**Methods**

**Participants**

Ninety-five undergraduates from the University of Southern Mississippi participated in this study for partial course credit. All participants were native English speakers with normal or corrected-to-normal vision. *G\*Power* (Faul, Erdfelder, Lang, & Buchner, 2007) was used to conduct a sensitivity analysis which indicated that our sample size provided sufficient power (.80) to detect a small effect size (Cohen’s *d* = 0.27) or larger.

**Materials**

The stimuli used were one-hundred-eighty associative word pairs initially reported in Maxwell and Huff (under review). These word pairs were originally taken from the University of South Florida Free Association Norms (Nelson et al., 2004). There were 40 forward pairs which only had an association in the forward direction (e.g., credit-card), 40 backward pairs which only had an association in the backward direction (e.g., card-credit), 40 unrelated pairs which had no directional association (e.g. art-lion), 40 symmetrical pairs which had an association in both the backward and forward direction (e.g., salt-pepper), and 20 non-tested buffer pairs to control for primacy and recency effects. The word pairs were divided evenly into two study lists, with each list having 20 forward, backward, unrelated, and symmetrical pairs and 10 buffer pairs, for a total of 90 word pairs in each list. All participants saw both lists presented separately in study-test blocks, and the order of the word pairs was counterbalanced. Each list began and ended with five buffer pairs, with the other pairs in between and randomly mixed for each participant.

Pairs across all conditions were equated on associative strength (i.e., FAS and BAS) using the Nelson et al. (2004) free-association norms. Additionally, these pairs were designed to control for lexical and semantic properties that could potentially influence recall ability, including word length, SUBTLEX frequency (Brysbaert & New, 2009), and concreteness values from derived from the English Lexicon Project (Balota et al., 2007). All study blocks were matched on each of these properties. Thus, mean associative overlap and lexical/semantic properties were equivalent between direction types and across study lists. Finally, counterbalanced versions of the study lists were created that switched the order of the word pairs (i.e., forest-tree vs. tree-forest). As a result, forward pairs from one counterbalance became backward pairs on another. This allowed for greater control of item differences, particularly on forward and backward pairs, as the same items were used in both the forward and backward directions across counterbalances. Pair order was similarly flipped and counterbalanced across unrelated and symmetrical pairs.

The cued-recall test in each block contained all 80 cue words from the studied pairs, with the exception of the buffer pairs. The cue word was shown next to a question mark that had replaced the target word. The order of the test was randomly organized for each new participant.

**Procedure**

The design for this study was modeled after Maxwell and Huff (under review). All participants were run individually on computers using the *E-Prime* 3 software (Psychology Software Tools, Pittsburgh, PA). Participants were randomly assigned to one of three different study conditions: Item-specific study, Relational study, or a Read only control group. For each study condition, participants were told that they were going to be presented with word pairs and were going to be tested on their memory for the pairs. The cue word was always presented on the left and the target word was always presented on the right. Participants were instructed to rate how likely they were to remember the word pair, and these JOL ratings were done a scale from 0 to 100, with 0 being “I am certain I WILL NOT REMEMBER the word pair” and 100 being “I am certain I WILL REMEMBER the word pair.” Participants were also instructed to use the full range of the scale when providing their ratings to help reduce anchoring on the ends of the scale.

For the Read condition, participants were instructed to study the word pairs by reading them silently; this served as the control condition. For the Relational condition, participants were instructed to study the word pairs by thinking about how the words in each pair were related. The example given was if a participant saw the pair “Cat-Turtle”, they may think about how cats and turtles are both animals or how cats and turtles can both be pets. For the Item-Specific condition, participants were instructed to study the word pairs by thinking about how the words in each pair were unique. The example given was if a participant saw the pair “Cat-Turtle”, they might think about how cats have fur, but turtles have shells or how cats are mammals, but turtles are reptiles. Participants only saw one type of study instructions. After the instructions, participants completed a ten-word practice set. Participants were then given their first block of word lists to study at their own pace and provided their JOL ratings while the word pair was displayed.

After the first study block was completed, participants were given two minutes to complete a math sheet that served as a filler task. Participants then completed a cued-recall task in which only the cue word was presented, and they were asked to provide the target word from memory. Participants were encouraged to give their best guest as to what the target word was if they were unable to retrieve the target word, but participants were able to skip to the next cue by pressing enter if they could not remember. After the first cued-recall test was finished, participants then went through a second study/test block with the same instructions as the first block. Once participants had completed the second block, they were debriefed on the study. The Read condition lasted approximately 30 minutes, and the Relational and Item-Specific conditions lasted approximately one hour

**References**

Nelson, D. L., Mcevoy, C. L., & Schreiber, T. A. (2004). The University of South Florida free association, rhyme, and word fragment norms. *Behavior Research Methods, Instruments, & Computers*, *36*(3), 402–407. doi: 10.3758/bf03195588

*Figure 2*. Comparison of mean JOL ratings and recall rates across each pair type for each of the three study conditions. Error bars represent 95% confidence intervals.