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On interpreting the relationship between remember–know judgments and confidence: The role of instructions ☆

Lisa Geraci [a,*], David P. McCabe [b], Jimmeka J. Guillory [a]

[a] Department of Psychology, Texas A&M University, College Station, 4235 TAMU, TX 77845-4235, United States
[b] Department of Psychology, Colorado State University, Campus Box 1876, Fort Collins, CO 80523-1876, United States

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ABSTRACT

Two experiments were designed to test the hypothesis that the nature of the remember–know instructions given to participants influences whether these responses reflect different memory states or different degrees of memory confidence. Participants studied words and nonwords, a variable that has been shown to dissociate confidence from remember–know judgments and were given a set of published remember–know instructions that either emphasized know judgments as highly confident (Experiment 1) or as less confident (Experiment 2) states of recognition. Experiment 1 replicated the standard finding showing that remembering and knowing were differently influenced by the word–nonword variable, whereas confidence responses were not. By contrast, Experiment 2 showed a similar pattern of data for remember–know and sure–unsure responses, thus demonstrating the importance of the instructions for interpreting the relationship between remembering and knowing and confidence.

1. Introduction

In 1985 Tulving proposed a method for studying two types of memory experiences, remembering and knowing. Remembering reflected conscious recollection of oneself in the past (called autonoetic consciousness, or self-knowing), while knowing reflected knowledge of the past in the absence of any contextually-bound recollection (called noetic consciousness, or knowing). Applied to a standard recognition memory experiment, a participant might indicate that she recognizes a particular item because she remembers making a personal association, for example, at the time of study. For other test items, she might simply recognize the item without any memory for the contextual details of having studied the item. In the latter case, the participant knows that she saw the item earlier, but she can not recall any specific details associated with studying that item. Hundreds of studies have demonstrated that participants regularly assign remember responses to some recognized items and know responses to others (Gardiner, Ramponi, & Richardson-Klavehn, 2002; McCabe, Roediger, McDaniel, & Balota, in press). Furthermore, certain variables influence remembering, whereas others influence knowing (see Roediger, Rajaram, & Geraci, 2007; Yonelinas, 2002 for reviews), suggesting that there is a legitimate and important difference between these two subjective experiences, although there is disagreement as to the nature of that difference.

Tulving originally proposed that the remember–know paradigm (1985) measured retrieval experiences associated with episodic and semantic memory systems, respectively. Over the last couple of decades other theories have been advanced to

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* Corresponding author.
E-mail address: lgeraci@tamu.edu (L. Geraci).

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explain remember and know responses. In general, one class of theories (which could be classified as dual state theories) describe remembering and knowing as output from different encoding or retrieval processes, whereby remembering and knowing reflect the result of conceptual and perceptual processes (e.g., Gardiner, 1988; Gardiner & Java, 1990; Rajaram, 1993), distinctive and fluent processes (e.g., Rajaram, 1996, 1998; Rajaram & Geraci, 2000) or recollective and automatic processes (e.g., Jacoby, Yonelinas, & Jennings, 1997). In all cases though, remember and know responses are viewed as reflecting two qualitatively different processes and resultant experiences.

In contrast, single process theories suggest that remembering and knowing reflect different levels of confidence associated with varying degrees of memory strength from a single memory process (Donaldson, 1996; Hirshman & Master, 1997; Inoue & Bellezza, 1998). By this view, participants use the terms remembering and knowing as proxies for high and low confident states of recognition. Remembering and knowing reflect a single memory process, with more information or a stronger trace leading to highly confident judgments of remembering, and less information or a weaker memory trace leading to a less confident judgments of knowing. Thus, according to this view, remember–know judgments reflect different levels of confidence associated with a single memory process.

Whether remembering and knowing are equivalent to confidence is debatable. Single-process views suggest that remember and know judgments are synonymous with confidence, whereas dual-process models typically view remembering and knowing as qualitatively different states associated with memory retrieval. There are data supporting each view. One factor that may be critical for this discussion, which has not received much attention, is the nature of the remember–know instructions given to participants. There are only a few published studies that have directly examined the influence of different remember–know instructions (Geraci & McCabe, 2006; McCabe & Geraci, 2009; Rotello, Macmillan, Reeder, & Wong, 2005), but descriptions of remember–know instructions in published papers suggest that there is wide variability across labs in the details of the remember–know instructions given to participants. This fact was confirmed by our examination of a series of remember–know instructions that we gathered from several prominent memory researchers. These instructions varied greatly in the detail that was given to participants, including some that briefly instructed participants to assign a remember response if one can remember contextual details or a know responses if one cannot remember those details. Other instructions seemed to simply reiterate the terms themselves, instructing participants to give a remember response when they were sure they remembered the word. Otherwise, they were to give a know response. Still other instructions told participants to give a remember response when they could recollect details of the study episode and to give a know response when they could not recollect details but the item seemed familiar. Finally, some instructions told participants to make remember responses when they could recollect details of the study episode and to give a know response when they knew with confidence they had seen the item but they could not recall the specific instance of studying the item. From these examples, it is clear that there is great variability across labs in how participants are instructed to assign remember and know responses.

One important issue regarding whether remembering and knowing are equivalent to confidence has to do with the definition of knowing in particular. As illustrated in the previous paragraph, it appears that knowing can be defined as either a high confidence or a low confidence state. Kelley and Jacoby captured these multiple definitions when they described knowing as "...the inability to recollect any details of the study presentation in combination with a feeling of familiarity or certainty that the word was studied" (1998, p. 134). Indeed, a handful of experimental results support the idea that know responses are sometimes defined as a high confident judgments, occasionally referred to as a just know state (see Barber, Rajaram, & Marsh, 2008; Conway, Gardiner, Perfect, Anderson, & Cohen, 1997; Herbert & Burt, 2004) and sometimes defined as lower confidence judgments, occasionally referred to as a familiar judgment in this case (e.g., Lindsay & Kelley, 1996). We suggest that whether knowing is defined as a relatively high or low confidence state of awareness may influence whether participants use the remember–know distinction as a proxy for confidence.

The current study examined the influence of remember–know instructions on the relationship between remember–know judgments and confidence. To do this, we used a manipulation that has been shown to dissociate remember–know and sure–unsure responses. Gardiner and Java (1990; see also Rajaram, Hamilton, & Bolton, 2002) found that remember–know and sure–unsure judgments were assigned to words and nonwords differently. Participants gave significantly more remember responses to words than nonwords, and significantly more know responses to nonwords than to words, whereas they gave more sure than unsure responses to both types of words. Thus, there was an interaction between remember–know judgments and words and nonwords, but only a main effect for sure–unsure judgments, suggesting that remember–know judgments are not analogous to confidence judgments (see Gardiner, 2001; Mantyla, 1997; Parkin & Walter, 1992; Rajaram, 1993 for other similar dissociations and Dunn, 2004, for a different interpretation of these data).

In the current studies, we used Rajaram et al.'s (2002) within-subjects variant of the Gardiner and Java (1990) paradigm. Participants studied and were tested on two lists containing words and nonwords across two study sessions. In session 1, they made remember–know judgments following recognition decisions and in session 2 (a week later), they made sure–unsure judgments following recognition judgments. In Experiment 1, participants received published remember–know instructions taken from Rajaram (1993; see also Appendix A). Critically, the instructions direct participants to give a know response "... if they are *certain* that they recognize the item, but it fails to evoke any specific conscious recollection from the study list" [emphasis added]. Thus, like remembering, knowing is described as a highly confident state of awareness. The key difference between remembering and knowing, then, is whether recognition is accompanied by conscious recollection of details from the study session. Thus, using these instructions, we expected to replicate previous findings that show a dissociation between remembering and knowing and sure–unsure judgments (Gardiner & Java, 1990; Rajaram et al., 2002).

Experiment 2 used a different set of remember–know instructions that defined knowing as a low confidence state of awareness. We attempted to find published instructions that were similar to the ones we had gathered informally. There were very few articles in which the remember–know instructions given to participants were included and it was not uncommon to find studies that simply stated that participants were given remember–know instructions (with no further details), or stated that remember–know instructions were based on published instructions (typically Rajaram, 1993 or Gardiner & Java, 1990). However, even in the latter case when the instructions were based on other published instructions, it was not clear how much the instructions adhered to the published ones. Therefore, we chose to use a set of instructions printed in Yonelinas (2001, p. 363; see also Appendix B) because these instructions were clearly included in the method section and because they appeared to meet our criteria of defining knowing as a less confident state of awareness than remembering. They were also fairly representative of several of the other instruction sets that we had gathered informally.

We predicted that results from Experiment 1 would show the expected dissociation between remembering and knowing and confidence using the word/nonword manipulation. In contrast, in Experiment 2, we expected to find the same pattern of data for remember–know responses as sure–unsure response, where people would give more remember responses to both types of words, which would be similar to the sure–unsure data.

2. Experiment 1

2.1. Method

2.1.1. Participants

Fifty Texas A&M University undergraduates participated for course credit. Sixteen people were excluded from the analyses because they did not demonstrate a proper understanding of either the RK or sure–unsure instructions when they were asked to explain their understanding of them after the recognition tests.

2.1.2. Design

This experiment used a 2×2 within-subjects design. Item type (word vs. nonword) and judgment type (remember–know and sure–unsure) were the within-subject variables.

2.1.3. Materials

Four study lists were derived from a set of 60 words and 60 nonwords taken from Rajaram et al. (2002). Study lists were counterbalanced for study status (studied vs. nonstudied) and metamemory judgment type (remember–know vs. sure–unsure). Following Rajaram et al. (2002), the remember–know instruction condition always preceded the sure–unsure instruction condition (see Appendix C for these instructions) with the assumption that participants' ability to make sure–unsure judgments would be relatively unaffected by having previously received remember–know instructions.

2.1.4. Procedure

Participants were tested individually across two study/test sessions that occurred 1 week apart. During session 1, participants were presented with a list of 30 items (15 words and 15 nonwords) shown one at a time on index cards (each item was presented for approximately 3 s, which was timed using a tape recorder that beeped at this timing). Participants were instructed to memorize the items for an upcoming memory test. Immediately following study, participants engaged in a conversation with the experimenter that was unrelated to the studied words for 10 min. After the retention interval, participants were read the remember–know instructions for the upcoming recognition test, which took approximately 5 min. The remember–know instructions were taken verbatim from Rajaram (1993). If participants were confused about the definitions of remembering or knowing, the experimenter clarified by simply rereading part of the instructions. To attempt to stay as close to the written instructions as possible, the experimenter did not elaborate on the definitions beyond what was provided in the written instructions. After hearing the instructions, participants began the recognition test. They were given a sheet of paper that included 60 items, randomly intermixed (15 studied words, 15 studied nonwords, 15 nonstudied words, and 15 nonstudied nonwords). Participants circled items that they recognized and wrote "remember" or "know" in the space provided next to each of the recognized items. The recognition test was self-paced but no one took longer than 10 min to complete the task.

One week later, participants returned for session 2 of the experiment. Participants studied a new list of 30 items (15 words and 15 nonwords). Following study, participants again engaged in a 10 min conversation with the experimenter and were then given instructions for the upcoming recognition test. This time, participants were instructed to make sure–unsure judgments for recognized items. Instructions for these judgments were taken from Gardiner and Java (1990). Again, participants were given a sheet of paper that included 30 studied items from session 2 (15 words and 15 nonwords) and 30 nonstudied items (15 words and 15 nonwords), randomly intermixed. Participants circled the words they recognized and wrote "sure" or "unsure" next to the recognized item in the space provided.

Once the test for session 2 was completed, participants were given a post-test questionnaire designed to assess their understanding of remember–know and the sure–unsure instructions. Three judges (two of the authors and one research assistant) scored the post-test questionnaires. In all cases, there was unanimous agreement on which participants did not

understand the instructions. Participants were removed from the following analyses if they did not appear to understand either the remember–know instructions or the confidence instructions.

2.1.5. Results and discussion

The alpha level was set at $p < .05$ for the following analyses. In all analyses we used remember–know responses as an independent variable because this variable can be considered to be an instruction manipulation, following the logic and the method of analyses outlined by Gardiner and Java (1990). First we examined the effect of judgment type (R/K vs. S/U) and item type (word vs. nonword) on memory performance. Results showed a main effect of judgment type, ($F(1, 35) = 14.05$, $MSE = .02$, $\eta_p^2 = .28$), showing that participants remembered more items overall when they made sure–unsure judgments than remember–know judgments. There was also a main effect of item type ($F(1, 35) = 24.14$, $MSE = .015$, $\eta_p^2 = .41$), showing that participants had better memory for words than nonwords overall. Importantly, the interaction between judgment type and item type was significant ($F(1, 35) = 5.23$, $MSE = .02$, $\eta_p^2 = .13$).

Following Gardiner and Java (1990; and Rajaram, Hamilton, and Bolton, 2002), we examined the pattern of remember and know responses that were given to studied words and nonwords using a 2×2 ANOVA (means are presented in Table 1). This analysis showed that there was a main effect of item type, $F(1, 35) = 9.57$, $MSE = .02$, $\eta_p^2 = .22$, but no effect of response type, $F(1, 35) = 1.12$, $MSE = .03$, $\eta_p^2 = .03$. There was a significant interaction, $F(1, 35) = 5.24$, $MSE = .04$, $\eta_p^2 = .13$, between the two variables. Planned comparisons showed that participants gave more remember responses than know responses to words, $F(1, 35) = 4.09$, $MSE = .05$, $\eta_p^2 = .11$. They gave slightly more know responses than remember responses to nonwords, but this difference was not significant, $F(1, 35) = 1.73$, $MSE = .02$, $\eta_p^2 = .05$.

Next, we examined the pattern of sure and unsure responses for words and nonwords. Using a 2×2 ANOVA, results showed that there was a main effect of item type, $F(1, 35) = 14.13$, $MSE = .02$, $\eta_p^2 = .29$, and a main effect of response type, $F(1, 35) = 92.34$, $MSE = .04$, $\eta_p^2 = .73$. The main effect of response type showed that people gave many more sure responses than unsure responses to both words and nonwords. We obtained an interaction, $F(1, 35) = 22.44$, $MSE = .02$, $\eta_p^2 = .39$, due to the very large number of sure responses for words compared to nonwords, following the results from the Rajaram et al. study. Nonetheless, the pattern of data showed that confidence was similarly affected by the word–nonword manipulation, as shown in Table 1. Planned comparisons confirmed this observation and indicating that participants gave more sure than unsure response to both words, $F(1, 35) = 131.69$, $MSE = .03$, $\eta_p^2 = .79$, and nonwords, $F(1, 35) = 19.90$, $MSE = .03$, $\eta_p^2 = .36$.

False alarms for remember–know responses and sure–unsure responses were low and similar to those reported by Gardiner and Java and Rajaram et al. (see Table 1). Taken together, the results very closely replicate those presented in Gardiner and Java (1990) and Rajaram et al. (2002).

There are additional ways to analyze theses data that are different from the method reported thus far and the method used in previous studies. In particular, we can also examine the effect of the word–nonword manipulation on accuracy (hits minus false alarms) for remember and know responses and also for sure and unsure responses. Results from this type of analysis can reveal whether the word–nonword variable influenced accuracy as well as the recollective experiences associated with studied and nonstudied items. We first examined the remember–know responses. Results from the 2×2 ANOVA (on item type on response type) showed main effects of item type, $F(1, 35) = 17.64$, $MSE = .02$, $\eta_p^2 = .34$, and response type, $F(1, 35) = 6.48$, $MSE = .04$, $\eta_p^2 = .16$. The interaction between the two variables approached significance $F(1, 35) = 3.26$, $p = .08$. The lack of a significant interaction between item type and response type for the remember–know accuracy data appears to be

Table 1
Experiment 1 mean response probabilities (remember/know and sure/unsure) for studied words and nonwords.

	Item type	
	Words	Nonwords
Response type		
Remember		
Hits	.36 (.21)	.22 (.16)
FAs	.02 (.04)	.02 (.05)
Know		
Hits	.25 (.17)	.27 (.14)
FAs	.05 (.07)	.10 (.12)
Response type		
Sure		
Hits	.55 (.19)	.35 (.23)
FAs	.02 (.04)	.04 (.06)
Unsure		
Hits	.12 (.08)	.16 (.10)
FAs	.06 (.08)	.09 (.09)

Note: Standard deviations are in parentheses.

due to the relatively high proportion of false alarms for know responses given to nonwords ($M = .10$), which is similar to the means for these items reported by Rajaram et al. ($M = .12$) and Gardiner and Java ($M = .12$). In the current study, subtracting the false alarms appeared to eliminate the small nonword advantage for know responses (more know responses than remember responses to nonwords), thereby eliminating the item type by response type interaction. Based on inspection of the means for Rajaram et al. (2002) and Gardiner and Java (1990), subtracting the false alarms from the hits would have eliminated the interaction in the Rajaram et al. study, but not the Gardiner et al. paper. In the Gardiner and Java paper, there appears to be a strong interaction between the two variables on accuracy.

We conducted the same analysis on sure and unsure responses. Results showed main effects of items type, $F(1, 35) = 20.06$, $MSE = .02$, $\eta_p^2 = .36$, and response type, $F(1, 35) = 124.16$, $MSE = .04$, $\eta_p^2 = .78$, and a significant interaction between the two variables, $F(1, 35) = 17.75$, $MSE = .03$, $\eta_p^2 = .34$. The corrected sure estimate ($M = .53$; $SD = .19$) was greater than the corrected unsure estimate ($M = .06$; $SD = .11$) for words, $F(1, 35) = 144.40$, $MSE = .03$, $\eta_p^2 = .81$, and the corrected sure estimate ($M = .33$; $SD = .18$) was also greater than the corrected unsure estimate ($M = .07$; $SD = .11$) for the nonwords, $F(1, 35) = 32.14$, $MSE = .03$, $\eta_p^2 = .48$. As with the studied item analyses of the sure–unsure data, the interaction appears to be driven by the very high level of sure responses given to studied items (see also Rajaram et al., 2002). Thus, the data appear to be mixed with respect to whether the word–nonword manipulation influences accuracy in a manner similar to studied items. Nonetheless, our results show that when people correctly recognize items, they tend to indicate that they remember words but know nonwords, as in previous studies. For our purposes, it is sufficient to simply replicate this finding to then compare these results to those using a different set of remember–know instructions. This was the goal of Experiment 2.

3. Experiment 2

3.1. Method

3.1.1. Participants

Forty-five Texas A&M University undergraduates participated for course credit. Nine people were excluded from the analyses because they did not understand the remember–know or sure–unsure instructions.

3.1.2. Design

This experiment used the same design as Experiment 1: a 2×2 within subjects design with item type (word vs. nonword) and judgment type (remember–know and sure–unsure) as the within subject variables.

3.1.3. Materials and procedure

The materials and procedure were the same as those used in Experiment 1 with the exception that a different set of remember–know instructions were used (Yonelinas, 2001).

3.1.4. Results and discussion

As in Experiment 1, we first examined the effect of judgment type (remember–know vs. sure–unsure) and item type (word vs. nonword) on memory performance. Results showed a main effect of judgment type, $F(1, 35) = 13.54$, $MSE = .01$, $\eta_p^2 = .28$, indicating that participants recognized more items overall when they made sure–unsure judgments compared to remember–know judgments. There was no main effect of item type, $F(1, 35) = 1.45$, $MSE = .02$, $\eta_p^2 = .04$, and no interaction between judgment type and item type, $F(1, 35) = 1.65$, $MSE = .02$, $\eta_p^2 = .05$, showing that, unlike the results from Experiment 1, sure–unsure and remember–know instructions similarly influenced memory for words and nonwords using this set of remember–know instructions.

Following Gardiner and Java (1990) and Rajaram, et al. (2002), we examined the pattern of remember and know responses that were given to studied words and nonwords for each judgment task (remember–know and sure–unsure) separately using a 2×2 ANOVA. Using this second set of remember–know instructions, results showed that there was an effect of response type ($F(1, 35) = 9.54$, $MSE = .04$, $\eta_p^2 = .21$), but no effect of item type ($F(1, 35) < 1$), and no interaction between the two variables ($F(1, 35) < 1$). The means are presented in Table 2.

Next, we examined the pattern of sure and unsure responses for words and nonwords. The pattern of sure and unsure responses was similar to the pattern of data for remember and know responses just reported. Using a 2×2 ANOVA, results showed that there was a main effect of response type, $F(1, 35) = 66.86$, $MSE = .05$, $\eta_p^2 = .66$, but no effect of item type, $F(1, 35) < 1$, $MSE = .01$, $\eta_p^2 = .03$. As in Experiment 1 (see also Rajaram et al. results), there was an interaction between the two variables, $F(1, 35) = 13.40$, $MSE = .02$, $\eta_p^2 = .28$, due again to the very high number of sure responses to words. Planned comparisons showed that people gave more sure responses than unsure responses to both words, $F(1, 35) = 69.52$, $MSE = .04$, $\eta_p^2 = .67$, and nonwords, $F(1, 35) = 27.37$, $MSE = .03$, $\eta_p^2 = .44$. As can be seen from the means, the significant interaction appears to be driven by the high number of sure responses to the words. But again, results replicated Experiment 1 and showed that confidence was similarly affected by the word–nonword manipulation. Thus, the sure–unsure pattern of data are very similar to the remember–know data (see Table 2) using this set of instructions.

Again, false alarms for remember–know responses and sure–unsure responses were low and similar to those reported by Gardiner and Java (1990), Rajaram et al. (2002), and Experiment 1 of the current paper (see Table 2).

Table 2
Experiment 2 mean response probabilities (remember/know and sure/unsure) for studied words and nonwords.

	Item type	
	Words	Nonwords
Response type		
Remember		
Hits	.32 (.23)	.29 (.17)
FAs	.01 (.03)	.04 (.06)
Know		
Hits	.21 (.15)	.20 (.13)
FAs	.04 (.05)	.09 (.09)
Response type		
Sure		
Hits	.49 (.21)	.39 (.17)
FAs	.04 (.09)	.06 (.11)
Unsure		
Hits	.12 (.11)	.19 (.11)
FAs	.06 (.07)	.10 (.08)

Note: Standard deviations are in parentheses.

As in Experiment 1, we also analyzed accuracy data. Results from the 2 × 2 ANOVA (on item type and response type) showed main effects of item type, $F(1, 35) = 9.90$, $MSE = .01$, $\eta_p^2 = .22$, and response type, $F = 15.76$, $MSE = .04$, $\eta_p^2 = .31$, but no interaction between the two variables, $F(1, 35) < 1$. For words, means were .30 ($SD = .23$) for remember estimates and .18 ($SD = .15$) for know estimates. For nonwords, means were .26 ($SD = .14$) for remember estimates and .11 ($SD = .13$) for know estimates. We conducted the same analysis on sure and unsure estimates. Results showed main effects of items type, $F(1, 35) = 4.66$, $MSE = .02$, $\eta_p^2 = .12$, and response type, $F = 92.83$, $MSE = .04$, $\eta_p^2 = .73$, and a significant interaction between the two variables, $F(1, 35) = 8.85$, $MSE = .02$, $\eta_p^2 = .20$. Sure estimates ($M = .45$; SD = .23) were greater than unsure estimates ($M = .06$; $SD = .09$) for words, $F(1, 35) = 78.68$, $MSE = .04$, $\eta_p^2 = .69$, and sure estimates ($M = .33$; SD = .18) were also greater than unsure estimates ($M = .08$; $SD = .11$) for nonwords, $F(1, 35) = 42.72$, $MSE = .03$, $\eta_p^2 = .55$. Examination of the means shows that the significant interaction appears to be driven by the very high sure responses to the words. Nonetheless, the pattern is similar for words and nonwords, with remembering being associated with both types of items more than knowing. This pattern was obtained for the remember–know and sure–unsure responses given to the studied items and the accuracy data. These data suggest that, unlike the pattern of data from Experiment 1, the remember–know instructions used in Experiment 2 influenced performance in a manner similar to the sure–unsure instructions.

4. General discussion

The results indicate that instructions influence whether remembering and knowing appear to simply reflect differences in confidence associated with recognition of studied items. In Experiment 1, using instructions that defined knowing as a high confidence response yielded a pattern of remember–know responses that differed from the pattern of sure–unsure judgments. By contrast, in Experiment 2, using instructions that defined knowing as a lower confidence state yielded a pattern of remember–know responses that was similar to the pattern of sure–unsure responses.

These data demonstrate the importance of considering the role of remember–know instructions in developing theories of remembering and knowing, particular in relation to confidence. As such, these data add to the body of literature showing that variations in remember–know instructions can influence the data and subsequent conclusions researchers draw. Many published studies use different remember–know instructions and differences in instructions may lead to different findings for similar independent variables, which may complicate our understanding of the relationship between remember–know judgments and confidence.

The current data add a growing body of evidence demonstrating the importance of considering the role of the type of remember–know instructions given to participants. Remember–know instructions have been varied using either a one-step procedure in which participants are instructed to choose whether a test item is remembered, known, or new, or a more common two-step procedure in which participants first make a yes–no recognition judgment followed by a remember–know judgment (e.g., Dewhurst, Holmes, Brandt, & Dean, 2006; Eldridge, Sarfatti, & Knowlton, 2002; Hicks & Marsh, 1999). This work shows that using a one-step, or simultaneous, judgment procedure may make participants more liberal in their recognition and judgment responses (e.g. Hicks & Marsh, 1999). Remember–know instructions also sometimes include a third "guess" response, which can help ensure that remember–know judgments reflect actual recognition responses, rather than guessing (e.g., Gardiner, Ramponi, and Richardson-Klavehn, 1998). Furthermore, participants have also been instructed to distinguish between knowing in the familiarity sense and knowing (or just knowing) in the semantic sense of word (e.g. Barber et al., 2008; Conway et al., 1997), and this work shows that participants use familiarity differently than they

use just knowing. In addition, other work shows that reports of false remembering are reduced with slight changes to remember–know instructions (Geraci & McCabe, 2006; McCabe et al., in press). Finally, still other studies have included other states of awareness, such as believing, as response options (Guillory & Geraci, 2009).

The current study manipulated instructions and showed that, whether remember–know responses reflect differences in confidence may depend on the type of instructions. Previous studies have demonstrated that remembering and knowing are dissociable from confidence (Gardiner & Java, 1990; Rajaram et al., 2002) based on the pattern of results for hits. Certainly, the items that participants correctly endorse as studied do show a different pattern of data for remember–know and confidence judgments. However, in the current study, if one were to focus on accuracy (hits minus false alarms) the instruction manipulation does not change the pattern of data substantially. In both instruction conditions, remember and know judgments were numerically greater for words than nonwords, similar to the pattern obtained with confidence judgments. This pattern appears for the accuracy data presented in Rajaram et al. (2002) study, but not in the Gardiner and Java (1990) study. In the Gardiner and Java study, remembering and knowing are dissociated from confidence even when accuracy scores are calculated. In terms of the influence of various remember–know instructions, our data indicate that on a practical note, the instructions given to participants may not have as great an influence across labs if overall accuracy is assessed. Of course, for those who are interested in the subjective experience associated with studied items that people claim to remember, the way in which remember know responses are assigned to studied items is crucial to theory development. Thus, the accuracy data may not provide much leverage with respect to understanding the subjective experience associated with studied items.

One interesting data point to come from the current study was the number of participants who did not understand how to apply the remember–know or confidence responses, as intended by the experimenter. Based on participants' responses to the post-test questionnaire, approximately one-fifth of the participants in each study did not understand either the remember–know or the confidence instructions. In Experiment 1, 11 out of the 50 participants who were run in the experiment did not understand the remember–know instructions and 4 did not understand the confidence instructions (1 person did not understand either set of instructions). In Experiment 2, nine out of the 45 participants who were run did not understand the remember–know instructions. All of the participants in Experiment 2 understood the confidence instructions. In a recent study, we found that participants used remember–know responses more accurately when they were given neutral terminology (type A memory vs. type B memory), rather than "remember" and "know" terms, which have many different colloquial meanings (McCabe & Geraci, 2009). Further, participants were more accurate in their responses when the instructions also explicitly directed participants to constrain their remember responses to information from just the study episode, rather than generally explaining the qualitative differences in the experiences of remembering and knowing. Thus, instructions can be critically important when assessing remembering and knowing, and it is critical the consider the potential influence of the specific instructions used across remember–know studies. The current study joins a growing list of studies demonstrating that the remember–know instructions given to participants can have important theoretical implications for our understanding of the relationship between remembering and knowing and confidence.

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Appendix A. Experiment 1: Remember–know instructions

This is a memory test. On the sheet you will see a list of items. Please indicate, yes or no, whether you recognize each item as having been presented earlier during the study session. If you recognize the item from the study list, you should circle it. If you do not recognize the item you should simply leave it alone and move on to the next item. You will not be prompted to make your recognition judgments. Rather, upon seeing the item, you should simply decide whether or not you studied that item earlier. If you recognize the word, then please judge whether you Remember the item from the list or you know it was there. The following descriptions will help you make the distinction between these two post-memory judgments.

You should make a remember judgment if you can consciously recollect its prior occurrence. Remember is the ability to become consciously aware again of some aspect or aspects of what happened or what was experienced at the time the word was presented (e.g., aspects of the physical appearance of the item, or of something that happened in the room, or of what you were thinking or doing at the time). In other words, the "remembered" word should bring back to mind a particular association, image, or something more personal from the time of study, or something about its appearance or position (i.e., what came before or after that word).

You should make a know judgment if you recognize the item from the study list, but you cannot consciously recollect anything about its actual occurrence or what happened or what was experienced at the time of its occurrence. In other words, write "know" when you are certain that you recognize the item, but it fails to evoke any specific conscious recollection from the study list.

To further clarify the difference between these two judgments (remembering and knowing) here are a few examples. If someone asks for you name, you would typically respond in the "know" sense, without becoming consciously aware of anything about a particular event or experience. However, when asked the last movie you saw, you would typically respond in the "remember" sense, that is, becoming consciously aware again of some aspects of the experience of seeing the movie.

Now, I will ask you to describe instances from your own life that you would classify as Remember responses and Know responses to make sure that the distinction between these two states is clear. (At this point stop and ask subjects for examples using both categories.)

To reiterate, you will see a list of items and you will judge "yes" or "no" whether you recognize the words as having been presented earlier. If you indicate that you do recognize the word, by circling it, then you will try to indicate *how* you recognize the particular word, by writing remember or know on the blank. Importantly, if you indicate that you do not recognize the word, then you will simply move on to the next item since it will not be relevant (you can't remember a word that you said you did not study!). Please think carefully about each item and try not to guess.

On the count of three, you may begin. One, two, three,. . ..

Appendix B. Experiment 2: Remember–know instructions

This is a memory test. I will give you a sheet of paper with several words on it. Circle the words that you recognize as having been presented earlier during the study session. If you do not recognize the item you should simply leave it alone and move on to the next item. If you recognize and circle the word, then please judge whether you remember the item from the list or you know it was there. The following descriptions will help you make the distinction between these two post-memory judgments.

You should make a remember judgment if you can remember some qualitative information about the study event. This could include such things as recollecting what you were thinking about when the word was presented, what the word looked like, or what it sounded like. Moreover, you should write "remember" on the blank only if you can, if asked, tell the experimenter what you recollected about the study event.

You should respond know, by writing "know" on the blank, if you think the item was studied but you cannot recollect any details about the study event.

To reiterate, you will see a series of items and you will circle words that you recognize as having been presented earlier. If you indicate that you do recognize the word, by circling it, then you will also try to indicate *how* you recognize the particular word, by writing remember or know on the blank. For those items you do no recognize you should not circle the item or fill in the blank. Simply leave the item unmarked. Think carefully about each item and try not to guess. Also, please work on one item at a time, and make both the recognition and Remember or Know judgment together.

On the count of three you may begin. One, two, three,. . ..

Appendix C. Confidence instructions

This is a memory test. On the sheet you will see a list of items. Please indicate, yes or no, whether you recognize each item as having been presented earlier during the study session. If you recognize the item from the study list, you should circle it. If you do not recognize the item you should leave it alone and move on to the next item. You will not be prompted to make your recognition judgments. Rather, upon seeing the item, you should simply decide whether or not you studied that item earlier. If you recognize the item, then please indicate how confident you are that you studied the item earlier. If you are confident that you saw the item earlier, then you would write "sure" on the blank next to the item to indicate that you are sure that you studied that item earlier. If you are not confident that you saw that particular item earlier, then you should write "unsure" to indicate that you are unsure. After making this judgment you may proceed to the next item

To reiterate, you will see a list of items and you will judge "yes" or "no" whether you recognize the word as having been presented earlier. If you indicate that you do recognize the word, by circling it, then you will try to indicate how confident you are that you recognize that particular item, by writing "sure" or "unsure". Importantly, if you indicate that you do not recognize the word, then you will simply leave it alone and move on to the next item. That is, you will only make the sure–unsure decision if you indicate that you studied the item. Please think carefully about each item and try not to guess.

On the count of three you may begin. One, two, three,. . ..

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