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Anger, negative emotions, and cardiovascular reactivity during interpersonal conflict in women

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Abstract

Objective: In order to evaluate the relationship between women's subjective emotional discomfort with anger and cardiovascular responses to stress, cardiovascular and affective responses were examined during two anger-provoking conditions: one in which anger would be in self-defense, and one in which anger would be in defense of a significant other. **Methods:** A total of 42 healthy, normotensive women aged 18–35 years recruited a close female friend to participate in the study with them, and were randomly assigned to one of two harassment conditions: (i) Self-Harass, where women were harassed while performing a math task; (ii) Friend-Harass, where women witnessed a close female friend being harassed while their friend performed a math task. **Results:** Self-Harass and Friend-Harass women reported feeling equally angry, annoyed, and irritated (all P's $< .01$) during their respective anger-provocation conditions. However, Self-Harass women reported experiencing significantly greater increases in feelings of depression and guilt during anger provocation (P's $< .05$) relative to Friend-Harass women. Interestingly, it was also the Self-Harass women who exhibited significantly greater elevations in heart rate (HR), cardiac output (CO), systolic blood pressure (SBP), forearm blood flow (FBF), and significant reductions in forearm vascular resistance (FVR; P's $< .001$) relative to Friend-Harass women during anger provocation. **Conclusions:** Results suggest that women may experience other negative emotions (e.g., guilt, depression) when anger is in self-defense relative to when it is in defense of others, and that these emotions may play a more important role than anger in moderating cardiovascular reactivity (CVR) during interpersonal conflict.

Keywords: Anger provocation; Cardiovascular reactivity; Negative emotions; Women

Introduction

Research has demonstrated a link between anger and anger-related feelings and increased risk for cardiovascular disease (CVD) [1–3]. It has been proposed that the mechanism through which anger confers risk for CVD is via persistent exaggerated cardiovascular reactivity (CVR) to stress [4–9]. In support of this hypothesis are a number of studies documenting a relationship between anger and elevated CVR to laboratory stressors, particularly those involving interpersonal conflict [7,10–12].

With a few exceptions (e.g., Refs. [13–15]), research examining the anger–CVR relationship has largely focused on male samples. However, studies that have included women participants frequently report either gender differences in both cardiovascular and emotional responses to harassment or inconsistent results for women across harassment studies (see Refs. [4,6,16]). Explanations for these inconsistent findings, both within and across studies have included: (1) different anger expression styles for men and women [17]; (2) gender relevance of interpersonally challenging stressors [18]; and (3) underreporting of anger responses to harassment in women [19].

Often neglected in research examining anger and CVR in women is that anger is a socially different experience for men and women. Anger, in contrast to nearly all other emotions, is considered a typically male response [20,21]. This view appears to have been fostered by socialization practices that accept, and even encourage anger in men, but

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discourage anger in women [22]. In fact, there is evidence from socialization literature showing that girls from a very young age selectively inhibit the expression of socially unacceptable emotions, namely anger [21,23–25].

It is noteworthy that despite compelling socialization influences, women experience anger to the same degree as men, as intensely, and for much of the same reasons [24,26–28]. However, consistent with socialization practices, there is evidence that women tend to inhibit both the experience and the expression of anger relative to men [24,26,29].

Because women are socialized to suppress anger, but appear to experience anger to the same degree as men, it has been argued that feeling or showing anger may elicit other negative emotions in women (e.g., guilt, anxiety) that may not be elicited in men [20,24]. In fact, there is evidence showing that women more frequently report other negative emotions (e.g., shame, depression, and guilt) and cry in response to their anger than do men [30–32]. The question is, what effect could these other negative emotions have on women's cardiovascular responses in studies employing interpersonal harassment protocols, whose goal is to evaluate the effect of anger on CVR?

In order to evaluate the potential moderating effect of other negative emotions on CVR during anger provocation, the affective and cardiovascular responses of women were examined under one of two anger-provocation (harassment) conditions: one in which experiencing anger may be considered socially acceptable (i.e., consistent with socialization practices), and one in which experiencing anger may not be considered socially acceptable (i.e., inconsistent with socialization practices). Evidence suggests that women may experience less emotional conflict during anger if they believe that they have a legitimate or socially acceptable reason for feeling angry [20,30]. Given that women are socialized for supportive and protective roles [20,22,23,33], women may experience fewer negative emotions during anger when it is in defense of a significant other as opposed to when it is in defense of themselves personally. In this study, women were either harassed themselves (Self-Harass) or were witness to the harassment of a close female friend (Friend-Harass). It was hypothesized that harassment would elicit feelings of anger in women under both conditions, but that only women experiencing anger in the self-defense condition would exhibit increases in other negative emotions and show greater elevations in CVR relative to women experiencing anger in defense of a significant other.

Method

Participants

Forty-two healthy, normotensive female undergraduates between the ages of 18 and 35 participated in the study. All participants recruited a close female friend to participate in the study with them. All participants were randomly assigned to one of two harassment conditions: (1) Self-Harass: the participant observed her friend engage in a mathematical subtraction task without harassment; then engaged in the math task herself while being harassed through anger-provoking statements; or (2) Friend-Harass: the participant engaged in the math task without harassment; then observed her friend engage in the math task while her friend was harassed through anger-provoking statements.

Physiological recording apparatus

Though both the participant and her friend were instrumented identically for physiological recording, only signals for the participant were actually recorded. Measurements of systolic blood pressure (SBP) and diastolic blood pressure (DBP) (in mm Hg) were obtained at 1-minute intervals using an IBS Model SD-700A automated blood pressure monitor (Waltham, MA, USA) and a thigh cuff on the left leg. Heart rate (HR, in bpm), cardiac output (CO, in l/minute), stroke volume (SV, in ml), and TPR (in dyne-sec cm^{-5}) were recorded noninvasively through impedance cardiography using a Minnesota Impedance Cardiograph (Model 304B, Instrumentation for Medicine, Greenwich, CT, USA), the Cardiac Output Program (COP, Bio-Impedance Technology, Chapel Hill, NC, USA), and an IBM AT computer. (For a detailed explanation of impedance methodology and the Minnesota Impedance Cardiograph, see Ref. [34].) Recordings for these cardiac measures were obtained during the first 50 seconds of each minute. Ensemble averaged values of HR, CO, SV, and TPR were obtained from these recordings by the COP system for each minute. Forearm blood flow (FBF, in ml/minute/100 ml) was also measured each minute using Whitney's procedure [35]. Forearm vascular resistance (FVR) values (in units) were calculated by dividing individual FBF measurements by the corresponding mean arterial blood pressure value. A detailed explanation of this measurement procedure is provided elsewhere [36].

Mental arithmetic task

The task employed was a 9-minute computerized mathematical subtraction task consisting of 180 subtraction equations presented for a duration of 3 seconds with either correct or incorrect solutions [37]. The task was divided into three 3-minute trials. The participant responded using a computer mouse as to whether the solution to the equation was correct or incorrect. Auditory feedback informed the participant if she had given the appropriate response.

State affect measure

To assess changes in affective state, each participant and her friend completed a visual-analog mood questionnaire at