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Emotional imagery, the visual startle, and covariation bias: An affective matching account

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Abstract

This study assessed the effects of imagery valence and arousal on the visually prompted startle reflex, heart rate, and estimates of probe occurrence in 24 males and 22 females. Valence and arousal independently augmented startle magnitudes, similar to prior research with acoustic probes (Witvliet, C.V.O., Vrana, S.R., 1995. Psychophysiological responses as indices of affective dimensions, Psychophysiology 32, 436–443). In both of these studies, arousal exerted stronger effects than valence on the startle reflex. Arousal also facilitated heart rate acceleration. Participants' estimates of startle flash occurrence reflected a covariation bias. Estimates were higher and more accurate for the high-arousal conditions and for the negative conditions, paralleling startle magnitude findings. Results suggest that affective *response matching* processes (rather than affective stimulus matching) influenced both startle reflex magnitudes and probe frequency estimates. Comparisons with the covariation bias literature are drawn, differences are addressed, and directions for future research are suggested.

Keywords: Emotional imagery; Valence; Arousal; Visual startle reflex; Covariation bias; Heart rate

1. Introduction

Emotional modulation of the startle reflex has been viewed as the result of an affective match between the startle probe stimulus and the emotional context in

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which the probe occurs. Startle probe stimuli are viewed as aversive, and eyeblink responses to startle probes are augmented when they occur during aversive contexts (Lang et al., 1990). Most studies have focused on valence as the dimension of emotion that mediates startle responding. However, some researchers — particularly those interested in startle modulation during emotional imagery — have also noted the importance of affective arousal in startle responding (Cook et al., 1991; Hawk et al., 1992; Witvliet and Vrana, 1995), although most studies have not attempted to separate the valence and arousal dimensions in their research designs.

Using a balanced 2-valence by 2-arousal imagery design, Witvliet and Vrana (1995) found that negative valence and high-arousal independently facilitated eyeblinks to acoustic startle probes, and the effect of arousal was even greater than the effect of valence. These results suggest that *both* valence *and* arousal are important in affective matching during imagery (Witvliet and Vrana, 1995). In the current study, we extend these results by measuring the magnitude of the visual startle reflex in imagery conditions that vary in valence and arousal. Participants reported on their valence and arousal response to the startle probes in order to examine the specific properties of the affective match between the startle probe and imagery context that modulate startle responding. In addition, we extend the concept of affective matching by examining its role in the bias toward participants' report of a covariation between the presentation of startle probe and both negative and arousing imagery.

Methodologically, the most common means for prompting startle eyeblinks during imagery is to present sudden onset white noise bursts (Vrana and Lang, 1990; Cook et al., 1991, 1992; Witvliet and Vrana, 1995). Studies in which emotion has been prompted by slides have used other probe modalities to startle participants, including visual and tactile startles. Bradley et al. (1990) found that regardless of whether startle probes were acoustic or visual, the same emotion–startle effects were obtained in their slide study. A similar pattern of affective modulation was found when Hawk and Cook (1997) used airpuffs to elicit startle responses during slides (although startle responses were unexpectedly larger during neutral than positive and negative slides in the first half of the experiment). Thus for these slide studies, startle responses were generally similar even when probes occurred in different sensory modalities, suggesting that affective processing plays a more significant role in startle modulation than the sensory modality of stimuli. Importantly, researchers have not yet tested startle–emotion effects by using different sensory modalities for eliciting startle responses during imagery. Because we believe the startle–emotion effects during imagery are due to the affective match between the startle probe *stimulus* and the affective qualities of the context in which the probe is presented, we predict that the sensory modality of the startle probe should not alter emotion effects, and that high-arousal and negative valence will independently augment startle responding to visual light flashes, just as was found with acoustic startle stimuli (Witvliet and Vrana, 1995).

Previous data suggest that participants' affective responses to the visual startle probe contribute to the affect–startle effect (Bradley et al., 1990). Whereas acoustic startle magnitudes were enhanced during aversive emotion across all participants,