



Careful Inspection of Memory Reduces Recognition Memory Accuracy

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INTRODUCTION

The goal of the experiments reported here was to investigate how the number of response options might affect recognition memory. Most researchers interested in the processes leading to recognition have come to believe that various ancillary or additional decisions surrounding recognition do not appreciably affect it. For example, in 1999 we claimed that remember-know responses may change people's decision criteria but do not significantly affect discriminability of old from new items. Over the past 50 years, ROC curves are constructed by having the participant rate their confidence that an item is old and/or new. The assumption that such additional judgments leave the discrimination process perfectly intact has not gone unchallenged over the years (e.g., Wickelgren, 1968). One argument is that maintaining, say, a series of decision criteria in working memory could serve as a cognitive load and functionally reduce discriminability. Consequently, in our first experiment, we directly compared standard old-new recognition with a confidence rating procedure that would be used to construct ROC curves. Most researchers would predict that measures of discriminability should be the same in the two conditions.

EXPERIMENT 1: METHOD

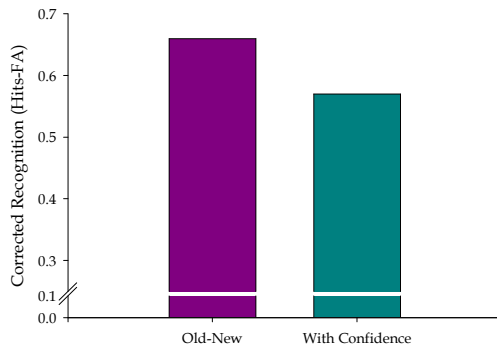
- Stimuli: 60 unrelated old words; 60 new words unrelated to studied words
- Study Duration: 3000 ms
- Test: 120 self-paced, no feedback trials
- Old-New with 2 response options
- Confidence judgment with 6 response options
 - Old responses on a 1-3 scale
 - New responses on a 1-3 scale



RESULTS

Our primary dependent measure is corrected recognition (hits less false alarms) and this data is shown in the graph for this experiment. Taking confidence ratings reduced discriminability by 9%, and this result is statistically significant. Thus, a ratings procedure with six options reduced recognition accuracy as compared with a "standard" recognition procedure with two options. The same results were obtained in signal detection measures of d' and C where the former was reduced from 2.10 to 1.77 and the latter was equivalent across the two conditions. These results challenge the notion that additional decisions associated with recognition leave discriminability the same as in the standard condition. They also made us question our earlier claims that qualitative decisions associated with recognition, such as remembering versus knowing do not affect discriminability as well. Therefore, the two subsequent experiments explored this issue.

Experiment 1



EXPERIMENT 2: MOTIVATION

In this next experiment, we compared a standard old-new recognition condition to two other conditions that each had four response options. To explore our 1999 work, one condition was given three old response options and one new option. The old responses were remembering, knowing, or guessing. In the final condition, we used three qualitative response options inspired by Ghetti (2003). These options asked for reasons concerning why the participant felt the item was new. One option was a feeling that the item was distinctive enough that it would have been remembered (WHR). The second option was simply that the item lacked familiarity (LF). Finally, a third option was provided that allowed them to specify that something else on the list provided evidence that the current test item was new, or a recall-to-reject (RR). As such we tested three conditions: one with two response options and two with four response options.

EXPERIMENT 2: METHOD

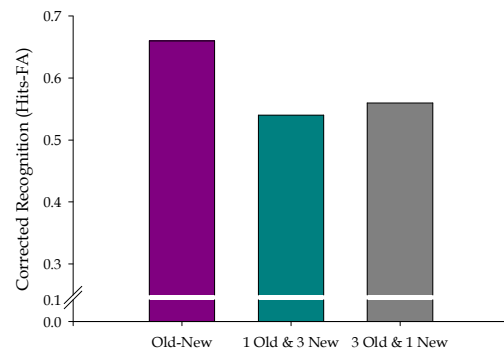
- Stimuli: 60 unrelated old words; 60 new words unrelated to studied words
- Study Duration: 3000 ms
- Test: 120 self-paced, no feedback trials
- Old-New with 2 response options
- 3 Old & 1 New responses: "New" versus 3 Old Options
 1. Remember
 2. Know
 3. Guess
- 1 Old & 3 New responses: "Old" versus 3 New Options
 1. Lacks Familiarity (LF)
 2. Would Have Remembered (WHR)
 3. Recall-to-Reject (RR)



RESULTS

Corrected recognition is shown in the graph for this experiment. The two conditions with four response options had significantly lower discriminability than the standard old-new recognition condition. However, the two conditions with four options did not differ from one another. These results were mirrored in d' values with best performance in the old-new condition (2.13) and worse performance in the other two conditions (1.87 and 1.74). Therefore, the results conceptually replicate Experiment 1 insofar as having more response options lowered discriminability. Not surprisingly, because the number of old alternatives differed from the number of new alternatives in two of the conditions, criterion C differed significantly across the conditions. Because discriminability and criterion are theoretically independent, this does not change the conclusion that collecting more detailed memory measures can actually lower recognition accuracy. Nevertheless, in the next experiment, we wanted reassess these issues using two new conditions that had the same number of old versus new response options.

Experiment 2



EXPERIMENT 3: MOTIVATION

In this experiment we compared a standard old-new recognition condition with two conditions that each had three old and three new response options. In the latter conditions, the old responses were the remember-know-guess options from the 3 Old & 1 New condition in Experiment 2. Likewise the new responses were the LF-WHR-RR options from the 1 Old and 3 New condition. Thus, there were six options. Because we found in 1999 that a sequential versus a simultaneous decision could influence performance, our two latter conditions differed in this regard. In one condition, participants first made an old-new judgment (like the standard condition) and then chose among the six options (3 old or 3 new). In the other condition, no explicit old-new judgment was made, but rather, one of the six options was chosen directly.

EXPERIMENT 3: METHOD

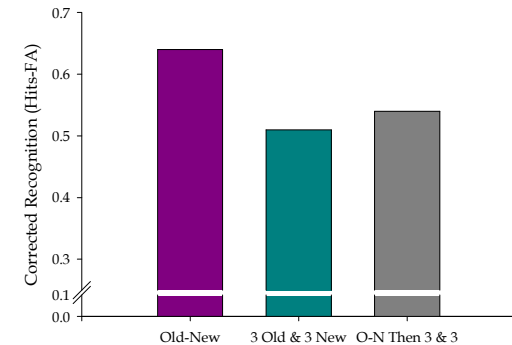
- Stimuli: 60 unrelated old words; 60 new words unrelated to studied words
- Study Duration: 3000 ms
- Test: 120 self-paced, no feedback trials
- Old-New with 2 response options
- 3 Old & 3 New responses: Choose one of the six keys

Old Options	New Options
1. Remember	1. Lacks Familiarity (LF)
2. Know	2. Would Have Remembered (WHR)
3. Guess	3. Recall-to-Reject (RR)
- Old New, then 3 Old & 3 New responses
(Old and New responses are same as above)

RESULTS

The results replicated the previous two experiments as seen in the graph for this experiment. The two conditions with six response alternatives displayed a marked reduction in discriminability as compared with "standard" recognition. However, there was no effect of first taking an old-new judgment as compared with not doing so. These results are replicated in d' values: 1.99, 1.48, and 1.66. But because the number of old and new response alternatives were equated, there were no differences in criterion C .

Experiment 3



CONCLUSIONS

We, and others, have claimed before that what one obtains from memory is a function of how the question is asked. Researchers who study recognition memory can no longer ignore this important message. Across three experiments, when the number of response options was increased in a quantitative way with confidence or a qualitative way with meta-memorial judgments, discriminability between the old and new items was decreased. Theoretically, we believe these results to be the consequence of goal maintenance in working memory. Having to maintain more response options may tax working memory to some degree. There is evidence that greater loads can affect standard recognition memory (see Hicks & Marsh, 2000); and the results of these experiments extend that finding. Although we did not find a way to protect people from this detrimental influence (e.g., the sequential condition in Experiment 3) that may be a very fruitful direction to pursue.