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The fluency heuristic in recognition memory: The effect of repetition

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Abstract

Five experiments investigate whether the attribution of processing fluency to recognition memory depends on the amount of fluency that is expected from targets based on the frequency with which they appeared during an earlier study phase. Subjects studied targets either one or five times and then were given a recognition test that included a priming phase to enhance the fluency of half of the test items. Results showed that the priming phase had a greater influence on recognition responses when targets had been presented once than when they had been presented five times. However, an interaction between fluency and target frequency was found only when frequency was manipulated between-subjects. An interaction between the priming manipulation and target frequency was also found using a "counterfeit" manipulation of frequency, suggesting that attributions of fluency are adjusted according to subjects' expectations for the amount of fluency that should result from previous experiences with a stimulus.

Keywords: Repetition; Fluency; Recognition memory; Heuristic; Attribution

On a recognition test, when a stimulus is processed quickly and easily relative to other stimuli in the same context, it is more likely to be classified as "old" (Gellaty, Banton, & Woods, 1995; Higham & Vokey, 2000; Jacoby & Dallas, 1981; Jacoby & Whitehouse, 1989; Johnston, Hawley, & Elliott, 1991; Rajaram, 1993). There is a great deal of evidence supporting the idea that the relationship between processing fluency and recognition memory is mediated by an unconscious attributional process whereby subjects infer that enhanced processing fluency is the result of prior experience with a stimulus (e.g., Jacoby & Dallas, 1981; Jacoby & Whitehouse, 1989; Whittlesea, 1993; Whittlesea, Jacoby, & Girard, 1990). This inference is presumed to be based on subjects' knowledge—acquired through a lifetime of experience processing old and new stimuli—that stimuli that have been encountered before are indeed processed more fluently relative to stimuli that are new (Murrell & Morton, 1974; Neisser, 1954). As a result of this knowledge, processing fluency is interpreted as familiarity and is used as a heuristic when judging whether a test item is old or new (Jacoby & Dallas, 1981).

Although the link between fluency and recognition memory has been well established, high levels of processing fluency are not always interpreted as a sign that the stimulus occurred in the past. Rather, enhanced fluency can be interpreted as affective preference (Mandler, Nakamura, & Vandt, 1987; Whittlesea & Price, 2001), perceptual clarity (Goldinger, Kleider, & Shelley, 1998; Masson & Caldwell, 1998), higher linguistic frequency (Toth & Daniels, 2002), or fame (Jacoby, Woloshyn, & Kelley, 1989b), depending on which source is viewed by the subject as most likely.

The degree to which fluency plays a role in recognition memory depends on several factors. A recent study by Westerman, Lloyd, and Miller (2002) found that

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fluency is more likely to be interpreted as evidence of prior experience with a stimulus if there is a sensory match between the study and test phases of an experiment. In their experiments, the fluency of recognition test items was enhanced by briefly presenting a prime that matched the subsequent test item. This technique has been used in many previous studies with the canonical finding being that primed test items are more likely to be called "old" when preceded by a prime (Jacoby & Whitehouse, 1989; Rajaram, 1993; Westerman, 2001; Westerman et al., 2002). Westerman et al. found that when the study and test phases were both visual, the priming manipulation increased the number of "old" responses to test items. However, when the study phase was auditory and the recognition test was visual, the priming phase did not have a significant influence on recognition responses.

Westerman et al. (2002) also found that the interaction between sensory modality and processing fluency persisted when there were no target items presented during the study phase. In their experiment, subjects were told that they were presented with a subliminal list of words that was either auditory or visual (in reality, there were no words presented; only auditory or visual noise was presented). On a later memory test, subjects were asked to classify each stimulus as familiar or not familiar, and the fluency of half of the test items was enhanced through priming. The results showed that the group that was presented visual noise during the study phase used perceptual fluency as a cue to recognition to a much greater extent than the group that was presented auditory noise. Westerman et al. interpret their results as evidence that the attributional process that translates fluency into a positive recognition response is sensitive to the sensory match between the study and test phases of an experiment. Processing fluency is more likely to be interpreted as familiarity if the study and test phases are in the same sensory modality. When they are in different modalities, processing fluency is not as likely to be translated into a sense of familiarity.

In their original article proposing the role of perceptual fluency in recognition memory, Jacoby and Dallas (1981) stressed that the link between fluency and recognition is mediated by an attributional process that is sensitive to an item's fluency relative to the fluency of other test items. A recent series of papers by Whittlesea and Williams (1998, 2000, 2001a,b) provides further evidence for the sophistication of the attributional process that mediates the role of fluency in memory judgments. Whittlesea and Williams found that subjects are sensitive to the amount of fluency that is normally associated with different types of stimuli and different recognition contexts, and their inferences as to the source of fluency are adjusted according to these factors. For example, in one of their experiments (Whittlesea & Williams, 1998, Experiment 3) subjects were presented with a study list consisting of both words and nonwords. The nonwords were constructed to be either easy or difficult to process by virtue of their orthographical regularity and their similarity to English words (e.g., "hension" and "stofwus" are examples of nonwords that are easy and difficult to process, respectively). Later, subjects were given a recognition test that contained targets and lures from each of the three stimulus categories (words, orthographically regular nonwords, and orthographically irregular nonwords). Naming latencies for the test stimuli revealed that words were processed more fluently than both categories of nonwords. However, on the recognition test the highest false alarm rate was found for the orthographically regular nonwords (the false alarm rates were .09, .16, and .38 for the orthographically irregular nonwords, words, and orthographically regular nonwords, respectively). Whittlesea and Williams theorized that the high false alarm rate that was found for orthographically regular nonwords occurred because the processing of these items was surprisingly fluent given their nonword status, and subjects interpreted the ease of processing as evidence that the nonword had appeared on the study list. The authors theorized that the fluency-based illusion of recognition did not occur for words in spite of their greater fluency because subjects *expect* a high degree of fluency when processing common words. Therefore, the fluency of the words was not interpreted as a sign that they had appeared previously.

Whittlesea and Williams (2000, 2001a,b) proposed the *discrepancy attribution hypothesis* to specify the circumstances that lead to the interpretation of fluency as a sign of previous experience with a stimulus. According to their hypothesis, fluency is interpreted as a sign of previous experience when the amount of fluency that is experienced while processing a stimulus is greater than the amount that would be expected given the characteristics of the stimulus (e.g., more fluency is expected when processing a word than a nonword) and the recognition context in which it appears. The discrepancy attribution hypothesis assumes that the role of fluency in recognition memory depends critically on subjects' expectations regarding the amount of fluency that is associated with old and new test items. The present study was designed to test this aspect of the discrepancy attribution hypothesis. Whereas Whittlesea and Williams manipulated the amount of fluency that would be expected naturally to accompany an item on a recognition test by varying the nature of the stimuli (i.e., common words versus nonwords), we manipulated the subjects' expectations for the fluency that would accompany target items by varying the frequency with which each word appeared on the study list.

In the present experiments, a repetition priming procedure (e.g., Jacoby & Whitehouse, 1989; Westerman, 2001) was used to enhance the processing fluency of a portion of the recognition test words. Prior research using this technique has investigated its effect