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Question format shifts bias away from the emphasised response in tests of recognition memory

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ABSTRACT

The question asked to interrogate memory has potential to influence response bias at retrieval, yet has not been systematically investigated. According to framing effects in the field of eyewitness testimony, retrieval cueing effects in cognitive psychology and the acquiescence bias in questionnaire responding, the question should establish a confirmatory bias. Conversely, according to findings from the rewarded decision-making literature involving mixed incentives, the question should establish a disconfirmatory bias. Across three experiments (*ns* = 90 [online], 29 [laboratory] and 29 [laboratory]) we demonstrate a disconfirmatory bias – "old?" decreased old responding. This bias is underpinned by a goal-driven mechanism wherein participants seek to maximise emphasised response accuracy at the expense of frequency. Moreover, we demonstrate that disconfirmatory biases can be generated without explicit reference to the goal state. We conclude that subtle aspects of the test environment influence retrieval to a greater extent than has been previously considered.

1. Introduction

Each time we decide whether or not we recognise something in our environment, the environment itself informs both why we are attempting to tell old from new, and the consequences of making such a decision. When making memory decisions in the real world, it is therefore sensible to consider all aspects of our memory decisions, from cause to consequence, so as to set appropriate goals that enable more strategic use of the available memory evidence. To illustrate this, consider a memory user faced with two tasks: the first being to identify a criminal from a suspect line-up; the second being to decide whether or not to greet a potential acquaintance at the supermarket. If both the suspect and the potential acquaintance evoke equal memory evidence in their respective scenarios, it is conceivable that the markedly different consequences of incorrect "old" decisions in each situation will lead to different memory outcomes. In the line-up the available memory evidence may be deemed insufficient to inform the police that the criminal is present, whereas in the supermarket, the same level of evidence may be more than enough to greet the potential acquaintance. In this way, even subtle manipulations of standard recognition testing environments may influence memory evaluations.

How the testing environment biases memory has been the subject of extensive laboratory investigation, which has fuelled the formalisation of the source monitoring framework – the collection of monitoring/control processes that underpin the evaluation of retrieved memory content (Jacoby, Kelley, & McElree, 1999; Johnson, Hashtroudi, & Lindsay, 1993). For instance, numerous studies have demonstrated influences of the testing environment on the likelihood of endorsing false memories, as

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manipulated both in the Deese–Roediger–McDermott paradigm (DRM; Deese, 1959; Johnson et al., 1997; Mather, Henkel, & Johnson, 1997; Roediger & McDermott, 1995) and in laboratory analogues of eyewitness testimony (Lindsay & Johnson, 1989; Loftus, 1996; Loftus, Donders, Hoffman, & Schooler, 1989). Testing bias effects in the standard single item recognition paradigm have also been observed, albeit with a predominant focus on one particular manipulation – cueing. Cueing participants that a word presented at test is likely to be old or new has been shown to bias decision-making in a confirmatory direction e.g. a "likely old" cue increases the likelihood of "old" responding. This effect is consistent across many methods of cue delivery, ranging from informing participants of the relative proportion of *old* and *new* items at test (Ratcliff, Sheu, & Gronlund, 1992; Van Zandt, 2000), providing valid and invalid performance feedback (Estes & Maddox, 1995; Han & Dobbins, 2009; Rhodes & Jacoby, 2007), and trial-by-trial cueing by text, presentation location and colour (Aminoff et al., 2012; Jaeger, Cox, & Dobbins, 2012; O'Connor, Han, & Dobbins, 2010; Rhodes & Jacoby, 2007). As long as cues can be easily assimilated into the memory decision-making process, they lead to a confirmatory bias that increases endorsements of the cued decision (albeit often to a lesser degree than would be optimal according to the cue; Cox & Dobbins, 2011; Healy & Kubovy, 1978; Wallace, 1980).

Despite the large volume of research on how explicit cues bias memory, whether implicit cues embedded within traditional laboratory-based recognition experiments also introduce bias has remained largely overlooked. This is surprising given the extensive research in analogous applied domains such as questionnaire design (e.g. response acquiescence; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003) and eyewitness testimony (e.g. leading questions; Loftus, 1996) in which strong influences of question format on decision-making have been observed. These effects appear particularly relevant to laboratory-based memory research which often employs the single item recognition paradigm (often termed yes/no recognition) in which the question "old?" is presented with a to-be-judged item and is responded to with either "yes" or "no" keypresses (e.g. Donaldson, 1996). If this format implicitly emphasises the importance of making an "old" decision, and this implicit emphasis biases memory performance, then this bias is likely presenting itself in most laboratory-based memory research where this canonical "old?"-cued recognition test is employed.

The direction of any bias observed in recognition memory research would provide insight into memory decision-making processes that ultimately determine responding. Two competing predictions of bias direction are apparent, one derived from the laboratory-based memory cueing and applied framing literatures summarised above, and an alternative derived from research into rewarded decision-making. Findings from the cueing/framing literatures suggest that the question "old?" sets up an expectation of encountering an *old* item, thereby leading to a bias *towards* making the emphasised memory decision. A bias in the opposite direction would be anticipated from findings in the rewarded decision-making literature. In mixed incentive research, increasing both the monetary payoff for a correct response and the monetary punishment for an incorrect response, for one of two available response options, motivates a bias against making that monetized response (e.g. Newman, Widom, & Nathan, 1985). To clarify, if the aim was to instantiate similar incentives for a single item recognition task, this might involve offering a £1 reward for each correct "old" decision, as well as a £1 punishment for each incorrect "old" decision, whilst not providing any incentives for correct or incorrect "new" decisions. The anticipated effect of this manipulation would be to instil a bias against making an "old" decision (as has been observed previously, Han, Huettel, Raposo, Adcock, & Dobbins, 2010). This reluctance is putatively goal-driven, as participants seek to maximise the accuracy of endorsing the decision that is monetarily emphasised as a higher-order goal, even if this entails making it less often (e.g. preferring 10 responses with 90% accuracy to 20 responses with 65% accuracy). If the format of the test question serves to impart similar albeit more implicit emphasis to particular memory decisions, we would hence expect a different bias direction to the cueing hypothesis outlined above: the question "old?" should reduce the likelihood of responding "old", thereby leading to a bias *against* making the emphasised memory decision.

Below we report three recognition experiments which assess whether the format of the test question biases recognition memory responding, and in what direction. We used both an established measure (signal detection estimates of response criterion, which bin responses by *new* or *old* item status) and a somewhat unorthodox measure ('decision accuracy', which bins responses by decision status; Duncan, Sadanand, & Davachi, 2012) of recognition performance. Across these experiments, we replicated a novel form of memory bias sensitive to the decision goals implicitly emphasised by the test environment.

2. Experiment 1

We first used an online experiment to explore whether bias in yes/no recognition memory is influenced by the question presented alongside to-be-judged words at test. Following an incidental encoding procedure, the test question was varied on an item-by-item basis, between "old?" (old question emphasis condition) and "new?" (new question emphasis condition), to which participants could respond "yes" or "no".

2.1. Method

2.1.1. Participants

Participants were 90 self-reported native English speakers who reached the minimum performance threshold of $d' > 0.1$ in each within-subjects experimental condition[2] (58 female; mean age = 34.7; age range = 20–66), from a full sample of 120

[2] This performance threshold was maintained across all three experiments.