



Effort analysis of gender differences in cardiovascular response: Further evidence involving a traditionally feminine incentive[☆]

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ABSTRACT

Participants were presented a moderately- or impossibly difficult cumulative mental addition task with instructions that they could win a traditionally feminine- or masculine incentive if they achieved a 90% success rate. When the incentive was feminine, systolic blood pressure responses during the task period were stronger under moderately difficult conditions among women, but low irrespective of difficulty among men – creating a gender difference only when difficulty was moderate. By contrast, when the incentive was masculine, systolic-, mean arterial- and, to a lesser degree, diastolic blood pressure responses during the task period were stronger under moderately difficult conditions irrespective of gender. The former finding confirmed expectations and adds substantively to the body of evidence favoring a recent effort analysis of gender influence on CV response to performance challenge. The latter findings conflict with what was first expected, but can be understood in terms of *post hoc* reasoning extended in light of participants' ratings of the masculine incentive.

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1. Introduction

Recent research has addressed implications of a conceptual analysis concerned with the influence of gender on cardiovascular (CV) response to performance challenges (Wright, 2014a; Wright & Barreto, 2012). Core assumptions are that beta-adrenergic influence on the CV system varies with effort (Ahlikvist, 1948; Obrist et al., 1978; Obrist, 1981) and that effort varies non-monotonically with the difficulty of imminent or ongoing instrumental behavior (Brehm & Self, 1989; Wright, 1996; Wright & Kirby, 2001). If little effort is required to succeed, then little effort should be deployed. As difficulty increases, so should effort until success appears exces-

sively difficult – given the available benefit – or impossible, at which point effort should be withheld and remain low as difficulty continues to rise. The analysis also assumes that women and men sometimes place different value on available performance incentives (Buss, 1989; Buss and Schmitt, 1993; Ford & Beach, 1951; Harrison & Saeed, 1977; Peterson, 2004).¹

A key implication is that gender differences in appraised incentive value should sometimes – but not always – yield gender differences in effort and associated CV responses, with the presence and character of emergent gender differences depending on the difficulty of the performance challenge and gender character of the incentive. If difficulty is such that both genders perceive success on a possible task as worthwhile, both should exert effort in proportion to the difficulty of the challenge and experience correspondent CV responses (Fig. 1). By contrast, if difficulty is such that the gender with a higher incentive value appraisal considers success to be worthwhile, but the gender with a lower incentive value appraisal does not, the gender with the higher value appraisal should exert more effort and experience a stronger CV response. Whereas effort

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¹ It is of note that the valuing here refers to cold cognitive assessments as opposed to assessments based on warm feelings of desire, which have been distinguished by some theorists (Berridge, 2004; Brehm, Wright, Solomon, Silka, & Greenberg, 1983; Wright, 2011).

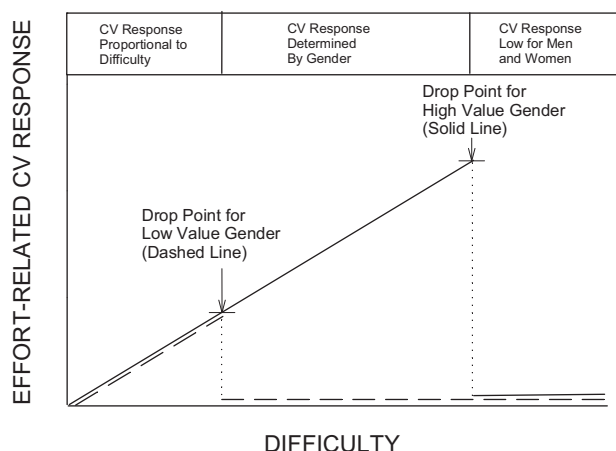


Fig. 1. The relation between effort-related CV response and difficulty for women and men with low- and high incentive value appraisals. Drawn from Barreto et al. (2012).

and associated CV responses should be proportional to difficulty for the higher value gender, they should be low for the lower value gender. If difficulty is such that success appears excessively difficult or impossible to both genders, then both should exert low effort and experience – again – correspondent CV responses.

The implication above is noteworthy for at least two reasons. One is because it could partially explain why CV response correlates of gender have been inconsistent in stress, health and other performance challenge studies (Atienza, Henderson, Wilcox, & King, 2001; Brown & Smith, 1992; Davis & Matthews, 1996; Jorgenson & Houston, 1981; Lash, Eisler, & Schulnian, 1990; Lash, Gillespie, Eisler, & Southard, 1991; Leinwand, 2003; Matthews, Davis, Stoney, Owens, & Caggiula, 1991; Stoney, Matthews, McDonald, & Johnson, 1988; Matthews & Stoney, 1988; Saab et al., 1997; Smith, Limon, Gallo, & Ngu, 1996; Stroud, Niaura, & Stoney, 2001; Van Egeren, 1979; Van Well, Kolk, & Klugkist, 2008). Most often, investigators have observed stronger CV responses in men, with effects being especially likely for systolic blood pressure (SBP – Saab, 1989; Stoney, Davis, & Matthews, 1987). However, they have sometimes observed stronger responses in women (e.g., Van Egeren, 1979) and at other times observed CV gender effects that were context-specific or null (e.g., Jorgenson & Houston, 1981).

A second reason the implication is noteworthy is because it offers an account for why CV gender differences have so commonly been manifested in terms of SBP, the peak pressure following a heartbeat. On a given heart cycle (beat-to-beat period), SBP is thought to vary with the power of the preceding heart contraction and total peripheral resistance (TPR) – resistance to peripheral blood flow corresponding to net space in the vascular network (Brownley, Hurwitz, & Schneiderman, 2000; Fairclough and Mulder, 2012; Kelsey, 2012; Richter & Gendolla, 2009). Increases in contraction force are believed to follow from beta-adrenergic activation and tend to raise SBP because they push boluses of blood through arterial space in shorter time intervals. TPR increases (associated with vascular space reductions) raise SBP because they oppose the blood being pushed. Insofar as SBP corresponds to beta-activation in a performance context, it can reasonably be taken to reflect effort – the proposed mediating link between gender and CV response. To be sure, common CV outcomes other than heart contractility and SBP can be affected by beta-adrenergic activation. However, these outcomes have underpinnings that render them less sensitive to the influence under some or all performance conditions. Thus, for example, beta-adrenergic activation tends to elevate the pace at which the heart beats, but its influence can be tempered

or masked by countervailing parasympathetic (vagal) activation, particularly when engagement is low (Obrist, 1981).

1.1. Direct tests

To date, two studies have examined directly the incentive appraisal implication. The first, by Frazier, Barreto, & Wright, 2008, led university undergraduates to believe they could earn a chance to win a traditionally feminine incentive (a fragrant body lotion) if they met an easy (two trigram) or moderately difficult (six trigram) memory challenge. Researchers predicted that effort and associated CV responses during the memory period would be proportional to difficulty among women, but low irrespective of difficulty among men – yielding a gender difference only when the challenge was moderately difficult. Heart rate (HR) responses corresponded well. SBP and diastolic blood pressure (DBP) responses were proportional to difficulty only among women, but unexpectedly elevated for men, possibly because of procedural points of confusion that were specific to the men (see article for details).

The second experiment, by Barreto, Wong, Estes and Wright (2012), included a streamlined protocol, used a different task and changed the gender character of the incentive to evaluate the suggestion that a countervailing effort pattern should be observed when men have higher value appraisals. Undergraduates were led to believe they could win a traditionally masculine incentive (their choice of mega men supplements or a bottle of Axe deodorant) by meeting an easy or moderately difficult cumulative mental addition challenge. The task required participants to add numbers sounded at a particular pace. Difficulty was varied by changing the latency between and value of addends. Easy participants were presented 1s at 5s intervals. Moderately difficult participants were presented values ranging between 1 and 9 at 2s intervals. As expected, SBP responses assessed during performance rose with difficulty among men, but were low under both task conditions among women – forming a 3 (i.e., easy-women, difficult-women, easy-men) versus 1 (i.e., difficult-men) response pattern. Performance period DBP, mean arterial pressure (MAP), and HR responses followed similar patterns, although the gender \times difficulty interaction for HR fell short of significance.

1.2. Present research

The present research was carried out as a part of an effort to extend the Barreto et al. (2012) study in two ways, (1) by including conditions in which participants were provided a traditionally feminine incentive, and (2) by contrasting responses to a moderately difficult performance challenge with responses to an impossibly difficult challenge. The first extension allowed a second, more compelling, test of the idea that women should evince stronger effort-related CV responses than men when they perceive success on a possible task as worthwhile, but men do not. The other extension allowed a first test of the idea that gender differences in appraised incentive value will not yield gender differences in effort-related CV responses when success appears excessively difficult or impossible to women and men. As in the original study, participants were assigned a cumulative mental addition challenge with instructions that they could earn a prize by doing well. However, here the challenge was either the moderately difficult version of the task assigned previously or a version of the task identified in pretesting as impossible. Further, whereas some participants were told a good performance would earn the traditionally masculine incentive, others were told it would earn a traditionally feminine incentive – creating a 2 (incentive character) \times 2 (gender) \times 2 (difficulty) factorial design.

Central predictions were twofold. One was that when the incentive was feminine, effort and associated CV responses would be

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