Editorial

Familiarity or Conceptual Priming? Good Question! Comment on Stenberg, Hellman, Johansson, and Rosén (2009)

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Abstract

■ Stenberg et al. argued that FN400 brain potentials index familiarity rather than conceptual priming. Their data from a test of name recognition showed that both familiarity and FN400s were influenced by frequency but not fame, whereas separate behavioral measures of priming were influenced by fame but not frequency. However, this apparent dissociation was gravely weakened by confounds in task demands and inadequate behavioral measures of priming. Although Stenberg et al. failed to provide evidence suitable for disentangling neural correlates of familiarity from those of conceptual priming, an analysis of their report can be used to highlight difficulties that remain to be surmounted to understand recognition and the neural events that signal distinct memory functions engaged during recognition. ■

In their article, "Familiarity or conceptual priming: Event-related potentials in name recognition," Stenberg, Hellman, Johansson, and Rosen (2009) attempted to dissociate ERP correlates of familiarity from those of conceptual priming. Currently, the predominant view holds that FN400 ERPs specifically index familiarity, as distinct from recollection (Rugg & Curran, 2007). The veracity of this association warrants rigorous examination because it is often cited as evidence that recognition memory is based on two underlying neurocognitive processes (e.g., Eichenbaum, Yonelinas, & Ranganath, 2007) rather than on one process (Shimamura & Wickens, 2009; Wixted, 2007; Squire, Stark, & Clark, 2004).

In addition, neural comparisons of familiarity and conceptual priming are essential to our understanding of the precursors to behavioral indicators of familiarity. For example, one plausible and intuitively appealing scenario is that processes that can support facilitated responding in a conceptual priming test are the same processes that can support familiarity when indicated in a recognition test (e.g., Rajaram & Geraci, 2000). It is therefore instructive to juxtapose familiarity and conceptual priming to clarify the extent to which they arise in conjunction with the same or different brain events.

There are considerable weaknesses in the corpus of evidence typically cited in favor of the putative association between FN400 and familiarity, as we have summarized in recent reviews (Voss & Paller, 2008; Paller, Voss, & Boehm, 2007). Moreover, new evidence has demonstrated that FN400 potentials are closely aligned with conceptual priming (Voss, Schendan, & Paller, in preparation; Voss, Lucas, & Paller, in press; Voss & Paller, 2006, 2007, 2009). The central logic behind our position starts with the assumption that processing that supports conceptual priming can occur incidentally during a recognition test. Therefore, special steps are necessary to dissociate neural correlates of familiarity from those of conceptual priming. Given that the literature in this area largely lacks such dissociations verified with behavioral measures of both types of memory, the apparent link between FN400 potentials and familiarity must be regarded as premature.

Here we outline why the experiments described by Stenberg et al. (2009) are a step in the right direction but ultimately fall short of selectively associating ERPs with familiarity versus conceptual priming. We describe these shortcomings in a constructive manner by using them to illuminate strategies for convincingly dissociating familiarity and conceptual priming in future studies.

Stenberg et al. (2009) conducted two experiments on memory for names of individuals. These names varied (a) in the frequency with which they tend to be encountered in everyday life and (b) in the fame ascribed to the named individual (as estimated along a famous–nonfamous continuum). In Experiment 1, recognition testing revealed that frequency influenced behavioral estimates of familiarity and FN400 amplitudes similarly; low-frequency names elicited more familiarity than did high-frequency names, and only low-frequency names elicited FN400 effects. Level of fame had no effect on either familiarity or FN400 effects. In Experiment 2, implicit-memory testing was conducted using a task requiring speeded fame judgments or one requiring speeded frequency ratings. Priming was found only for famous names, regardless of frequency. The authors reasoned that FN400 potentials reflect familiarity rather than conceptual priming because conceptual priming appeared to be selective for high-fame names, whereas familiarity and FN400 potentials appeared to be selective for low-frequency names.

One problem that seriously weakens the authors' conclusions is the insensitivity of the chosen behavioral

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measures to conceptual priming. In Experiment 2, one task (either rating name frequency or fame) was performed during study, and the other at test. Priming was absent when frequency decisions were made at test. In other words, priming effects were driven entirely by the 50% of participants who made fame decisions at test. On the basis of priming measures collapsed across test, the authors concluded that name frequency had no effect on priming. If this analysis instead were to be conducted excluding data from the frequency test (for which priming was absent), a sizeable trend for greater priming for low- versus high-frequency names would be revealed (Table 2). Indeed, robust conceptual priming for low-frequency words has previously been noted (Ramponi, Richardson-Klavehn, & Gardiner, 2007). With reliable measures of conceptual priming, it is conceivable that one could reach the conclusion that conceptual priming, familiarity, and FN400 potentials are all similarly sensitive to name frequency. The findings, as they stand, thus fail to provide a convincing dissociation between conceptual priming and familiarity.

Another shortcoming is that different encoding tasks were performed in the paradigm used to investigate neural correlates of recognition (Experiment 1) versus the paradigm used to investigate behavioral correlates of conceptual priming (Experiment 2). These differences likely served to differentially influence conceptual processing for nonfamous names. Names were studied in Experiment 1 under intentional encoding and were therefore likely subject to conceptual processing whether famous or nonfamous. Although the authors asserted that "a faceless name has no semantics" (p. 9), we suspect that participants in memory experiments commonly find it advantageous to engage in conceptual elaboration as a mnemonic strategy (Richardson, 1998), even with names that do not happen to belong to a famous person.[1] Moreover, the most meaningful nonfamous names would tend to be overrepresented in ERP contrasts. Only correct responses were considered, and, even for minimally meaningful stimuli, the relatively more meaningful items are best recognized (Voss et al., in press; Voss & Paller, 2007). We would thus assert that conceptual fluency was likely enhanced for repeated names correctly identified during recognition testing, especially for rare names, for which FN400 old/new effects were also maximal. In contrast, task demands during encoding in Experiment 2 likely served to de-emphasize conceptual processing, in that speeded decisions were necessary rather than memorization. The encoding task that produced significant priming was frequency rating, which is a task unlikely to engage much conceptual elaboration. Conceptual priming would thus have occurred preferentially for famous names because they carried preexisting conceptual meaning.[2]

The selectivity of priming for famous names in Experiment 2 therefore cannot be generalized to Experiment 1. This asymmetry in the way the two experiments were designed should be considered a confound because it served to stack the deck in favor of finding (a) neural correlates of conceptual priming during recognition in Experiment 1 for both famous and nonfamous names and (b) behavioral signs of conceptual priming in Experiment 2 only for famous names. We posit that Stenberg et al. (2009) did not show that FN400 effects reflect familiarity rather than conceptual priming because adequate dissociations between behavioral measures of the two memory phenomena were not present. The findings should therefore be considered equivocal with respect to the two positions.

On the other hand, some of the findings reported by Stenberg et al. (2009) contradict an association between FN400 and familiarity. Consider the prediction that FN400 effects should be present whenever accurate recognition is based on familiarity. FN400 effects were observed for low-frequency names but not for high-frequency names. If FN400 potentials truly indicated familiarity, then high-frequency names—which were also recognized with high levels of familiarity (Table 1)—should have evoked FN400 effects.

We have previously argued that behavioral measures of both familiarity and conceptual priming are necessary to substantiate any neural dissociation between them (Voss & Paller, 2008; Paller et al., 2007). In this respect, the study reported by Stenberg et al. (2009) can be seen as an advance over the many previous studies in which neural correlates of familiarity-based recognition were identified without any attempt to account for effects of conceptual priming on behavioral and neural measures. However, not only must conceptual priming be measured, but, as highlighted here, these measures must closely reflect the type of conceptual processing engaged in the recognition test. In other words, the conditions of recognition testing must closely match those used for assessing conceptual implicit memory with respect to conceptual processing.

A key step in understanding recognition will be to determine the extent to which it emerges as a result of processing that also produces conceptual priming. Valid dissociations between conceptual priming and familiarity are needed for this endeavor. Armed with these dissociations, it will be feasible to characterize the neurocognitive processes that give rise to both memory expressions, so as to determine the extent to which they overlap. Future investigations should therefore focus on dissociations between conceptual priming and familiarity memory wherein the contributing neural events can be investigated and understood.

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Notes

1. Stimuli that are seemingly devoid of meaning can nonetheless be perceived as meaningful, much as a cloud might be seen to resemble an animal or a Rorschach splotch a couple embracing. In experiments with minimally meaningful stimuli (Voss et al., in press; Voss & Paller, 2007), we found that the meaningfulness ascribed to any particular stimulus varied idiosyncratically across individuals and yet was remarkably stable for a given individual even when tested a year later. Conceptual priming was restricted to the particular images that an individual found to be meaningful. Furthermore, FN400 amplitudes during priming tests correlated directly with the magnitude of this conceptual priming, and FN400 potentials during recognition tests were observed only for the idiosyncratically meaningful images. Stimuli not perceived as meaningful did not support conceptual priming and did not elicit FN400 potentials during recognition, even when familiarity was strong.
2. An additional concern should be registered about the assumption that conceptual fluency with nonfamous names at test would result in their faster classification as not being celebrities (the priming measure). Fluency with nonfamous names due to a recent exposure can lead them to be mistakenly categorized as famous (i.e., the "false-fame effect" described by Jacoby, Kelley, Brown, & Jasechko, 1989). Although accuracy data were not reported, the trend for slower responses for repeated nonfamous names could have been an indication of conceptual priming after all.

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