



State anxiety and affective physiology: effects of sustained exposure to affective pictures

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Abstract

Effects of sustained exposure to emotional stimuli on affective reactions and their recovery were examined to determine whether increasing exposure to a specific emotional content (e.g., unpleasant) cumulatively affects physiological responses; and whether motivational activation persists following sustained exposure. Participants viewed pleasant, neutral, and unpleasant IAPS pictures, presented in blocks separated by an inter-block interval. With increasing exposure to unpleasant pictures, startle magnitude showed greater potentiation, and corrugator EMG activity increased. Both affective startle and corrugator modulation persisted following exposure to unpleasant pictures. The cumulative effects of sustained exposure to unpleasant pictures were enhanced for those reporting higher state anxiety, consistent with the hypothesis that sustained aversive exposure leads to increased defensive activation. These findings suggest sustained exposure to unpleasant pictures may induce a short-term mood state, and may be a useful paradigm to study individuals who vary in symptoms of anxiety. © 2004 Elsevier B.V. All rights reserved.

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1. Introduction

Previous work has indicated that during exposure to individual affective pictures, phasic facial electromyographic (EMG) indices of emotion, including the acoustically elicited startle eye blink response and corrugator supercilii activity, as well as initial heart rate deceleration, are heightened when viewing unpleasant, compared to pleasant, pictures. Furthermore, electrodermal reactivity is reliably greater when viewing emotional (pleasant

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or unpleasant), compared to neutral, pictures (e.g., Lang et al., 1993; Bradley et al., 2001). These responses are hypothesized to reflect activation of underlying brain systems that mediate appetitive and defensive motivational behavior, respectively (Lang, 1995).

In this study, we explored the emotional effects of exposure to a sustained series of emotional pictures. Important questions concern whether such exposure to unpleasant (or pleasant) emotional content has a cumulative effect on physiological responses, and second, whether defensive or appetitive activation is maintained when the stimuli are withdrawn. Thus, the research considers the special effects of massed emotional stimulation, either pleasant or unpleasant, on the development of a tonic affective state, and furthermore, assesses the extent to which this pattern may persist following exposure.

Two previous studies have examined psychophysiological responses during and after sustained affective picture presentations. Bradley et al. (1996) presented blocks of 24 pleasant, neutral or unpleasant pictures in which each picture was shown for 6 s and was followed by a 6 s inter-picture interval. Startle response magnitude was greater 1 s following the offset of unpleasant, compared to pleasant or neutral, pictures. Thus, at least immediately after picture offset, blinks were modulated in the absence of an unpleasant picture stimulus. In addition, corrugator EMG activity increased as more unpleasant pictures were presented, suggesting a cumulative effect of prior pictures on this facial frown response. Sutton et al. (1997) also presented blocks of 24 similarly rated affective pictures. In their study, each picture was shown for 12 s and affective startle modulation was explored at different time points within each picture. They found that startle potentiation was greater for startle probes presented later in each picture presentation compared to probes presented soon after picture onset.

In the current study, rather than measuring startle responses at different times within a single picture presentation or immediately after picture offset, startle was measured both early and late in a continuous picture series. Corrugator and zygomatic EMG activity, and autonomic responses (heart rate, skin conductance) were measured continuously. Furthermore, the persistence of affective responding was examined over relatively long (i.e., 30–60 s) intervals post-picture viewing, again with early and late assessment. Finally, participants' self-evaluated anxiety (state and trait anxiety) prior to the experiment was determined and their relationship assessed to both picture response magnitude and the persistence of these emotional effects after stimulation.

Several alternative hypotheses were evaluated: first, does response sensitization occur, resulting in a cumulative increase in affective modulation as more pictures of the same hedonic valence were presented? This view is supported by previous research on sustained exposure to pictures (e.g., Bradley et al., 1996) as well as by studies showing that prolonged exposure to uncontrollable stress in rodents, and electric shock in humans, results in the response sensitization of defensive systems (Figueiredo et al., 2003; Hamm and Stark, 1993). Second, prolonged exposure could lead to diminution in reactivity, presumably due to habituation. For instance, some data suggest that repeated processing of erotic film clips results in the loss of pleasure attenuated startle magnitude (Koukounas and Over, 2000). Third, it is possible that emotional reflex reactions are driven primarily by the specific stimulus, and these responses do not change with increased exposure. In this case, affective differentiation would also terminate after exposure.

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