Consciousness and Cognition 24 (2014) 57–69

Contents lists available at ScienceDirect

Consciousness and Cognition

journal homepage: www.elsevier.com/locate/concog

Investigating the subjective reports of rejection processes in the word frequency mirror effect

J. Thadeus Meeks [a,*], Justin B. Knight [b], Gene A. Brewer [c], Gabriel I. Cook [d], Richard L. Marsh [e]

[a] Department of Psychology, Southern Illinois University Edwardsville, United States
[b] BioImaging Research Center & Department of Psychology, University of Georgia, United States
[c] Department of Psychology, Arizona State University, United States
[d] Department of Psychology, Claremont McKenna College, United States
[e] Department of Psychology, University of Georgia, United States

ARTICLE INFO

Article history:
Received 15 May 2013

Keywords:
Recognition memory
Word frequency
Rejection processes
Remember–Know

ABSTRACT

We sought to systematically investigate how participants subjectively classify the basis of their recognition memory judgments for low and high word frequency items. We found that participants more often reported rejection processes related to the increased perceived memorability for unstudied low word frequency items (relative to high word frequency items), rather than classifying their decision on a lack of familiarity. Experiment 2 replicated this pattern and demonstrated context variability and word frequency independently influenced the subjective classifications for correct rejections. Results of Experiment 3 revealed that these differences are dependent upon having experience with both low and high frequency items. Overall, these data suggest participants' rejection of low frequency items is more strongly related to judgments of perceived memorability, but only when they are presented in the context of high frequency items. The results are discussed in relation to distinctiveness and expected memorability.

1. Introduction

The investigation of determining whether an item has occurred in a particular context has a long and venerable history in the experimental psychology literature (Strong, 1912; for recent reviews see Malmberg, 2008 and Yonelinas, 2002). One regularity emerging from this literature is the occurrence of mirror effects. Mirror effects appear when memory for a particular class of items exhibits higher hit rates and lower false alarm rates than for a differing class of items (for a review, see Glanzer, Adams, Iverson, & Kim, 1993). There are many types of mirror effects in recognition memory, but the most commonly studied effect is related to normative word frequency (WF; e.g., Glanzer & Adams, 1985). Words with low word frequency (LWF; e.g., *aardvark*) tend to be correctly recognized and false alarmed to less than words with high word frequency (HWF; e.g., *city*). Many proposals have been made about what causes the mirror effect; however, systematic investigation of the potential processes involved in the effect has primarily focused on the increased hit rate for LWF items. As with the study of mirror effects, the predominant approach to studying recognition memory has been concerned with how individuals correctly identify old items with relatively little attention paid to how individuals reject new items. Our focus in this study was on the possible contributions of rejection processes involved in the increased correct rejection rate (i.e., lower false alarm rate) for LWF items in traditional mirror effects. More specifically, we wished to investigate the subjective reports of memory processes associated with the decision that LWF and HWF items have not been studied (and the report of rejection processes in general).

* Corresponding author.
E-mail address: jmeeks@siue.edu (J.T. Meeks).

1053-8100/$ - see front matter © 2014 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.concog.2013.12.007

2. The hit rate portion of the word frequency mirror effect

The hit rate portion of the WF mirror effect is often attributed to enhanced recollection for LWF items (thus higher hit rates), whereas the false alarm portion is often attributed to greater pre-experimental familiarity for HWF items (e.g., Arndt & Reder, 2002; Guttentag & Carroll, 1994; Joordens & Hockley, 2000; Reder et al., 2000; Rugg, Cox, Doyle, & Wells, 1995). Some evidence for the role of recollection in the hit rate portion of the WF mirror effect comes from examining participants' subjective classification of their old responses (Cook, Marsh, & Hicks, 2006; Dewhurst, Brandt, & Sharp, 2004; Dewhurst, Hitch, & Barry, 1998; Gardiner & Java, 1990; Joordens & Hockley, 2000; Reder et al., 2000). In the Remember–Know procedure, "Remember" responses represent conscious recollection of the episodic context associated with the studied item. Alternatively, if the item is familiar enough to warrant an old response but lacks any diagnostic episodic detail, the participants should respond "Know". LWF items are given more Remember responses than HWF items (Cook et al., 2006; Dewhurst et al., 1998, 2004; Gardiner & Java, 1990; Joordens & Hockley, 2000).

There is some debate about the use of subjective reports in measuring recollection and familiarity. For example, many claim that the binary judgment between Remember and Know simply reflects different confidence levels in the recognition decision (Donaldson, 1996; Dunn, 2004; Wais, Mickes, & Wixted, 2008; but see Williams, Conway, & Moulin, 2013 for recent evidence against this). There is also evidence that the amount of Remember and Know responses is altered by list composition at study (e.g., McCabe & Balota, 2007) and test (e.g., Benjamin, 2005; Bodner & Lindsay, 2003; McCabe & Balota, 2007; Tousignant & Bodner, 2012). Despite these limitations, if used correctly, the Remember–Know procedure can be used to successfully measure recollection and familiarity (see Migo, Mayes, & Montaldi, 2012 for a recent review and Lampinen, Neuschatz, & Payne, 1997 for further discussion of the pros and cons of subjective memory reports including Remember–Know judgments).

3. The correct rejection portion of the word frequency mirror effect

While most studies have focused on the hit rate portion of the WF mirror effect, much less research has examined the false alarm portion. The aim of the current study was to assess the cognitive mechanisms that contribute to the false alarm portion of the WF mirror effect by utilizing subjective memory classifications similar to those requested in the Remember–Know procedure. Another way to conceptualize the false alarm portion of the WF mirror effect is that new LWF items are more often correctly rejected than HWF items. Because LWF items lack pre-experimental familiarity relative to HWF items, they elicit fewer implicit associative responses (Underwood & Freund, 1970). This lower level of familiarity may result in greater rejections of new LWF items as studied in the experimental context. Another possible way to explain the correct rejection differences focuses on the metacognitive assessment of LWF items. Presumably, due to their low rate of pre-experimental occurrence, LWF items are judged to be distinctive or memorable enough to lead to the metacognitive impression that they would have been remembered if they had in fact been previously experienced (Benjamin, 2003; Brown, Lewis, & Monk, 1977; Guttentag & Carroll, 1998). This in turn would lead to a higher correct rejection rate for LWF items than HWF items. This metacognitive, memorability-based judgment requires that the participant realize that LWF items are more memorable than HWF items. Some, however, have found that participants actually judge high frequency words as more memorable (e.g., Wixted, 1992). Guttentag and Carroll, as well as Benjamin, asked for memorability judgments during the memory test and found higher memorability judgments for LWF words relative to HWF items. Thus, the actual retrieval attempt provides the evidence needed to judge LWF words as more memorable.

The idea of a memorability-based rejection process bears similarity to research on the distinctiveness heuristic. Israel and Schacter (1997) demonstrated that false memory was significantly reduced when pictures were encoded along with the auditory presentation of the word as compared with when only auditory encoding occurred. This result presumably occurs because participants metacognitively use the absence of diagnostic, pictorial details in memory as evidence that if they had studied the item, they would have remembered it. LWF items are encountered less, which likely makes them more inherently distinctive than HWF items. Thus, a similar rejection process to the distinctiveness heuristic could be applied to LWF items more often than HWF items (Benjamin, 2003; Brown et al., 1977; Guttentag & Carroll, 1998).

Ghetti (2003) focused on a rejection process similar to the distinctiveness heuristic. In particular, she evaluated the ability to make the metacognitive judgment that if an item would have been studied, one would have remembered it (i.e., a "do not recall to reject" process; see Strack & Bless, 1994 for a similar idea). In Experiment 1, Ghetti manipulated item salience and asked participants to subjectively classify their rejection of items into one of three categories (one being the previously mentioned metacognitive process). A second mechanism was based on the feeling of a lack of familiarity. If an item lacked the familiarity to pass a certain criterion, the participant should report this process. Note that this option does not require an independent assessment of the subjective memorability of an item based on its salient characteristics (Ghetti, 2003). The third rejection process involved the recall of information from the encoding context that led to the rejection of a new item on a test list (e.g., Rotello & Heit, 2000). A recollection rejection mechanism, when used, has also been shown to reduce false memories (e.g., Brainerd, Reyna, & Estrada, 2006; Gallo, 2004; Schmid, Herholz, Brandt, & Buchner, 2010). Its use, however, appears to be dependent on numerous factors such as the use of related stimuli and test cues (Gallo, 2004; Light, 2012; Schmid et al., 2010) and explicit instructions to use the rejection process (e.g., Lampinen, Arnal, & Hicks, 2009; Rotello, Macmillan, & Van Tassel, 2000). In the current study, we took this approach of asking participants to classify the rejection