Deconstructing threat in picture processing: An event-related potential investigation of sex differences in the motivational relevance of highly aversive images

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Rosemaree Kathleen Miller

Date: _____

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Abstract

Motivational relevance refers to an individual's capacity to prioritise attention allocation towards stimuli with high emotional salience. Sex differences in cognition, perception and behaviour suggest that the motivational relevance of negative stimuli is different for men and women. The evidence is mixed for this form of sexual dimorphism, however, as men and women are also known to vary in their vulnerability to stress-eliciting stimuli, or stress reactivity. This association between stress reactivity and an individual's biological sex may be affected by the specific features of a stimulus which denote threat to an individual. The strength of this relationship in emotional processing has previously been assessed with the use of unpleasant images as negative stimuli in several studies utilising electroencephalography (EEG) measures. The premise that the threat value of aversive images, particularly salient forms of negative stimuli, drives sex-specific variation in event-related potential (ERP) activity was examined across three EEG studies in the present research. Threat value, in this context, refers to the interaction between the stimulus- and individual-level factors that drive attention allocation towards threatening stimuli. In Experiment 1 this was investigated through the selection of specific semantic categories in images shown to participants (i.e., reptiles, firearms, humans) and the measurement of personality traits associated with stress reactivity in men and women (i.e., alexithymia, neuroticism, trait anxiety and worry). The influence of the female ovarian cycle on stress reactivity was also addressed by recruiting women prescribed contraceptive medication for all three EEG studies. In line with predictions, sex differences in stimulus-locked ERP amplitude were moderated by the threat value of images showing snakes, handguns or human injury. The effect of context on responses towards the threat value of aversive stimuli was

targeted in Experiments 2 and 3. Differences between men and women in motivational relevance may depend on the deployment of sex-specific strategies in response to stimuli which represent threats to male or female individuals. This was tested using a modified Flanker paradigm which featured congruent and incongruent arrays constructed from images sourced from specific stimulus categories (i.e., reptiles, firearms, humans), as well as the measurement of the same stress-related personality traits assessed in Experiment 1. Sex differences, and similarities, in response selection were indexed by stimulus-locked ERP activity modulated by reptile and firearm stimuli in Experiment 2, and human stimuli in Experiment 3. Across all three EEG studies levels of neuroticism, trait anxiety and worry contributed to sex-specific variation in ERP activity across the picture processing stream, supporting the notion that differences between male and female individuals in motivational relevance are influenced by both individual- and stimulus-level factors. Moreover, the results of the present research demonstrate that threat value must be considered when investigating the emotional salience of negative stimuli, and that sources of individual variation, such as sex differences, represent a rich avenue of inquiry for psychological research. Furthermore, the present research findings also have implications for the way in which stress reactivity is examined in men and women, particularly in regards to the types of psychopathology associated with being male or female.