Cardiovascular responses across stressor phases: The match of gender and gender-role identification with the gender relevance of the stressor

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Abstract

Objective: To test the hypothesis that cardiovascular responses across stressor phases (anticipation, stressor, recovery) are higher when gender or gender-role identification match with the gender relevance of the stressor than in case of a mismatch and gender irrelevance which are not supposed to differ. **Methods:** In a double-blind design, 151 healthy women and men were assigned to the Cold Pressor Test with feminine, masculine, or gender-irrelevant introductions. **Results:** The pattern of responding was vascular [high on systolic blood pressure (SBP), diastolic blood pressure (DBP), and total peripheral resistance (TPR), and relatively low on heart rate, stroke volume, and cardiac output] across stressor phases. SBP, DBP, and TPR responses supported the gender match hypothesis, although men showed higher TPR responses to irrelevance than to mismatch. DBP and TPR responses supported the gender-role identification match hypothesis. **Conclusion:** The match–mismatch–irrelevance paradigm contributes to the understanding of gender differences in stress responses and related health risks.

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Introduction

Health differences between women and men are well documented [1–3]. One of the underlying mechanisms may be a differential response to stressful situations, which in due course may damage health (e.g., higher rates of cardiovascular disease in younger men may be explained by differences in stress response). However, research on cardiovascular reactivity to laboratory stressors showed mixed results with regard to gender differences [4–8]. These inconsistent findings have been attributed to the type of stressor under investigation [i.e., cognitive stressors (reaction time, memory tests] vs. social stressors [9–11]. It was then assumed that these stressor-related differences in reactivity should be understood in relation to their gender relevance. A gender-relevant stressor is characterized by contexts associated with sociocultural norms about what is appropriate for women and men in regard to which it is more important to succeed for women and men, respectively, thereby having distinct effects on effort. The impact of a gender-relevant stressor depends on what gendered information is represented in memory and on how this information is organized. Differences among men and among women are then reflected by differences in gender-role identification (i.e., the adherence to gender-appropriate behavior). Higher cardiovascular responses are then expected when a stressor is automatically appraised as gender-relevant and taps the importance of maintaining the integrity of gender-role identification, that is, in case of a match between gender (role identification) and gender relevance of the stressor.

Three studies found gender match effects on systolic blood pressure (SBP), whereas findings were mixed on diastolic blood pressure (DBP) and heart rate (HR) [10–12]. One study found no effects [13]. However, their negative findings have been attributed to order effects [11] and the

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majority of their sample being androgynous [14]. Effects of gender-role identification match on SBP were shown in two studies and on HR in one [15–17]. However, other findings were negative [14,18]. The evidence supporting the match hypothesis has been mixed to date, possibly due to differences between these studies. No study combined gender and gender-role identification to estimate the surplus value of identification, and only one tested the match hypothesis in both genders in one design [14]. One study included feminine, masculine, and irrelevant conditions [13], whereas the other studies covered only two. The type of stressor used as the basic stressor to manipulate the (ir)relevance with differed as well. Three studies [10,11,16] used a physical stressor [Cold Pressor Test (CPT)], whereas the others used a psychological stressor. The CPT is considered as relatively gender-neutral in meaning, but the neutrality of the psychological stressors is questionable (see above). Only one study conducted a pilot to check the neutrality of the basic psychological stressor [13]. Except for one study [14], cardiovascular measures were limited to BP and HR. However, underlying hemodynamic determinants [stroke volume (SV), cardiac output (CO), total peripheral resistance (TPR)] are important because of their relation to type of stressor, gender differences, and health risks (e.g., [19–21]). Also, except for three studies [12,13,15], anticipation and recovery phases were covered in addition to baseline and stressor phase, thereby acknowledging possibly differential responding in these phases (e.g., [19,22]). One study directly assessed gender-role identification with masculinity and femininity scales [14], whereas the others indirectly measured identification by estimating how stressful it is to deviate from the rules involved in gender role. Direct and indirect measures of identification represent different underlying constructs [23]. Direct measures are more sensitive to societal pressure to view ideal gender roles as more and more overlapping, and to better predict controlled behavior (subjective experience). Indirect measures are relatively free of such pressures and more predictive of automatic behavior (e.g., cardiovascular responses) [24,25]. The studies also varied in employing a double-blind design. In two studies the experimenters were unaware of identification scores [16,18]. It is uncertain whether hiding the true nature of the study succeeded. Except for one study [14], stressors were presented as masculine or feminine, referred to as sex hormones, or as different performances of men and women, thereby confounding the importance with the ability conception of gender relevance [12]. Apart from checking health status, preexperiment food intake, exercise, and drug use, the studies varied in control for age (so far mostly young students), body mass index (BMI), hormonal status (e.g., [20]), daily stress (e.g., [21]), gender of experimenter, and time of testing.

The present study expanded upon earlier studies by addressing most of the above issues. In a double-blind design we tested match effects on six cardiovascular

parameters over four stressor phases in adult women and men while controlling for age, BMI, hormonal status, and daily stress. The CPT was chosen as a relatively gender-neutral stressor of relatively high difficulty. Gender relevance was manipulated by feminine, masculine, and neutral introductions to the CPT, suggesting a research-related association between hand in the water and personal characteristics related to gender stereotypes, but without any reference to men or women, masculinity or femininity, or hormones. It was assumed that cardiovascular responses across stressor phases would be stronger in case of a gender match than a gender mismatch and irrelevance, whereas responses in case of mismatch and irrelevance were not expected to differ. In addition, we examined match effects of indirectly measured gender-role identification, determined post hoc.

Methods

Participants

Participants were recruited via advertisements in local newspapers and word of mouth. Of 238 respondents screened over the telephone, 169 (71%) met the criteria for eligibility. They were included in the study if they were between 18 and 60 years old, were normotensive (blood pressure less than 140/90 mm Hg), and had a BMI (kg/m^2) between 18 and 27. They were excluded if they had a history of cardiovascular disease or chronic disease requiring medical attention or any current use of prescribed medication. Of the 169 respondents scheduled to the laboratory session, 14 did not show up because they forgot, did not have time, or did not want to attend. Participants had to refrain from cigarettes, caffeine, and alcohol for at least 8 h before the session as well as from food and exercise for at least one and a half hours before the session. One participant was rescheduled for not meeting these last criteria. Three participants withdrew from the study during the laboratory session for reasons of anxiety. Data of one subject were excluded because of measurement failure. The final sample consisted of 75 white men and 76 white women between 19 and 57 years old (mean=32.22, S.D.=10.5). The ethical board of our department approved the study protocol. Participants gave signed informed consent in which anonymity and the opportunity to withdraw were assured. They were paid $12 for their participation.

Experimental conditions

In addition to the general introduction that the study was about stress and the aim was to measure heart rate and blood pressure in response to ice water, the introductions to the CPT [hand up to the wrist in a container filled with ice water maintained at a temperature of 4°C ($\pm$1°C)] were varied and used to manipulate the gender relevance of the stressor. The