# Success importance and urge magnitude as determinants of cardiovascular response to a behavioral restraint challenge☆

Stephanie D. Agtarap *, Rex A. Wright *, Christopher Mlynski, Rawan Hammad, Sabrina Blackledge

*University of North Texas, United States*

## ABSTRACT

Decades of research have investigated a conceptual analysis concerned with determinants and cardiovascular correlates of effort in people confronted with performance challenges, that is, opportunities to alter some course of events by acting. One suggestion is that effort and associated cardiovascular responses should be determined jointly by the difficulty of meeting a challenge and the importance of doing so. The present experiment tested this in a context involving behavioral restraint, that is, effortful resistance against a behavioral impulse or urge. Participants were presented a mildly evocative violent film clip (restraint difficulty low) or a strongly evocative violent film clip (restraint difficulty high) with instructions to refrain from showing any facial response. Success was made more or less important through coordinated manipulations of outcome expectancy, ego-involvement and social evaluation. As expected, SBP responses assessed during the work period were proportional to clip evocativeness – i.e., the difficulty of the restraint challenge – when importance was high, but low regardless of clip evocativeness when importance was low. Findings conceptually replicate previous cardiovascular results and support extension of the guiding analysis to the behavioral restraint realm.

© 2016 Elsevier B.V. All rights reserved.

Decades of research have investigated a conceptual analysis concerned with determinants and cardiovascular (CV) correlates of effort in people confronted with performance challenges, that is, opportunities to alter some course of events by acting (Wright, 1996, 2008; Wright and Kirby, 2001). One core idea is that beta-adrenergic influence on the CV system varies with effort (Ahlquist, 1948; Obrist, 1976, 1981). Another is that effort varies non-monotonically with the difficulty of imminent or ongoing behavior - first rising and then falling abruptly, with the fall occurring where task requirements outweigh the importance of success or render success impossible (Brehm and Self, 1989; Brehm et al., 1983; Wright and Brehm, 1989). A key suggestion is that success importance should moderate the relation between difficulty and CV response to a possible challenge. When importance is high enough to justify task requirements, effort and associated CV responses should be proportional to difficulty. When it is not high enough to do so, effort and associated CV responses should be low.

## 1. Evidence for the suggestion

Impressive empirical support has been garnered for the preceding suggestion (Eubanks et al., 2002; Gendolla, 1998; Gendolla et al., 2008; Richter et al., 2012; Silvia et al., 2010; Wright et al., 1998; Wright et al., 1990; for recent reviews, see Gendolla et al., 2012; Richter et al., 2016). Consider for example two early experiments that operationalized importance in terms of outcome expectancy, that is, the expectation that an outcome will be attained or avoided if required behavior is successfully executed (Bandura, 1982; Vroom, 1964). The first (Wright and Gregorich, 1989) provided participants a low- (1/15) or high (14/15) chance of winning a modest prize by succeeding on an easy (two-trigram) or moderately difficult (five-trigram) memorization task. As expected, analysis of CV responses assessed just prior to work revealed a difficulty × expectancy (i.e., importance) interaction for systolic blood pressure (SBP). Among the high chance participants, responses were proportional to difficulty – greater when difficulty was moderately high. By contrast, among the low chance participants, responses were low irrespective of difficulty. The pattern was expected for SBP because it is partially determined by heart contraction force, which is considered to be a "gold standard" index of beta-adrenergic activation (Brownley et al., 2000; Fairclough and Mulder, 2012; Kelsey, 2012; Papillo and Shapiro, 1990).

The later experiment (Wright et al., 1992) manipulated outcome expectancy (i.e., importance) in an avoidance context rather than in an appetitive one and measured CV responses during, rather than just prior to, the work (see also Manuck et al., 1978; Murray et al., 1993). Participants were presented trials of a Sternberg (1966) memory task that involved character strings and recognition probes. For half (easy conditions), each string had three characters; for the rest (difficult conditions), each string had seven characters. Instructions indicated that a 90% success rate would ensure a strong (19/20) or weak (1/20) chance of avoiding an aversive noise. Once again, analysis revealed a difficulty × expectancy (importance) interaction for SBP, this time accompanied by a similar interaction for heart rate (HR) – which can sometimes reflect beta-adrenergic activation. Whereas responses were proportional to difficulty when expectancy was high, they were low in both difficulty conditions when expectancy was low.

## 2. Present research

Research in this article examined the key suggestion in a fresh context, one involving behavioral restraint - defined as resistance against a behavioral impulse or urge (Brehm, 1999). Application of the guiding effort analysis to behavioral restraint begins with assumptions (1) that restraint involves expending oneself to meet a performance challenge, and (2) that one can restrain in different measures (Wright, 2015; Wright and Agtarap, 2015). Put differently, people fighting an urge have a task to accomplish and can apply themselves more or less intensively to it (Higgins, 2006). In light of these assumptions, it is reasonable to suppose that two factors should play roles in determining restraint intensity and associated CV responses. One is the magnitude of the urge being resisted. This should play a role because it sets the difficulty of the restraint challenge. More powerful urges are harder to resist than less powerful ones. The other factor is the importance placed on restraint success. This should play a role because it determines how hard people are willing to work. When importance is high enough to justify requirements of a possible restraint challenge, CV response should be proportional to urge magnitude – that is, the difficulty of the challenge. When importance is not high enough to justify the requirements, CV response should be low (Fig. 1).

We tested the restraint version of the suggestion using a protocol that directed participants to inhibit responses to a video presentation that was more or less emotionally evocative (Gross, 1998; Gross and Levenson, 1993, 1997). The protocol presented participants a mildly- or strongly evocative violent film clip and asked them to refrain from showing any facial response, with the opportunity to earn a chance of winning a movie ticket if they performed well enough. It varied success importance through coordinated manipulations of three variables – outcome expectancy, ego-involvement and the potential for social evaluation – resulting in a 2 (evocativeness low versus high) × 2

(importance low versus high) factorial design. As noted earlier, outcome expectancy refers to the belief that an outcome will be attained or avoided if required behavior is executed (e.g., Vroom, 1964). Ego-involvement refers to the extent to which performance has implications for self-definition and esteem (Gendolla and Richter, 2005, 2006b). Potential for social evaluation refers to the degree to which performance will be available for public scrutiny (Gendolla and Richter, 2006a; Wright et al., 1998; Wright et al., 2002; Wright et al., 1995).

We reasoned that success importance should be high when outcome expectancy, ego-involvement and the potential for social evaluation were high and low when outcome expectancy, ego-involvement and the potential for social evaluation were low (Gendolla and Richter, 2010). Our central prediction was that restraint intensity and its associated CV responses would be proportional to the evocativeness of the film clip in the high importance conditions, but low regardless of clip evocativeness in the low importance conditions. Given grounds for believing SBP should be especially sensitive to beta-adrenergic stimulation (and, thus, restraint intensity), we expected that it would be especially likely to reflect the anticipated 3 versus 1 CV response pattern.

## 3. Method

### 3.1. Participants

Participants were 113 undergraduate volunteers recruited through the SONA computer system in the Psychology Department at University of North Texas. They were randomly assigned to one of the four conditions created by the 2 (low or high evocativeness) × 2 (low or high importance) factorial design. Participants were blind to condition until the debriefing. Data from 7 were excluded due to protocol or data collection difficulties, with final analyses being performed on data from 106. There was inadvertent failure to record gender in seven of the final cases – yielding a breakdown by gender of 27 men and 72 women (7 unidentified). Race/ethnic-group status was not recorded, although it is reasonable to assume that status in this regard corresponded to that for students enrolled at the university. Recent census data indicated roughly 50% White or Caucasian, 23% Hispanic or Latino, 13% Black or African American, and 6% Asian, with negligible percentages in other categories.

### 3.2. CV assessment and restraint task

CV responses were assessed with a CNAP Monitor 500 (CNSystems), which utilizes a standard upper arm inflation cuff along with a double finger sensor that allows noninvasive measurement of SBP, DBP, mean arterial pressure (MAP) and HR. The finger sensor produces a continuous pressure signal that is calibrated by means of a special transfer function to an initial oscillometric value obtained from the arm cuff. It includes balloon-like cuffs placed on the proximal joints of the index and middle fingers. Real-time estimates of arterial pressure obtained with the CNAP have compared well with ones obtained by an invasive intra-arterial catheter system (Jeleazcov et al., 2010).

Participants were presented a three minute violent film clip taken from the movie *Saving Private Ryan* with instructions to maintain a neutral facial expression while watching the clip (Madan et al., 2014). In the clip, a team of soldiers encounters an enemy battalion. Unsettling violence ensues culminating in a scene of hand-to-hand combat during which one soldier drives a knife into the chest of another. Emotional evocativeness was manipulated through the inclusion or exclusion of sound. In the low evocativeness conditions, participants watched the clip without sound. In the high evocativeness conditions, they watched with the sound set to a medium-high volume. All other aspects of the clip (e.g., length, format, size, quality) remained the same. All participants wore headphones during the presentation with instructions that this would help them focus. They were told that their facial expressions
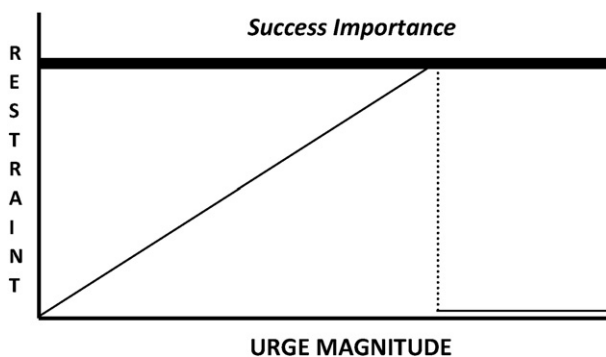


**Fig. 1.** Restraint as a function of urge magnitude, with restraint limits determined by success importance.