effects involving comprehension beyond decoding. Overall, though, the current results suggest that label mapping ability is related to reading comprehension even after decoding has been taken into account.

References

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