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Trait self-focused attention, task difficulty, and effort-related cardiovascular reactivity

Paul J. Silvia *, Hannah C. Jones, Casey S. Kelly, Alireza Zibaie

University of North Carolina at Greensboro, USA

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ABSTRACT

Using motivational intensity theory as a framework, the present experiment examined how individual differences in self-focused attention interact with task difficulty to predict effort, assessed via cardiovascular reactivity. Participants ($n = 50$) worked on a cognitive task fixed at an easy, medium, or hard level of difficulty, and individual differences in private self-consciousness and self-reflection were measured. Regression models indicated that trait self-focus interacted with task difficulty to predict cardiovascular reactivity, particularly systolic blood pressure (SBP) reactivity. Participants low and high in trait self-focus showed similar SBP reactivity in the easy and medium conditions, but they diverged in the hard condition: High trait focus was associated with higher SBP reactivity, indicating greater effort, whereas low trait self-focus was associated with low SBP reactivity, indicating disengagement. The findings thus support the motivational intensity approach to effort and its interpretation of self-focus's role in effort mobilization.

1. Introduction

Self-focused attention is a major construct in the psychology of self-regulation and motivation (Carver, 2003). A large literature shows that directing attention to the self causes people to compare themselves to relevant standards. When people feel able to meet a standard, high self-focus increases their motivation to do so, as seen in a variety of affective, cognitive, and behavioral outcomes (for reviews, see Carver and Scheier, 1998; Duval and Silvia, 2001). In the present research, we build upon recent applications of motivational intensity theory (Brehm et al., 1983; Wright, 1996) to self-focused attention. This theory makes new predictions about how self-focus affects the intensity of effort, measured with physiological outcomes. In particular, we examine how individual differences in trait self-focused attention and task difficulty jointly determine effort-related cardiovascular reactivity in an active coping situation.

2. Self-focus and motivational intensity

Many studies of self-focused attention have proposed that self-focus increases effort and motivation (for reviews see Carver and Scheier, 1998; Duval and Silvia, 2001), but the outcome measures have either been verbal self-reports, behavioral measures of persistence (how long people worked on a task), or achievement (how well people performed a task). Although worthwhile, such outcomes are at best indirect measures of the intensity of effort. An alternative approach, suggested by Wright's (1996) model of effort and cardiovascular activity, is to assess effort via cardiovascular reactivity in an active coping context.

Predictions about how self-focus affects effort-related cardiovascular reactivity can be developed by applying Brehm's motivational intensity theory (Brehm et al., 1983; Brehm and Self, 1989), which proposes that the level of effort expended is a function of two variables: the *importance* of the goal at stake and the *difficulty* of the behaviors needed to achieve the goal. Importance affects potential motivation, the degree of effort people are willing to expend: People are willing put forth more effort for important goals than for trivial ones. The actual degree of effort, however, is determined by difficulty. Effort is low for easy tasks, increases as the task becomes harder, and then eventually declines, either because the goal is unattainable (and hence additional effort is fruitless) or isn't important enough to merit the additional effort.

Motivational intensity theory has suggested some exceptions to this pattern. For example, unfixed tasks—sometimes known as "do your best" tasks or piece-rate tasks—lack a fixed level of difficulty because people can work as quickly or slowly as they like (Wright et al., 2002). Similarly, some tasks have an unclear level of difficulty (Richter and Gendolla, 2006, 2007). For tasks with unfixed or unclear difficulty, effort is a function of importance.

Gendolla et al. (2008) proposed that self-focused attention affects effort by affecting potential motivation, the level of justified effort. Because self-focused people are evaluating their actions relative to

* Corresponding author. Department of Psychology, P.O. Box 26170, University of North Carolina at Greensboro, Greensboro, NC, 27402-6170, USA. Tel.: +1 336 256 0007; fax: +1 336 334 5066.
E-mail address: p_silvia@uncg.edu (P.J. Silvia).
URL: http://www.uncg.edu/~p_silvia/ (P.J. Silvia).

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their standards, success should be more significant when self-focus is high. Thus far, three experiments on effort-related cardiovascular reactivity have supported the predictions made by motivational intensity theory. When self-focused attention was increased by filming participants with a video camera, systolic blood pressure (SBP) reactivity was higher for an unfixed task (Gendolla et al., 2008, Study 1). Because effort for unfixed tasks is due to importance (Wright et al., 2002), this finding suggests that self-focus made success more important. For fixed tasks, manipulating self-focus didn't affect SBP reactivity for easy or impossible tasks, which is predicted because effort isn't required or justified for such tasks. But it did increase SBP reactivity for moderately difficult tasks. People in low self-focus conditions disengaged at lower levels of task difficulty than people in high self-focus conditions (Gendolla et al., 2008, Study 2; Silvia et al., 2010), which further suggests that self-focus affects effort by making success more important.

3. The present research

The present research sought to extend the evidence for motivational intensity theory's predictions regarding self-focused attention and cardiovascular reactivity. In particular, we examined the influence of individual differences in self-focused attention instead of manipulated self-focus. Examining individual differences is valuable for several reasons. First, replicating the effects with individual differences would conceptually replicate the experimental work and thus offer strong support for Gendolla et al.'s (2008) motivational intensity interpretation. Finding similar effects with individual differences would cast strong doubt on alternative explanations for the effects of manipulated self-awareness (e.g., evaluation apprehension, distraction, self-presentation). Second, trait self-focus has been a major part of the self-focus literature since its origins (Buss, 1980; Fenigstein, 2009; Smári et al., 2008). Many of the demonstrations of self-focus's effects on cognition, motivation, and emotion used individual differences in self-focus (e.g., Scheier and Carver, 1977, 1983). As a result, a motivational intensity interpretation of self-focus should be able to explain the effects of both state and trait self-focus.

In the present experiment, adult participants completed a cognitive task with a fixed-difficulty level of either easy, medium, or hard. Individual differences in self-focused attention were measured with two self-report scales. We then tested whether levels of trait self-focus interacted with task difficulty to affect effort, quantified as systolic reactivity. Although psychophysiological work on motivational intensity commonly assesses reactivity for systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR), it views SBP reactivity as the parameter most closely linked to effort. Of the three, SBP best reflects the impact of the sympathetic nervous system (Richter et al., 2008; Richter and Gendolla, 2009a), and research shows it is the most consistent marker of effort (e.g., Bongard, 1995; Gerin et al., 1995; Light, 1981; Sherwood et al., 1990; Smith et al., 2000). DBP reactivity often parallels the effects of SBP reactivity (e.g., Al'Absi et al., 1997; Gendolla & Richter, 2005; Silvia et al., 2010) but it is less consistent. Both SBP and DBP are influenced by beta-adrenergic sympathetic discharge, but the effects of DBP can be obscured by changes in total peripheral resistance (Levick, 2003). HR is influenced by both sympathetic and parasympathetic arousal, so HR reactivity is the least consistent of the three parameters, although some research finds HR effects (e.g., Eubanks et al., 2002).

4. Method

4.1. Participants and design

A total of 56 people (45 women, 11 men) enrolled in General Psychology at the University of North Carolina at Greensboro participated as part of a research participation option. Six cases were excluded (primarily due to issues with the software, computer, or cardiovascular equipment, but also because of intense exercise before the session and participant non-compliance), leaving a final sample of 50 people (41 women, 9 men). Based on self-reported race and ethnicity, approximately 40% of the sample was African American and 48% of the sample was European American. Age ranged from 18 to 28 ($M = 18.7$, $SE = .23$). Task difficulty was manipulated with three levels (easy, medium, and hard), and each person was randomly assigned to one of these between-person conditions.

4.2. Cardiovascular assessment

SBP (mmHg), DBP (mmHg), and HR (bpm) were measured with an automated Dinamap 1846sx cardiovascular monitor using the oscillometric method. The experimenter placed a cuff (Critikon) over the brachial artery of the participant's non-dominant arm. There were four baseline assessments (one every 2 min) and five task assessments (one every minute).

4.3. Procedure

Each person participated individually. After providing informed consent, participants were told the study was about how the body responded during cognitive tasks. The experiment began with a baseline period, during which four cardiovascular assessments were taken at 2 min intervals while participants completed a questionnaire.

4.3.1. Assessment of trait self-focused attention

The questionnaire completed during the baseline period contained the measures of trait self-focus among demographic items and filler scales intended to disguise the study's purpose. Trait self-focus was measured with the revised private self-consciousness scale (Scheier & Carver, 1985) and the self-reflection scale (Grant et al., 2002). The revised private self-consciousness scale is a 9-item version of the original 10-item private self-consciousness scale (Fenigstein et al., 1975). In addition to simplifying the wording, the revised scale improved the internal consistency and unifactorial structure of the original scale (see Smári et al., 2008, for a review). The 12-item self-reflection scale, like the private self-consciousness scale, was designed to assess trait self-focus, and it appears to do so with higher internal consistency and stronger unidimensionality (Grant et al., 2002; Roberts & Stark, 2008). As one would expect, the two scales have correlated strongly in past research (Grant et al., 2002; Silvia & Phillips, 2011). Both scales were completed using a 7-point response format (1 = *strongly disagree*, 7 = *strongly agree*).

4.3.2. The d2 task

After the baseline period, the experimenter introduced the participant to the cognitive task. People completed a computer-based version of the d2 test of attention (Brickenkamp & Zillmer, 1998), which has been used in several studies of motivational intensity (Gendolla & Richter, 2005; Gendolla et al., 2008; Silvia et al., 2010). For this task, a *d* or a *p* is presented on the computer screen. The *d* or *p* has up to 2 apostrophes above and below it, and participants must decide if it is a d2 (a *d* with 2 apostrophes above it, 2 apostrophes below it, or with one above and one below it). Participants were told to press a green button if the letter was a *d* with exactly 2 apostrophes and a blue button for all other items (*d*s with 1, 3, or 4 apostrophes, and all *p*s). People used their dominant hand to respond. Responses were collected with a Cedrus RB-834 response pad, and the task was controlled by SuperLab Pro 2.0.4.

4.3.3. Manipulation of task difficulty

Fixed levels of task difficulty were manipulated by varying the response window for each task trial. In the *easy condition,* each trial