

Achievement Motivation and Memory: Achievement Goals Differentially Influence Immediate and Delayed Remember–Know Recognition Memory

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Abstract

Little research has been conducted on achievement motivation and memory and, more specifically, on achievement goals and memory. In the present research, the authors conducted two experiments designed to examine the influence of mastery-approach and performance-approach goals on immediate and delayed remember–know recognition memory. The experiments revealed differential effects for achievement goals over time: Performance-approach goals showed higher correct remember responding on an immediate recognition test, whereas mastery-approach goals showed higher correct remember responding on a delayed recognition test. Achievement goals had no influence on overall recognition memory and no consistent influence on know responding across experiments. These findings indicate that it is important to consider quality, not just quantity, in both motivation and memory, when studying relations between these constructs.

Keywords

memory, achievement motivation, achievement goals, remembering and knowing, memory consolidation

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Although once controversial, the premise that motivation has an important affect on cognitive processing is now widely accepted in scientific psychology (Kunda, 1990). Numerous investigators using a variety of paradigms across multiple disciplines have documented motivational influences on perception, attention, memory, decision making, and problem solving (for reviews see Dunning, 1999; Proffitt, 2006). Of these foci, research on motivation and memory has received a relative dearth of empirical attention, and the literature at present remains at a nascent level of development. The present research seeks to address this issue, focusing specifically on the link between achievement motivation and memory.

Achievement motivation represents the energization and direction of competence-relevant behavior (McClelland, 1985). The achievement goal construct has been the centerpiece of the achievement motivation literature for the past two decades; an achievement goal is a cognitive-dynamic purpose or aim focused on a distinct type of competence. The foundational model of achievement goals, the dichotomous model, distinguishes between two types of goals: mastery approach and performance approach (Dweck, 1986). Mastery-approach goals focus on the development of competence (e.g., trying

to master a task or do better than before), whereas performance-approach goals focus on the demonstration of normative competence (e.g., trying to do better than others). The type of achievement goal that one pursues establishes a framework for how one construes and engages in achievement tasks, and different achievement goals have been shown to have different effects on competence-relevant outcomes (see Elliot & McGregor, 2001; Kaplan & Maehr, 2007).

Competence plays an inherent and integral role in the storage, retention, and retrieval of information, and it seems likely that the type of competence that one pursues during task engagement influences these competence-based memory processes. Nevertheless, little empirical work has been conducted on the relation between achievement goals and memory, and the results that have emerged have been difficult to interpret.

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Graham and Golan (1991) manipulated mastery-approach and performance-approach goals and examined their influence on recall; they found that mastery-approach, relative to performance-approach, goals enhanced cued recall for material acquired during deep processing. Barker, McInerney, and Dowson (2002) sought to replicate the Graham and Golan finding, but instead obtained null results. Escribe and Huet (2005) measured mastery-approach and performance-approach goals and subsequently manipulated participants' dominant goal prior to a free recall task; null effects were observed. Thus, the research to date has failed to produce any clear, replicable links between achievement goals and memory.

The extant research is disappointing, but also meager, and we continue to think it likely that achievement goal pursuit has important implications for memory. As such, in the present research, we conducted two experiments designed to examine this issue, focusing specifically on the influence of mastery-approach and performance-approach goals on recognition memory. In our experiments, we attended to a methodological problem in the prior empirical work, and we incorporated two important conceptual distinctions from the memory literature that had not been considered in the prior work.

With regard to methodology, the achievement goal manipulations (and measures) used in the prior research included many different components, several of which would not be considered part of the achievement goal construct in the contemporary literature (e.g., a positive competence expectancy ["You will probably get better as you go along"] for mastery-approach goals and entity theorizing ["People are either good at these activities . . . or they are not"] for performance-approach goals; Graham & Golan, 1991, p. 189; see Elliot & Murayama, 2008). In our experiments, we took care to exclude those constructs from the manipulation and to limit our manipulations to what have historically been considered the core features of mastery-approach and performance-approach goals. That is, the mastery-approach goal manipulation focused on the goal of attaining task or self-based competence to develop one's own competence (i.e., the focus was on participants' own competence), whereas the performance-approach goal manipulation focused on the goal of attaining normative competence to demonstrate one's competence (i.e., the focus was on comparing participants' competence to the competence of others). This closer correspondence between conceptualization and operationalization should yield a clearer and more powerful test of the achievement goal-memory link.

In the memory literature, responses on immediate and delayed memory tests are presumed to reflect qualitatively distinct representations, with the former reflecting an initial trace that is fragile and unstable and the latter reflecting a reorganized representation that is more consolidated and less susceptible to loss (Hamann, 2001; Squire, 1992). Mastery-approach and performance-approach goals both represent appetitive investments in competence (Elliot, 1999), and, accordingly, both can facilitate elaborative learning processes in achievement settings. However, the two goals facilitate different types of

elaborative processes. Mastery-approach goals are linked to curiosity and exploration and an interest-based focus on learning (Hulleman, Durik, Schweigert, & Harackiewicz, 2008). Thus, mastery goals may facilitate a broad scope of attention beyond the target items to ideas and images associated with the target items in some way. This greater number of associations may not promote immediate retention but should enhance the likelihood that some of these associations are consolidated and preserved over time, thereby promoting long-term retention. In contrast, performance-approach goals are linked to high performance aspirations and expectations and persistent learning independent of interest (McGregor & Elliot, 2002). Thus, performance goals may encourage narrower, instrumentally oriented attention to the specific items to be remembered (Elliot, Shell, Henry, & Maier, 2005). This concentrated focus could help promote immediate recognition of to-be-remembered items, but given the meager associations to other contextual cues, retention is likely to decline rapidly over time.

Memory theorists distinguish between two subjective components of recognition memory, namely, remembering and knowing (Tulving, 1985). Gardiner (1988) has offered definitions of remembering and knowing that have guided empirical work in this area. Remembering is defined as being consciously aware of some aspect or aspects of what occurred or was experienced at the time a test item was first presented, whereas knowing is defined as recognizing that a test item was presented earlier without being able to consciously recollect anything about its actual occurrence or what was happening at that time. In the standard remember-know procedure, participants are asked to report, for items that they are able to recognize, whether their recognition is accompanied by a recollection of specific details of the study event or not. If so, participants are presumed to "remember" that the item was presented; if not, they are presumed to "know" that the item was presented. A vast amount of research has demonstrated that various experimental manipulations have a differential impact on remember and know responses, indicating that remembering and knowing represent qualitatively distinct aspects of recognition memory (Dewhurst & Conway, 1994; Diana, Reder, Arndt, & Park, 2006; Murayama, 2006; Rajaram, 1996; see Malmberg, 2008, for ongoing debate). In addition, although some researchers point to the similarity between remembering/knowing and memory indices assessed by other procedures (e.g., receiver operating characteristic analysis, a process dissociation procedure, or a source monitoring task; see Mitchell & Johnson, 2009; Yonelinas, 2001), the remember-know procedure produces unique indices of memory in that it captures the subjective states of awareness associated with memory recollection (Gardiner & Richardson-Klavehn, 2000; Murayama, 2006; Tulving, 1985; for research on neural dissociation of these indices, see Spaniol et al., 2009). Remember responses seem particularly sensitive to experimental manipulation, revealing effects that would go undetected with a sole reliance on overall memory measures (see Gardiner & Java, 1993). Attending to the remember-know distinction in the present research should,

therefore, provide a more fine-grained analysis of the influence of achievement goals on memory, with effects most likely to be observed for remember responding.

In the present research we conducted two experiments designed to examine the affect of mastery-approach and performance-approach goals on immediate and delayed remember-know recognition memory. We anticipated that performance-approach goals (relative to mastery-approach goals) would lead to greater remembering (but not knowing) on the immediate test but that mastery-approach goals (relative to performance-approach goals) would lead to greater remembering (but not knowing) on the delayed test. We also began our empirical investigation utilizing both deep- and shallow-processing tasks, as this is one of the key and most examined factors in memory research (Brown & Craik, 2000). Given our contention that the different effects of the two achievement goals come from the different forms of elaborative processing, we anticipated that the time-dependent effects of achievement goals on remember-know responding would be manifest in only elaborative (i.e., deep) processing tasks (not in shallow-processing tasks).

Experiment 1

Method

Participants. For course credit, 94 undergraduates from a private university in Japan participated in the study.

Materials. From a large pool of Japanese words (Ogawa & Inamura, 1974), 72 Japanese common nouns were selected. The words were divided into six lists of the same length with approximately the same average word frequency. Half of the lists were used in an immediate recognition test (the first test session), and the other half were used in a delayed recognition test (the second test session). In each set of three lists, words from one list were presented in a word generation task, words from a second list were presented in a stroke counting task, and words from a third list were used as lures on the recognition tests. Another eight Japanese common nouns were used as filler items in the study session to prevent primacy and recency effects. In addition, a different set of four Japanese common nouns that were difficult to generate or stroke count were used as filler items in the study session; these were included to increase the subjective difficulty of the learning process to enhance the credibility of the performance-approach goal manipulation (i.e., the task needed to be perceived as difficult enough to yield variability in performance across individuals). Half of the filler words were presented as part of a word generation task, and half were presented as part of a stroke counting task. Note that we used different words for the immediate and delayed recognition tests to prevent possible confounding through word repetition. All of the words used in the experiment were three to six katakana characters in length.

Procedure. Participants sat in front of a computer monitor and were given a booklet for the study session. At the beginning

of the session, participants were instructed to carefully read the first page of the booklet where the experiment was described. In the mastery-approach goal condition, participants were told that they would be presented with a number of simple word problems and that solving the problems could help them develop their cognitive ability. At the end of the goal description, they were encouraged to concentrate on the task and to do their best to develop their cognitive ability. In the performance-approach goal condition, participants were told that they would be presented with a number of simple word problems and that solving the problems could help them demonstrate their word processing ability in comparison with other university students in Japan. At the end of the goal description, they were encouraged to concentrate on the task and to do their best to perform better than other university students.

In the study session, the word generation and stroke counting items were presented on the computer screen alternately at the rate of 6 seconds per item. Each item was preceded by a cue (2 seconds) that indicated the type of item to follow. In the word generation task, a fragment of a Japanese word (written in katakana characters) and a clue that helped complete the fragmented word (e.g., “The name of our country” to induce the target word “Japan”) were presented. The clues used in the word generation task were pilot tested to ensure that participants would generate the same target word. Words that were not generated or that were different from the target word were excluded from the analysis. Participants were instructed to complete the word and write it in their booklet (in katakana characters). In the stroke counting task, a Japanese word written in hiragana characters (a different style of Japanese characters) was presented, and participants were instructed to write the word in their booklet in katakana characters while counting the number of katakana strokes. No mention had been made of the recognition test at this point.

In between the study session and the first test session, there was a 10-minute interval, during which participants completed a questionnaire. Most of the questionnaire was composed of filler items, but two items asked participants about the goal that they pursued during the study session (“I did the task with the goal of developing my cognitive ability,” hereafter called the mastery-approach goal item, and “I did the task with goal of performing better than other students,” hereafter called the performance-approach goal item). Participants answered the items on a 1 (*strongly disagree*) to 5 (*strongly agree*) scale.

In the first test session, participants were first informed that the (achievement goal) instructions that they were given earlier were irrelevant to the upcoming task. Then participants completed a recognition test in which all of the test words were presented pseudo-randomly on the computer screen at the rate of 10 seconds per item. Participants were instructed to indicate whether the test words had been presented in the study session or not. For the words that they recognized from the study session, they were further asked to make “remember” or “know” judgments. The remember and know judgments were made on an item-by-item basis; that is, if an item was recognized,

Table 1. Experiment 1: Mean Proportion of Correct Responses as a Function of Achievement Goals

	Stroke counting task				Word generation task			
	Mastery-approach goal		Performance-approach goal		Mastery-approach goal		Performance-approach goal	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Immediate test								
Recognition	0.59	0.19	0.58	0.15	0.91	0.09	0.92	0.07
Remember	0.27	0.19	0.29	0.16	0.68	0.23	0.76	0.13
Know	0.32	0.19	0.30	0.16	0.23	0.21	0.16	0.11
Delayed test								
Recognition	0.50	0.16	0.45	0.19	0.66	0.17	0.63	0.20
Remember	0.09	0.11	0.05	0.07	0.21	0.21	0.15	0.14
Know	0.40	0.14	0.39	0.16	0.45	0.19	0.48	0.18

participants made the remember or know response to it before responding to the next item. "Remember" and "know" were defined for participants both verbally and in writing; the definitions and instructions that we used were based on prior research (Dewhurst & Conway, 1994; Gardiner, 1988) and were taken verbatim from the appendix of Rajaram (1996). In these definitions and instructions, participants were told that a remembered word should bring to mind a particular association or image from the time of initial presentation (e.g., the position of the word or what came before or after the word). They were also told that a know response should be made when they are certain of recognizing a word but the word fails to evoke any specific conscious recollection from the initial presentation. After receiving the definitions and instructions, participants were encouraged to ask questions about the remember-know distinction, and, if needed, the experimenter clarified the information further before the test phase began.

The second test session took place exactly 1 week after the first test session; the procedure was the same as that used in the first test session. No mention of the second test session was made in advance; participants were simply scheduled to return a week later for an unrelated purpose.

Results and Discussion

Two participants did not come to the second test session, and one participant indicated that she could not understand the instructions of the second test session; these individuals were omitted from analyses involving the second test session. One participant completed the items in the booklet in an incorrect order; this individual was omitted from the analyses. In this and the following experiment, outlying values identified through Grubbs's (1950) test (a univariate statistical test used to detect outliers that substantially deviate from the normal distribution) were excluded. The mastery-approach goal item yielded a significant difference between the mastery-approach goal ($M = 3.90$, $SD = 0.66$) and performance-approach goal

($M = 3.10$, $SD = 1.12$) conditions, $F(1, 92) = 17.02$, $p < .01$. The performance-approach goal item also yielded a significant difference between the mastery-approach goal ($M = 2.55$, $SD = 0.99$) and performance-approach goal ($M = 3.15$, $SD = 1.24$) conditions, $F(1, 92) = 6.59$, $p < .05$. These results indicate that the achievement goal manipulation was successful. The two achievement goal items were uncorrelated ($r = -.04$).

Achievement goals and recognition memory. The results for the recognition tests are presented in Table 1. The data were analyzed separately for each type of task. A 2 (achievement goal: mastery approach vs. performance approach) \times 2 (time interval: immediate test vs. delayed test) mixed model ANOVA on overall recognition performance revealed a significant time interval effect for both the stroke counting task, $F(1, 84) = 28.15$, $p < .01$, and the word generation task, $F(1, 88) = 164.94$, $p < .01$; participants did better on the immediate test than on the delayed test for both tasks. Neither the main effect of achievement goal condition nor the Achievement Goal \times Time Interval interaction was significant for either task ($F_s < 2.15$). Thus, achievement goals did not significantly influence overall recognition performance.

However, when the recognition data were broken down by remember and know responses, significant effects were obtained. A 2 (achievement goal: mastery approach vs. performance approach) \times 2 (time interval: immediate test vs. delayed test) \times 2 (response type: remember vs. know) mixed model ANOVA revealed a significant three-way interaction for the word generation task, $F(1, 87) = 8.12$, $p < .01$. A simple interaction effect analysis showed a significant Achievement Goal \times Time Interval interaction for remember responses, $F(1, 174) = 9.38$, $p < .01$. Specifically, post hoc tests within each test session revealed that participants in the performance-approach goal condition had more correct remember responses than those in mastery-approach goal condition on the immediate test, $F(1, 91) = 4.50$, $p < .05$, $d = 0.45$. On the delayed test, however, participants in the mastery-approach goal condition tended to have more correct remember responses than those in the performance-approach goal condition (see Figure 1),

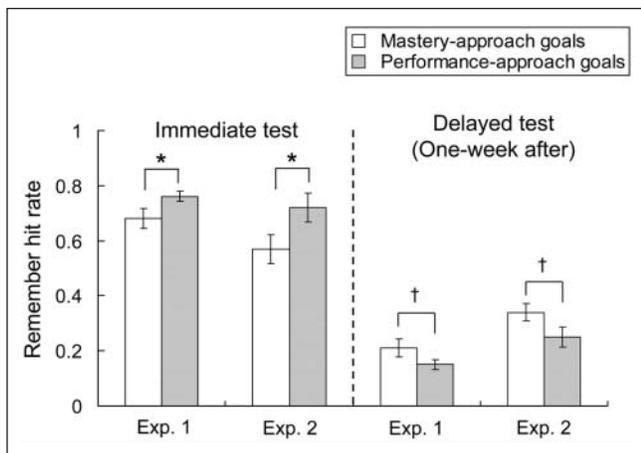


Figure 1. Correct remember response rates as a function of achievement goal manipulation and time interval from Experiments 1–2

Error bars indicate standard errors.

† $p < .10$. * $p < .05$.

$F(1, 88) = 3.20, p = .08, d = 0.39$. Another simple interaction analysis revealed a significant Achievement Goal \times Time Interval interaction for know responses, $F(1, 174) = 3.90, p < .05$. Specifically, post hoc tests within each test session revealed a significant effect of achievement goals on know responses in the immediate test session, $F(1, 91) = 4.18, p < .05, d = 0.48$, indicating that participants in the mastery-approach goal condition had more correct know responses than those in the performance-approach goal condition.¹ Null effects were obtained on know responses in the delayed test session ($F < 1$).

In contrast to the word generation task, the $2 \times 2 \times 2$ mixed model ANOVA for the stroke counting task revealed no significant main or interactive effects involving achievement goal condition ($F_s < 2.15$). This supports our prediction that the effect of achievement goals would be manifest only in the elaborative processing task.

False alarm rate analyses. We conducted supplementary analyses testing for achievement goal differences in the false alarm rate. The false alarm analyses for the immediate test revealed no difference in the false remember rate between the mastery-approach goal ($M = 0.03, SD = 0.05$) and performance-approach goal ($M = 0.03, SD = 0.04$) conditions, nor the false know rate between the mastery-approach goal ($M = 0.06, SD = 0.08$) and performance-approach goal ($M = 0.05, SD = 0.08$) conditions ($F_s < 1$). Likewise, the false alarm analyses for the delayed test revealed no difference in the false remember rate between the mastery-approach goal ($M = 0.04, SD = 0.07$) and performance-approach goal ($M = 0.04, SD = 0.06$) conditions ($F < 1$). However, there was a significant difference in the false know rate between the mastery-approach goal ($M = 0.29, SD = 0.16$) and performance-approach goal ($M = 0.23, SD = 0.13$) conditions, $F(1, 89) = 4.13, p < .05, d = 0.43$. Accordingly, we reanalyzed the know responses on the delayed test after correcting for false

alarms (i.e., we used hit rate – false alarm rate). Using these corrected know responses did not change the significance of the results reported in the primary analyses.

In sum, the results of this experiment indicated that achievement goals had no significant effects on overall recognition performance. However, by breaking down overall recognition performance into remember and know responses, we were able to document significant effects of achievement goals. Specifically, when immediate recognition memory was tested, we found that performance-approach, relative to mastery-approach, goals enhanced remember responses to words presented in a deep-processing task. When delayed recognition memory was tested, however, we found that mastery-approach, relative to performance-approach, goals tended to show higher remember responses in a deep processing task.

Experiment 2

The aim of Experiment 2 was to examine whether the findings of Experiment 1 would replicate with a somewhat different procedure in a sample from a different country (the United States) to examine the replicability and generalizability of the findings. We used a deep processing (word generation) task alone because it is on this task that the primary effects were observed in the previous experiment.

Method

Participants. For extra course credit, 60 undergraduates from a private university in the United States who were fluent in English participated in the study.

Materials. A set of 120 English common nouns used in the word generation task of an experiment by Masson and MacLeod (1992) was used in this experiment. The words were divided into six lists of the same length with approximately the same average word frequency. Half of the lists were used in an immediate recognition test (the first test session), and the other half were used in a delayed recognition test (the second test session). In each set of three lists, words from two of the lists were presented as a word generation task, and words from the third list were used as lures on the recognition tests. For each participant, the lists were rotated so that all of the words were used equally in different conditions across participants. As in the prior experiments, another six common nouns were used as filler items in the study session to prevent primacy and recency effects. As in Experiment 1, we used different words in the immediate and delayed recognition tests. All of the words used in the experiment were four to six characters in length.

Procedure. The experimental procedure was the same as that used in Experiment 1, with the following exceptions. First, the achievement goal instructions were slightly modified; following Elliot and Harackiewicz (1996), the promise of mastery-approach or performance-approach feedback was added to the corresponding goal manipulation. Specifically, in the mastery-approach goal condition, participants were told that they would

Table 2. Experiment 2: Mean Proportion of Correct Responses as a Function of Achievement Goals

	Word generation task			
	Mastery-approach goal		Performance-approach goal	
	M	SD	M	SD
Immediate test				
Recognition	0.95	0.09	0.96	0.04
Remember	0.57	0.28	0.72	0.28
Know	0.39	0.29	0.24	0.27
Delayed test				
Recognition	0.65	0.19	0.62	0.17
Remember	0.34	0.16	0.25	0.19
Know	0.31	0.19	0.36	0.15

be provided with information regarding the percentage of items that they solved correctly in the task, and they were encouraged to try to get as many answers correct as possible. In the performance-approach goal condition, participants were told that they would be provided with information regarding how they did compared to other students at the same university, and they were encouraged to try to do well relative to other students. Second, the manipulation check items were changed to specifically focus on the standard of competence evaluation ("I tried hard to get as many correct answers as possible" for mastery-approach goals; "I tried hard to do well in comparison with other [university] students" for performance-approach goals; see Elliot & Thrash, 2001). Third, only the word generation task was used in the study session. The word fragments and clues were presented pseudo-randomly. Fourth, all of the words were presented at the rate of 6 seconds per item in the study session based on a pilot study with a sample from the same U.S. university. Fifth, the interval between the study session and the first test session was 25 minutes. During this interval, participants not only completed a questionnaire but also participated in another, unrelated, experiment.

Results and Discussion

Four participants did not follow the experimental instructions (they either failed to provide any remember or know responses or produced remember and know responses to items that they did not recognize); these individuals were excluded from the analyses. Two participants did not come to the second test session and were omitted from analyses involving the second test session. The mastery-approach goal item yielded a significant difference between the mastery-approach goal ($M = 6.70$, $SD = 0.61$) and performance-approach goal ($M = 5.76$, $SD = 1.84$) conditions, $F(1, 54) = 7.40$, $p < .05$. The performance-approach goal item also yielded a significant difference between the mastery-approach goal ($M = 4.37$, $SD = 1.84$) and performance-approach goal ($M = 5.52$, $SD = 1.30$)

conditions, $F(1, 54) = 7.33$, $p < .01$. These results indicate that the achievement goal manipulation was successful. The two achievement goal items were uncorrelated ($r = -.11$).

Achievement goals and recognition memory. The results for the recognition tests are presented in Table 2. A 2 (achievement goal: mastery approach vs. performance approach) \times 2 (time interval: immediate test vs. delayed test) mixed model ANOVA on overall recognition performance revealed a significant time interval effect, $F(1, 52) = 237.83$, $p < .01$, indicating that participants did better on the immediate test than on the delayed test. Neither the main effect of achievement goal condition nor the Achievement Goal \times Time Interval interaction was significant ($F_s < 1$). Thus, as in Experiment 1, achievement goals did not significantly influence overall recognition performance.

Also in accord with the results from Experiment 1, when the recognition data were broken down by remember and know responses, significant achievement goal effects were obtained. A 2 (achievement goal: mastery approach vs. performance approach) \times 2 (time interval: immediate test vs. delayed test) \times 2 (response type: remember vs. know) mixed model ANOVA revealed a significant three-way interaction, $F(1, 52) = 8.48$, $p < .01$. A simple interaction effect analysis showed a significant Achievement Goal \times Time Interval interaction for remember responses, $F(1, 104) = 9.32$, $p < .01$. Post hoc tests within each test session revealed that participants in the performance-approach goal condition had more correct remember responses than those in mastery-approach goal condition on the immediate test, $F(1, 54) = 4.25$, $p < .05$, $d = 0.55$. On the delayed test, however, participants in the mastery-approach goal condition tended to have more correct remember responses than those in the performance-approach goal condition, $F(1, 52) = 3.08$, $p = .09$, $d = 0.48$. These results replicate the pattern found in Experiment 1 (see Figure 1). Another simple interaction analysis revealed a significant Achievement Goal \times Time Interval interaction for know responses, $F(1, 104) = 6.66$, $p < .05$. Post hoc tests within each test session revealed a significant effect of achievement goals on know responses in the immediate test session, $F(1, 54) = 4.02$, $p \leq .05$, $d = 0.54$, indicating that participants in the mastery-approach goal condition had more correct know responses than those in the performance-approach goal condition.² Null effects were obtained on know responses in the delayed test session, $F(1, 52) = 1.31$.

False alarm rate analyses. We conducted supplementary analyses testing for achievement goal differences in the false alarm rate. The false alarm analyses for the immediate test revealed no difference in the false remember rate between the mastery-approach goal ($M = 0.03$, $SD = 0.08$) and performance-approach goal ($M = 0.01$, $SD = 0.02$) conditions, nor the false know rate between the mastery-approach goal ($M = 0.03$, $SD = 0.05$) and performance-approach goal ($M = 0.02$, $SD = 0.04$) conditions ($F_s < 1.03$). In addition, the false alarm analyses for the delayed test revealed no difference in the false remember rate between the mastery-approach goal ($M = 0.08$, $SD = 0.09$) and performance-approach goal ($M = 0.05$, $SD = 0.07$) conditions, nor the false know rate between the mastery-approach

goal ($M = 0.17$, $SD = 0.16$) and performance-approach goal ($M = 0.14$, $SD = 0.12$) conditions ($F_s < 1.63$). Thus, the achievement goal manipulation did not produce a response bias on remember-know judgments.

In sum, the results of this experiment replicated the results of Experiment 1, thereby documenting the East–West generality of the findings. Again, achievement goals had no significant effects on overall recognition performance, but by examining remember and know responses separately, we were able to document that performance-approach and mastery-approach goals had a differential influence on recognition memory. Specifically, when immediate recognition memory was tested, we found that performance-approach, relative to mastery-approach, goals showed higher remember responses to words presented. When delayed recognition memory was tested, however, we found that mastery-approach, relative to performance-approach, goals tended to show higher remember responses.

Meta-analysis of the achievement goal effect on the delayed memory test. Given that the positive effect of mastery-approach, relative to performance-approach, goals on the delayed memory test fell short of conventional significance (i.e., both were $p < .10$, two-tailed), we meta-analyzed the results of Experiments 1 and 2. Following Hedges and Olkin's (1985) procedure, we found that the effect of mastery-approach goals on delayed memory performance was significant across experiments (average $d = 0.41$, $p = .01$).

General Discussion

Existing research on achievement goals and memory is sparse and has produced unclear findings. In the present research, we attended to a methodological problem with the prior research and incorporated additional conceptual distinctions from the memory literature that afforded a more powerful and fine-grained analysis of the link between achievement goals and memory. We showed that achievement goals do not influence overall recognition but do systematically affect remember responses in a deep-processing context. Moreover, we observed differential effects for mastery-approach and performance-approach goals over time: Performance-approach goals (relative to mastery-approach goals) enhanced correct remember responding on an immediate recognition test, whereas mastery-approach goals (relative to performance-approach goals) showed greater correct remember responding on a delayed recognition test.

A critical feature of the present research was our construct differentiation with regard to both motivation and memory. Mastery-approach goals and performance-approach goals represent the same overall quantity of motivation (i.e., the same degree of commitment to competence) but are qualitatively distinct types of motivation.³ In similar fashion, overall recognition may be differentiated in terms of qualitatively distinct types of memory—remembering and knowing. Had we focused solely on the overall amount of motivation or the overall amount of memory in our research, we would have obtained null results. Thus, an important “take home” message

from this work is that it is important to consider quality, not just quantity, in both motivation and memory when studying relations between these constructs.

Mastery-approach and performance-approach goals have been shown to promote different types of elaborative processing, with mastery-approach goals facilitating broad-based encoding and performance-approach goals facilitating narrowly focused (i.e., instrumental) encoding (Elliot et al., 2005; Hulleman et al., 2008). These different forms of encoding are presumed to produce different types of memory representations, with mastery-based encoding leading to rich and variable contextual associations that likely consolidate over time and performance-based encoding leading to narrow but concentrated memory traces that help memory in the short run but are likely to rapidly decay (Bower, 1972; Meeter & Murre, 2004). The time-dependent findings that emerged in our experiments fit nicely with these patterns of encoding and further suggest that it is important to consider differentiation with regard to timing of recognition assessment when studying motivation and memory. Note that the time-dependent effect was not observed for know responses. This is consistent with previous findings that know responses reflect memory traces that are detached from contextual information and are insensitive to attentional focus (Conway, Gardiner, Perfect, Anderson, & Cohen, 1997; Macken & Hampson, 1993). Our findings also fit nicely within the contemporary achievement goal literature in which mastery-approach and performance-approach goals are both construed as effective forms of regulation but are seen as leading to different sets of (primarily) positive outcomes (Harackiewicz, Barron, Pintrich, Elliot, & Thrash, 2002).

Future work would do well to extend the time interval for memory consolidation beyond 1 week to see whether (and how) the effects observed herein change over time. Memory consolidation in general, and remember-know responding in particular, varies considerably over time (Sharot, Verfaellie, & Yonelinas, 2007). Conway et al. (1997), for example, found that undergraduates who scored well on a class test exhibited greater remember responding for test material during the semester but exhibited greater know responding when tested following a 25-week interval. This “remember-to-know shift” (Conway et al., 1997, p. 408) may reflect a consolidation-based change from initial, primarily episodic, representations to more semantic representations. The link between achievement goals and the acquisition of semantic knowledge is a fascinating topic that clearly warrants empirical attention, as it has important practical, as well as theoretical, implications.

A possible extension of the current work is to seek to replicate the findings using simpler achievement goal manipulations. In the present work, we followed historical precedent in using a combination of aims (e.g., to attain self or task-based competence) and reasons behind the aims (e.g., to develop one's competence) in our achievement goal manipulations. Recent work on achievement goals has begun to explore the implications of trimming achievement goal manipulations to their conceptual core (i.e., the standard of competence evaluation;

Elliot & Murayama, 2008), and future work on achievement goals and memory could follow suit. Parenthetically, as is customary in the achievement goal literature, we did not include a control condition (e.g., a no goal or “do your best” condition) in our experiments because the nature and interpretative meaning of such a condition would not have been clear. When faced with an achievement task, individuals are presumed to adopt an achievement goal of some kind (Barron & Harackiewicz, 2001). Accordingly, achievement goal researchers tend to focus on relative comparisons between achievement goals rather than comparisons between achievement goals and a control condition, and we did the same in the present research. We also did not systematically explore the possibility of cultural differences in our research, despite collecting data in different cultures. Some investigators have argued that East Asian individuals are more sensitive and attuned to contextual cues (Kitayama, Duffy, Kawamura, & Larsen, 2003), raising the possibility that East Asians would exhibit more remember responses because of the context dependence of such judgments. We cannot test this possibility in our current experiments because individuals from different cultures participate in different experiments. A systematic investigation of cultural effects on achievement goals and memory would be welcomed in future research.

Theorists over the years have acknowledged that motivation affects cognition, but, surprisingly, there has been relatively little research on the link between motivation and memory. This is true not only with regard to achievement goals and memory but also with regard to achievement motivation and memory (for exceptions, see Weiner, 1966; Woike, Bender, & Besner, 2009) and even, to a large extent, with regard to motivation in general and memory (although see, for example, Strachman & Gable, 2006). We think that the memory literature would benefit considerably from attending to and incorporating concepts and ideas from the motivation literature and that the motivation literature could benefit in commensurate fashion from the memory literature. It is our hope that the present experiments serve as an illustration of how empirical work on motivation and memory can bear fruit and, moreover, that it encourages others to conduct integrative research in this overlooked and promising area.

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Notes

1. Although we did not expect this result, the effect may be the result of the fact that the probability of making a know response to a presented word is constrained by whether or not a remember response has been made to the word (i.e., the know response rate automatically decreases as the remember response rate increases). Accordingly, as is typically done in memory research, we corrected the know response rate by using the formula proposed by Yonelinas and Jacoby (1994): corrected know rate = know hit response rate / (1 – remember hit response rate). This index (called the “familiarity rate”) allows us to estimate the know response rate that is not constrained by the remember response rate. The results showed that the achievement goal manipulation did not have a significant effect on this corrected know rate ($F < 1$). This suggests that the significant effect of achievement goals on know responses observed herein may have been the result of the dependent nature of remember–know responses (see Diana, Reder, Arndt, & Park, 2006).
2. Again, achievement goals did not have a significant effect on the corrected know response rate based on the formula by Yonelinas and Jacoby (1994), suggesting that the significant effect of achievement goals on know responses observed here may have been the result of the dependent nature of remember–know responses (see Diana et al., 2006).
3. It should be noted that we included “do your best” instructions in both achievement goal conditions to instantiate the same quantity of overall motivation in the two groups. On a related note, goal setting research (Locke & Latham, 1990) indicates that goal specificity and difficulty have an impact on motivation. These factors are presumed to influence the overall quantity of motivation, not the quality of motivation (the focus of the present research).

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