[TITLE HERE]

The ability for individuals to accurately monitor the progress of their own learning is critical for the successful retention of new information, as effective monitoring allows individuals to maximize retention by adjusting their study strategies (Nelson & Narens, 1990). Metacognitive judgments (i.e., having individuals make judgments about their memorial abilities) can be used to obtain information about the learning process. The Judgment of Learning (JOL) task is a commonly used metacognitive judgment paradigm. In a standard JOL task, individuals are asked to estimate their likelihood of correctly retrieving a target word if shown only the cue on a later memory test. These estimates can be elicited using several types of measurement scales (e.g., Likert Scales or binary “yes-no” responses; Hanczakowski, Zawadzka, Pasek, & Higham, 2013), however, JOLs are commonly elicited using a continuous 0 to 100 scale representing the percent likelihood of the target item being successfully recalled at test (e.g., 100% = definitely would remember; 0% = definitely would not remember). The use of a 100 point scale is beneficial because it allows for an easy comparison between predicted recall (via JOLs) and the proportion of items that are correctly recalled at test.

Though JOL ratings can be accurate and well calibrated with recall, various factors have been demonstrated to show discrepancies between predicted and actual performance. These include perceived ease in identical cue-target word pairs (Castel, McCabe, & Roediger, 2007), increased in time spent studying word pairs (Koriat & Ma’ayan, 2005), and both the direction and magnitude of associative relationships between the cue-target study pairs (Koriat & Bjork, 2005; Maxwell & Huff, in press). [ADD A SENTENCE OR TWO HERE ON HOW YOUR STUDY BUILDS UPON THESE]

Interest in the relationship between memory predictions and accuracy is not a novel area of exploration. For example, in an early study conducted(1) Overall, thisswere As such, the authors

Moreover, research conducted by Koriat and Bjork (2005) supports the notion that both the associative strength and direction of cue-target word pairs affects both the magnitude of JOL ratings and correct recall rates. Specifically, the authors delineated between types two types of associations that were thought to influence the relationship between JOLs and recall. First, *a priori* associations refer to forward associates (e.g., credit-card). The strength of these pair types is rooted in the likelihood that the cue item will elicit the target item at test. As such, a priori association strength can be readily assessed through the use of free association norms (e.g., The University of South Florida Free Association Norms; Nelson, McEvoy, & Schreiber, 2004; The Small World of Words Project; De Deyne et al., XXXX). These norms are generated through the use of a free association task in which participants are provided with a cue word and are asked to respond with the first target word that comes to mind. These norms can then be used to compute the probability of responding to word A with word B (i.e., forward associative strength, FAS). Second, *a posteriori* associations refer to the perceived relatedness between pairs that are only apparent to participants when words are paired together. These pairs can refer to weakly associated pairs (e.g., XXX-XXX) or strong associates that in which the pair order has been flipped (i.e., backward pairs, XXX-XXX). Similar to a priori pairs, free association norms can be useful for indexing the backward associative strength (BAS) between pairs (i.e., the probability of responding to word B with word A in an A-B item pairs; see Nelson, McEvoy, & Dennis, 2000 for a review). Thus, a posteriori pairs should have either weak levels of FAS or strong levels of BAS. To test the correspondence between JOLs and recall for a priori and a posteriori pairs, Koriat & Bjork (2005) conducted three experiments in which participants were presented with a unrelated and forward associates (Experiment 1), unrelated, backward, and forward pairs (Experiment 2), and [PAIR TYPES HERE] (Experiment 3). Across each experiment, an *illusion of competence* was detected for a posteriori pairs in which JOLs exceeded that of subsequent recall. In particular, this effect was most noticeable for backward pairs in which… [DESCRIBE PATTERN OF OVERESTIMATION].

Next, a follow-up study conducted by Castel et al. (2007) showed that the illusion of competence can be extended to include identical word pairs. Participants in Experiment 1 of this study were given a mix of strongly related, weakly related, unrelated, and identical cue-target word pairs and were asked to study the words and provide JOL ratings. The participants were later asked to recall the word pairs, and their JOL ratings were compared with their recall rates. The results showed an illusion of competence for the identical word pairs which could have been because the participants perceived the identical pairs to be easier compared to the other pairs and thus spent less time studying them or because the participants didn’t encode the identical pairs as deeply because they thought they would be easier to recall (Castel et al., 2007). In the study done by Koriat & Ma’ayan (2005), they found that when participants were allowed to self-pace their study of the word pairs, that the pairs they spent more time studying tended to show a decrease in JOL rating. The decrease in JOLs could be because the participants felt that the longer it took them to study the word pair the harder it would be for them to remember the pair later.

More recently, (e.g., on-off) Furthermore, they showed that the illusion of competence replicated across several manipulations designed to mitigate the illusion of competence, including having participants make JOLs under experimenter paced study and after a delay. [CALIBRATION PLOTS HERE]

[FACTORS DRIVING ILLUSIONS OF COMPETENCE HERE]

The present study further contributes to this area by manipulating the encoding strategies used by the participants. In our study, we had participants study the word pairs using either a relational encoding strategy, an item-specific encoding strategy, or a read encoding strategy which served as a control. For the relational encoding strategy, we had participants study the word pairs by thinking about how the two words were related (ex. cat-turtle, cats and turtles can both be pets). For the item-specific encoding strategy, we had participants study the word pairs by thinking about how the two words were different (ex. cat-turtle, cats are mammals while turtles are reptiles). For the read strategy, we simply had participants read the pairs silently.

[NEW PARAGRAPH ON KORIAT AND BJORK, CASTEL ET AL.]

[NEW PARAGRAPH ON MAXWELL AND HUFF, TALK ABOUT EXTENSION TO OTHER PAIR TYPES, CALIBRATION PLOTS, DELAYED MANIPULATION] The current study is modeled after a study done by Maxwell and Huff (in press). [I mentioned the extension to other pair types previously, should I mention it again?] In the Maxwell and Huff (in press) study, they evaluated participants’ metacognition through the use of associative cue-target word pairs and JOLs. The word pairs used were a mix of forward associative pairs, backward associative pairs, symmetrical associative pairs, and unrelated pairs. They found that participants JOL ratings for forward associative pairs were pretty well calibrated with their recall for the pairs. Unrelated and backward associative pairs were not very well calibrated, with the backward associative pairs showing a very large illusion of competence. The symmetrical associative pairs were a novel contribution, and they found that there was an illusion of competence displayed for symmetrical pairs even though there was an association in both directions for the pairs. Maxwell and Huff (in press) also created calibration plots to show whether participants were overconfident, where recall rates were lower than JOL ratings, or underconfident, where recall rates were higher than JOL ratings, for each of the pair types. Participants tended to be underconfident with forward associative pairs, but overconfident for all other pair types with backward associative pairs have the highest overconfidence. [ADD DELAYED MANIPULATION].

**Item-Specific-Relational Framework**

[OVERVIEW] In a study done by Hunt and Einstein (1981), they evaluated two different types of encoding strategies: relational processing and item-specific processing. They found that relational and item-specific processing can both be beneficial to memory, but that relational processing has a higher benefit for unrelated word pairs and item-specific processing has a higher benefit for related word pairs (Hunt & Einstein, 1981). Hunt and Einstein (1981) also found that the benefits of these processing types are dependent on the context of the words being studied. The example given in their study was that thinking about the color of the word pairs could either serve to relate the words (ex. blueness can relate ocean and blueberries) or to separate the words (ex. blueness can differentiate blueberries from strawberries). [ADD MORE ABOUT THIS STUDY]

As such, the present study seeks to reduce the illusion of competence found for backward word pairs through the use of relational and item-specific processing and through the use of warnings about the illusion of competence. Our hypothesis is that the item-specific processing will reduce the illusion of competence for the backward associative pairs because it will force the participants to create an association instead of relying on the weak association of the backward pair. Our hypothesis is also that by providing warnings to the participants that illustrate the illusion of competence found for backward word pairs that they will be more aware of the JOL ratings they provide for those pairs, and thus further reduce the illusion of competence.