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# Motivational Relevance as a Potential Modulator of Memory for Affective Stimuli: Can We Compare Snakes and Cakes?

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## Abstract

Consideration of affective dimensions beyond arousal may be useful for a more precise understanding of the effects of emotional events on episodic memory. As highlighted by Kensinger (2009), the valence of an event may differentially impact the accuracy of its recall. Paralleling work on attention, we propose that the relevance of an event or stimulus for survival may also importantly modulate memory accuracy. However, few memory studies to date have accounted for motivational relevance, and the stimuli employed in most studies are not matched on this dimension.

## Keywords

memory, motivational relevance, valence

While there is convincing evidence that arousal modulates memory performance (e.g., Mather, 2007), few studies have addressed how other emotion-related dimensions influence memory. Kensinger's review (2009) importantly addresses this void and posits that the valence of an event differentially affects accuracy of episodic memory. Building on this hypothesis, we propose that just as arousal alone may not fully capture the effects of emotion on memory, valence may also be too simplistic a distinction. Here we highlight the potential impact of motivational relevance, or the degree to which a particular stimulus is of import for survival and evolutionary fitness. As most previous memory studies have not considered motivational relevance, the stimuli used in these studies have not typically been appropriate for addressing this question, which may lead to premature conclusions regarding the effects of valence that do not account for other important affective characteristics.

Kensinger's conclusion that positive stimuli result in more generalized, conceptual memories is consistent with work by Levine and Pizarro (2004), a finding they situate in the context of goal relevance. They suggest that in happiness, the sought after goal has been attained, thus affording the luxury of processing based on general conceptual knowledge. While this may be adaptive for post-goal attainment states, pre-goal attainment states are likely to necessitate different priorities for attention and memory, such as directing resources to the specific details needed to achieve that goal. More broadly, motivational states, not just valence, matter for attentional deployment, and may matter for memory as well. In particular, a substantial body of

research has highlighted motivational relevance as an important characteristic distinguishing affective responses (Bradley, Greenwald, Petry, & Lang, 1992) and impacting allocation of attention (e.g., Gable & Harmon-Jones, 2008), suggesting that it may be an important consideration for memory as well.

Furthermore, despite the evidence reviewed by Kensinger on the valence effect, the literature on this issue is not entirely consistent. Of the studies that have included stimuli of both valences, a number have failed to find a memory advantage for negative compared to positive stimuli (Anderson, Wais, & Gabrieli, 2006; Bradley et al., 1992; Bradley & Lang, 2000; Libkuman, Stabler, & Otani, 2004). Indeed, a direct comparison of motivationally relevant stimuli found equivalent memory accuracy for aversive and appetitive stimuli (Bradley et al., 1992). In addition, the increased sensory cortical activation identified as a key mechanism underlying heightened memory for details of unpleasant stimuli has been shown to be present for positive stimuli as well (e.g., Breiter et al., 1996). Furthermore, this effect is more pronounced for high arousal stimuli, which correspond directly to stimuli of higher motivational relevance (e.g., threat, erotica) (e.g., Bradley et al., 2003). Such findings suggest that appetitive motivationally relevant stimuli are also preferentially processed and should be evaluated for their effects on memory.

The aforementioned inconsistencies in the valence effect may also be a function of methodological differences, including: (a) differences in the nature of stimuli used in different studies (e.g., some used motivationally-relevant stimuli, some did not), and (b) failure to match positive and negative stimuli on motivational relevance within the same study. With respect to the first point, the events Kensinger focuses on in detailing the valence difference (e.g., the O. J. Simpson trial, the Red Sox–Yankees World Series) are of less obvious motivational relevance than the stimuli used by Bradley and colleagues (1992) (e.g., threat, erotica) and some other studies which found no valence difference. Thus, it is possible that the valence effect demonstrated by Kensinger may be specific to salient, but non-motivationally-relevant events. Regarding the second point, almost none of the studies examining valence influences on memory have attempted to match stimuli on motivational relevance. For example, Kensinger refers to differences in memory accuracy for grenades and snakes compared to wedding gowns and cakes, stimuli that possess inherent differences with respect to survival.

It should be noted that motivational relevance is defined as those stimuli that strongly activate the appetitive and avoidance systems, which in effect confounds motivational relevance with arousal. However, it is possible to differentiate these two dimensions by comparing stimuli matched on arousal, but differing in biological salience (e.g., a snarling dog vs. a Yankees defeat). It is quite conceivable that attempts at dissociating the effects of valence, arousal, and motivational relevance would reveal that these constructs largely overlap, but also contribute smaller independent contributions to memory accuracy.

As a caveat, it is clear that a negativity bias exists for processing of affective stimuli, and this bias may apply to episodic memory as well. Furthermore, the notion that valence may influence recall is without question an important topic of research. However, given the noted attentional and functional neuroanatomical differences associated with motivationally relevant stimuli, it seems worth exploring the degree to which such differences extend to memory. We are by no means the first to posit that biological relevance may influence memory (e.g., Ochsner, 2000); however, little attention has been paid to testing this premise. In sum, we offer a caution on focusing solely on valence as a moderator of memory accuracy, and encourage analysis of additional affective characteristics, including motivational relevance.

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