

## Blood pressure changes highlight gender differences in emotional reactivity to arousing pictures

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### Abstract

The current study was aimed at investigating the effects of gender on the magnitude and patterning of blood pressure responses to specific pleasant and unpleasant, arousing visual stimuli. Systolic and diastolic blood pressure (SBP and DBP), as well as heart rate (HR) and skin conductance (SCR) responses were investigated during picture viewing in 21 female and 25 male students. The pattern of SCR and HR reactivity across emotional categories was found to be similar for men and women. Gender was found to be an effective moderator of BP responses specifically to sexual stimulus content, which prompted greater reactivity in men than in women. These findings extend prior research on gender differences in autonomic responding to emotional visual stimuli and suggest that BP changes might reflect sexual peripheral arousal more than other autonomic measures.

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### 1. Introduction

In Western countries, stereotypic beliefs about gender differences in emotional expression and experience are widely shared and are acquired as early as preschool age (Birnbaum, 1983). Women are expected to smile more, to share their feelings more often, to express more positive emotions, but also more powerless emotions, such as fear, sadness, shame and guilt, and with greater intensity. On the other hand, men are believed to inhibit their emotions, both positive and negative, except for powerful emotions, such as anger and pride (Brody and Hall, 1993; Heesacker et al., 1999; Timmers et al., 2003).

This gender role stereotype, though, has received only partial support from empirical findings, especially when specific emotional events and detailed social situations are considered (LaFrance and Banaji, 1992; Feldman Barrett et al., 1998; Hess et al., 2000).

The most consistent results on gender differences regard the expressiveness, or the “outward display” of the emotion (Kring and Gordon, 1998; Hutson-Comeaux and Kelly, 2002). Smiling behavior is observed more frequently in women than in men, and aggressive/anger overt reactions are more typical for men (Brody and Hall, 1993; Hess et al., 2000; Neumann and Waldstein, 2001). Other studies indicate that women are superior to men at facially expressing most of the basic emotions, including fear, sadness, disgust and surprise (Fujita et al., 1980; Tucker and Riggio, 1988; Kring and Gordon, 1998). However, since emotional expressivity per se is strongly influenced by voluntary control and modulation, as well as by social and cultural display rules (Ekman and Friesen, 1975; Ekman, 1992; Kring and Gordon, 1998; Bradley et al., 2001b), the general emotion stereotype could ultimately be the source of the sex-related differences (Hess et al., 2000).

Research investigating the relationship between emotional expression and physiology indicate that diminished physiological reactivity is associated with a more expressive behavior (externalizing style), whereas enhanced reactivity is associated with inhibition of emotional expression (internalizing style) (Buck, 1984). On the ground of this

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evidence, men are found to be more often internalizers, women externalizers (Manstead, 1991). On the other hand, Brody (1999) suggested that women might be better defined as generalizers, since they tend to express emotions in many modalities of emotional expression.

Indeed, it is reasonable to hypothesize that gender differences in emotional physiology are not extended to all affective contexts, but emerge more strongly under specific stimulus conditions, especially the ones that differentially challenge men and women, being more salient to one gender than the other. From an evolutionary point of view, men and women have been engaged in dealing with different adaptive problems, in order to achieve different biological and social goals. Thus, men might be more inclined to engage in competitive behaviors and in maximizing their sexual success, whereas women might invest more resources in motherhood and in developing enduring relationships (Troisi, 2001). Moreover, it is possible that gender differences in psychophysiological reactivity, if present, may be revealed only by physiological measures that are less influenced by voluntary control (e.g. autonomic versus EMG measures), and thus less affected by subjective evaluations and display rules (Bradley et al., 2001b). Lastly, it can be speculated that, due to constitutional factors, across genders emotional reactivity is represented by the selective activation of different response systems. In this respect, there is a lack of systematic investigation of gender differences in physiological responses to emotional stimuli.

In a recent study, Bradley et al. (2001b) investigated emotional responding in men and women by means of physiological, expressive and subjective indices. Results indicated that compared with men, women rated unpleasant pictures as more arousing and unpleasant, also reacting with larger changes in corrugator EMG activity and greater cardiac deceleration, irrespective of specific content. On the other side, men rated erotic materials as more arousing and pleasant, also showing larger skin conductance changes to this specific content than did women. It is concluded that women show a stronger disposition to engage the defensive motivational system when exposed to aversive cues, whereas men display increased appetitive activation only when viewing erotic stimuli. Despite these sex-related differences, the pattern of autonomic and somatic modulation was found to be largely comparable, with both genders being more reactive to highly arousing stimuli. Different results had been previously reported by Krug and Gordon (1998), who found that women were overall more facially expressive than men in response to emotional films, with no differences in reports of experienced emotion. Moreover, men were found to display greater skin conductance responses than women during fear and anger, whereas women showed greater reactivity during sadness and disgust. Thus, it cannot be concluded that women are, in general, more emotional than men, or that they are specifically more reactive to unpleasant events. On the other hand, no gender differences in cardiovascular reactivity have been reported by Neumann

and Waldstein (2001) across different emotional recall tasks differing in affective valence and arousal, indicating largely comparable response patterns in men and women. However, as suggested by the authors, some physiological differences between genders might have been identified by using a larger sample of emotional contents.

Some explanations for discrepancies in the literature may be the different nature (emotional perception versus emotional imagery) and duration (seconds versus minutes) of the employed tasks, as well as the adopted theoretical perspective (specific emotion versus dimensional approach).

Far more consistent and converging evidence emerge across studies investigating gender differences in cardiovascular reactivity to stressful events. In particular, one crucial measure, that also has potentially pathogenic implications, is blood pressure (BP). Stress research has demonstrated larger blood pressure responses in men under physical (Allen et al., 1993; Daida et al., 1996), cognitive (Allen et al., 1993; Lawler et al., 1995; Rose et al., 2004) and psychosocial (Morris-Prather et al., 1996; Fichera and Andreassi, 2000) stress. An exaggerated cardiovascular reactivity to stressors might play a role in the higher incidence of coronary heart disease (CHD) in men. Epidemiological evidence indeed indicates that the male gender is an established risk factor for cardiovascular disease and hypertension (Johnson, 1977; Kannel, 1987; Hall, 1990; Anastos et al., 1991; Smith et al., 2000). Although much focus has been placed on constitutional differences such as potential buffering effect of estrogens and/or on the role of androgens in blood pressure control (Reckelhoff, 2001; Leinwand, 2003), little is known about the underlying mechanisms associated with gender differences in cardiovascular disease and blood pressure regulation.

The importance of blood pressure, as compared with other cardiovascular parameters, in highlighting gender differences to stress has been documented by a large number of studies. On the other hand, little attention has been devoted to gender differences in blood pressure reactivity under nonstressful emotional conditions. Aversive, challenging, or engaging laboratory tasks, such as mental arithmetic, mirror tracer, public speaking, shock avoidance, or aerobic exercise have been usually employed. Even when defined as passive, standard stressful tasks usually imply by definition long-lasting aversive conditions, such as cold pressor test, loud noise stimulation or viewing accident/surgery films (Levenson, 1979; Sherwood et al., 1990), so that research is clearly biased in favour of prolonged negative emotional states.

The primary interest that guided the design of this study was the potential role of blood pressure in enhancing gender differences in emotional responding. It was hypothesized that BP, better than other autonomic measures, would be helpful in determining the emotional conditions under which gender differences are especially large. We investigated whether male “superiority” in BP reactivity to stress would

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