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Self-focused attention, performance expectancies, and the intensity of effort: Do people try harder for harder goals?

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Abstract Many theories argue that goal striving is more intense when people have optimistic expectancies for achieving the goal and when attention is self-focused. Brehm's motivational intensity theory, however, predicts that the intensity of motivation is only as high as necessary, so people will try harder for difficult tasks than for easy tasks, all else equal. The present experiment compared these two approaches by manipulating two levels of self-focused attention (low and high self-awareness, via a mirror) and two levels of task difficulty (easy and difficult). Effort was assessed as cardiovascular reactivity, particularly change in systolic blood pressure. Neither high self-focus nor an easy task per se caused increased effort; instead, high self-focus significantly increased systolic reactivity when the task was difficult. Effort was thus higher despite less optimistic goal expectancies, a finding that is predicted by Brehm's motivational intensity theory but not by traditional self-regulation models.

Keywords Self-focused attention · Effort · Cardiovascular reactivity · Active coping · Motivation

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Introduction

When do people try harder to reach a goal? In the present research, we consider the dynamics of effort involved in self-focused attention. Theories of self-awareness were among the earliest self-theories (Duval and Wicklund 1972), and many studies have found that focusing attention on the self has broad effects on motivation, cognition, and emotion (Silvia and Duval 2001a). Furthermore, many researchers have studied how self-focused attention promotes trying harder versus withdrawing, particularly with regard to how optimistic and pessimistic performance expectancies influence motivation (Carver and Scheier 1981; Duval et al. 1992).

In the present research, we consider the implications of Brehm's motivational intensity theory (Brehm and Self 1989; Brehm et al. 1983) for the classic problem of how self-focus and performance expectancies influence motivation. Applying the principles of Brehm's theory to self-regulation makes novel and non-intuitive predictions about the role of self-focus in effort and integrates disparate findings. We apply Wright's (1996) integration of Brehm's motivational intensity theory with Obrist's (1981) active coping approach. Wright's integrated model connects effort mobilization to physiological outcomes and thus allows assessing effort with psychophysiological methods.

Self-focused attention, expectancies, and motivated action

Motivation was a central concern of early self-awareness research. In the initial studies, researchers showed several main effects of self-awareness on measures of persistence and achievement, such as how long people spent on a task, how well people performed, and how many responses people generated for open-ended tasks (e.g., Duval and Wicklund 1972; Liebling and Shaver 1973; McDonald 1980; Wicklund and Duval 1971). Duval and Wicklund (1972) speculated that several variables, such as the size of the disparity between self and standards, could moderate such effects.

In their classic work, Carver and Scheier (1981) proposed that expectancies were a pivotal moderator of whether self-focused people tried harder or gave up. Several studies have found that self-focus amplifies the effects of expectancies on measures of persistence, behavioral approach and avoidance, and performance quality (Burgio et al. 1986; Carver et al. 1979a, b). In an extension of this work, Duval et al. (1992) found that the expected rate of progress influenced how self-focus affected time spent persisting on a task. The effects of expectancies go beyond measures of performance; for example, people who feel unable to meet a standard are more likely to blame external factors (Duval and Silvia 2002) and other people (Silvia and Duval 2001b) for their failure.

Brehm's motivational intensity theory

Taken together, the self-awareness literature predicts that people will try harder when their performance expectancies are positive. The notion that people will put forth more effort when they feel optimistic about achieving a goal sounds intuitive. Brehm's motivational intensity theory, however, proposes that effort is not quite so simple. This model assumes that the mobilization of bodily resources is costly, so people will only put forth as much effort as necessary to achieve a goal. Effort is thus jointly determined by two variables: the *difficulty* of achieving the goal and the *importance* of the goal. Importance determines potential motivation, the maximum level of effort people would mobilize; difficulty determines actual motivation, the level of effort actually mobilized.

Figure 1 depicts the theory's predictions under two levels of importance. If the instrumental behaviors are easy, there's no point to ramping up effort when great effort isn't needed. Effort is thus low when a task is easy, and it increases as the task becomes harder. Eventually, effort may reach the level of potential motivation established by the goal's importance. If so, then effort will drop to a low level. This typically happens when the goal seems unattainable—no amount of effort will lead to achieving the goal—or when the goal isn't important enough to merit the additional effort.

Some tasks, known as unfixed tasks, lack a fixed level of difficulty. These tasks allow people to work at their own pace and thus to achieve as much or as little as they wish. Because unfixed tasks lack a fixed difficulty parameter, Brehm's model predicts that effort during unfixed tasks is determined by potential motivation: people will put forth effort as a function of the goal's importance (Wright et al. 2002).

An appeal of Brehm's model is that it can organize and integrate a wide range of variables known to influence the intensity of effort. Some variables affect importance, such as social evaluation (Wright et al. 1995), the incentive value of the outcome (Wright et al. 1990), and the significance of needs, values, and identities implicated by the goal (Gendolla and Richter 2005, 2010). Other variables affect people's appraisals of task difficulty, such as fatigue (Wright et al. 2007), mood (Brinkmann and Gendolla 2007; Gendolla and Krüsken 2002), and individual differences in ability (Wright et al. 1994).

In our earlier work, we have suggested that self-focused attention influences the importance parameter in the model (Gendolla et al. 2008). When self-focused, people compare self with standards, and self–standard discrepancies generate negative affect (Duval and Silvia 2001; Silvia and Duval 2001b) and initiate self-regulatory processes aimed at discrepancy-reduction (Carver and Scheier 1981, 1998). It thus seems reasonable to locate self-awareness processes

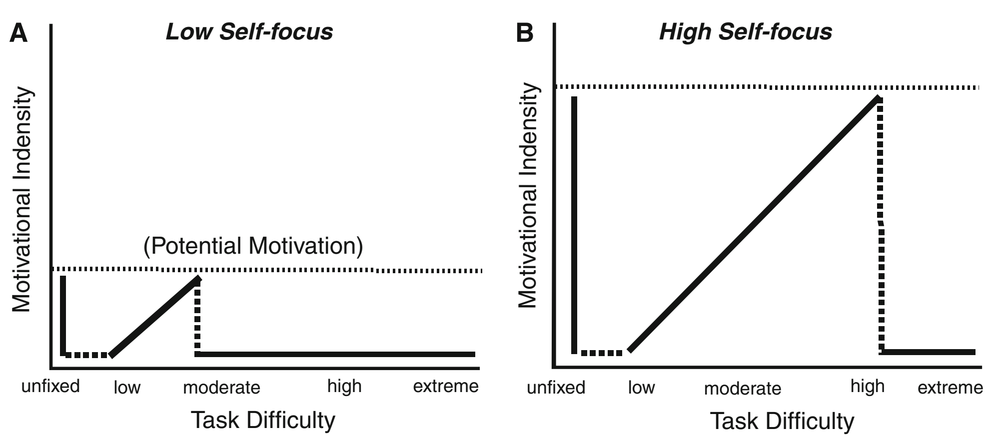

Fig. 1 Predictions for how importance and task difficulty jointly influence effort. Panel **a** shows the condition of low justified effort, Panel **b** shows the condition of high justified effort. Figure adapted from Gendolla et al. (2008)

within Brehm's model via the importance of meeting one's standards rather than difficulty. Two studies offered some support for our prediction. First, self-focus increased effort for an unfixed task (Gendolla et al. 2008, Study 1). Because effort for unfixed tasks is a function of importance (Wright et al. 2002), this effect implies that the task was more important for self-focused people. Second, self-focus influenced how hard people tried for difficult tasks but not impossible tasks. People low in self-focus put forth minimal effort in both cases, suggesting that neither task was worth the high level of effort needed. People high in self-focus, however, tried hard for the difficult task, which suggests that self-focus made the task important enough to merit the high effort (Gendolla et al. 2008, Study 2).

The present research

Our past work, however, was unable to evaluate the major point of contention between past models of expectancies and Brehm's model of effort: whether people try harder when expectancies are high. First, the prior experiments didn't examine the conditions needed to compare the two approaches. In the present research, we created two levels of task difficulty: an easy task and a difficult task. These conditions allow us to contrast the predictions made by self-awareness models and Brehm's model. Second, the prior experiments did not assess people's expectancies, so it is hard to say if the tasks brought about optimistic or pessimistic performance expectancies. Finally, both of the previous studies manipulated self-focus with a video camera—participants believed they were filmed and saw their own face on a monitor. Although a manipulation check showed that self-awareness was increased by this manipulation, the induction could have been confounded with evaluation apprehension, which has the same effect on effort mobilization as self-focus (e.g., Gendolla and Richter 2006; Wright et al. 2002). Thus, conceptual replication of the Gendolla et al. (2008) findings with another self-focus manipulation that is less prone to induce social evaluation is warranted.

In the present research, we created two levels of self-focus and had people work on a cognitive classification task that was either fairly easy or pretty hard. Before working on the task, people completed a block of practice trials, which allowed them to form (and us to measure) performance expectancies for the upcoming task. We then measured effort during the task, operationalized as the physiological mobilization of effort. Based on Brehm's model, we predicted that effort would be highest when self-focused people confronted a difficult task. As Fig. 1 shows, self-focused attention makes success on the task more important, so self-focused people will be willing to expend more effort. High effort is needed only when the task is hard, however, so self-focus will boost effort only in the difficult condition.

In this literature, cardiovascular reactivity is commonly used to assess effort. In particular, systolic blood pressure (SBP) consistently appears as a reliable marker of effort (Wright and Kirby 2001). SBP varies primarily due to the contractility of the heart, which is determined by beta-adrenergic sympathetic discharge (Richter et al. 2008; Richter and Gendolla 2009). Diastolic blood pressure (DBP) and heart rate (HR) often yield similar patterns, but they are generally less consistent markers of effort. DBP is due largely to vascular resistance, which is unsystematically related to beta-adrenergic sympathetic activity, and HR is affected by both sympathetic and parasympathetic arousal (Brownley et al. 2000; Obrist 1981; Papillo and Shapiro 1990). To get a fuller picture of cardiovascular responses the present research assessed all three cardiovascular parameters, but our primary predictions concerned SBP.

Method

Participants and design

Seventy-four university students enrolled in General Psychology at UNCG participated in the experiment as part of a research participation option. Four people were excluded due to equipment problems, leaving a final sample of 70 people (55 females, 15 males). Each person was randomly assigned to a 2 (self-focus: low vs. high) by 2 (difficulty: easy vs. hard) between-persons design.

Cardiovascular assessment

The cardiovascular assessments of SBP (mmHg), DBP (mmHg), and HR (bpm) were gathered with a Dinamap 1846sx automated cardiovascular monitor using oscillometry. A blood-pressure cuff was placed over the brachial arteria above the elbow of the non-dominant arm. The cuff inflated at 2 min. intervals during the baseline period and at 1 min. intervals during the task performance period, beginning with the start of the task.

Procedure

Participants completed the experiment individually. After completing an informed consent form, the participants were told that the study was concerned with how the body responds during mental tasks. The blood pressure cuff was applied and the experiment proceeded with an assessment of cardiovascular baseline values while participants completed questionnaires containing demographic information and filler scales. Four cardiovascular measures were taken at 2 min. intervals. After the baseline measurement period, participants received instructions explaining the task used in the performance period.

Self-awareness manipulation

In the *high self-awareness* condition, a 24” × 36” mirror was placed behind the monitor on the participant’s table. In the *low self-awareness* condition, the same mirror was in the same position but facing backwards. The non-reflective back of the mirror revealed only a dim grey paint. In both conditions, however, participants were told upon entrance to ignore the mirror and other clutter in the lab. These items were ostensibly there for another experiment directly after the session, and the experimenter had been told not to move anything in the room. This mirror procedure is one of the oldest (Duval and Wicklund 1972; Wicklund and Duval 1971) and most widely-used manipulations of self-awareness (Carver and Scheier 1978; Phillips and Silvia 2005).

Task difficulty manipulation

The task was a modified version of the d2 letter-cancellation task (Brickenkamp and Zillmer 1998). Single *d*’s and *p*’s were presented on a computer screen. Up to 2 apostrophes appeared above and below each letter; participants were told to press a green response key if the letter was a *d* with exactly 2 apostrophes. For all other combinations (*d*’s with 1, 3, or 4 apostrophes, and all *p*’s), they had to press a blue response key. Participants were then informed that the standard for performance was to be correct on 90% of the trials.

In the *easy condition,* each trial lasted for 3,000 ms. Making a response did not end the trial; the character appeared on the screen for the full 3,000 ms. In the *hard condition,* each trial lasted for 650 ms; making a response did not end the trial. The timing parameters were based on pretesting and on past research, which found that the easy condition was experienced as clearly easy and the hard condition was experienced as challenging but not impossible (Gendolla and Richter 2005; Gendolla et al. 2008). Participants completed a brief practice block of 22 trials. This acquainted them with the task and gave them a basis for forming performance expectations. After the practice block, participants were given a short “pre-task questionnaire” assessing their expectations of success. Three items measured expectancies, using 1–7 Likert scales: “Do you expect to meet this standard?,” “How confident are you that you can get 90% correct?,” and “Are you optimistic about your ability to meet the standard of 90% correct?”.

It is worth emphasizing that people’s expectancies for the upcoming task were based on direct behavioral experience with the task. Other manipulations have been used to influence expectancies and self-efficacy, such as getting encouragement or discouragement from the experimenter, receiving false success or failure feedback on a similar task, learning that the upcoming task will ostensibly be easy or hard, or viewing someone else succeed or fail (Bandura 1997; Carver and Scheier 1998). Such manipulations have value, but for the present purposes we wanted to manipulate expectancies directly (experience performing an objectively easier or harder task) rather than obliquely (persuasion, false information, or social comparison).

The performance session then began. The task lasted exactly 5 min. in both the easy and hard conditions. Cardiovascular responses were measured 5 times at 1 min. intervals, starting with the task’s onset. After the task, participants were debriefed and given the opportunity to ask questions about the research.

Results

Data reduction and preliminary analyses

The four baseline assessments were averaged to form overall baseline scores for SBP, DBP, and HR (all Cronbach’s alphas $> .94$); the five task assessments were averaged to form overall task scores for SBP, DBP, and HR (alphas $> .95$). Difference scores were computed as measures of baseline-to-task change. To assess possible initial value or carryover effects, we evaluated whether the baseline scores significantly covaried with the difference scores. We found significant relations for SBP ($r = -.305$, $p = .01$) and DBP ($r = -.389$, $p < .001$) but not for HR ($r = .049$, $p = .69$), so the analyses of SBP and DBP were conducted using baseline-adjusted scores (Llabre et al. 1991).

An index of performance expectancies was computed by averaging the three self-report items (alpha = .92). Task performance was measured with response times (RT) for correct trials and the number of errors. Because the easy and hard conditions had different numbers of trials, errors were expressed as the percentage of incorrect trials. RT and error data were missing for two participants due to equipment error.

Gender (scored 1 for men, 2 for women) was not included as a factor in the analyses because there were too few men relative to women. Two cells contained only 4 men, and one cell contained only 1. For the overall sample, gender correlated significantly with the baseline levels of SBP ($r = -.25$, $p = .036$), DBP ($r = .24$, $p = .045$), and HR ($r = .37$, $p = .006$), which is a common finding (Wolf et al. 1997), but it did not correlate with the baseline-to-task change scores for SBP ($r = -.08$), DBP ($r = -.11$), or HR ($r = -.05$).

Performance expectancies

Did the manipulation of task difficulty successfully change performance expectancies? A 2 (self-focus: no mirror, mirror) by 2 (task difficulty: easy, hard) between persons ANOVA on pre-task performance expectancies revealed a significant main effect for task difficulty, $F(1, 66) = 37.50$, $p < .001$, no effect for self-focus, $F < 1$, and no interaction, $F(1, 66) = 1.12$, $p = .295$. As anticipated, people in the easy condition ($M = 5.98$, SE = .18) had significantly more favorable performance expectancies than people in the hard condition ($M = 4.23$, SE = .22), which reflects a successful expectancy manipulation.

Cardiovascular effects

We tested our predicted 3 vs. 1 pattern using focused contrasts, which are more powerful than exploratory factorial ANOVAs for testing specific predicted interaction patterns (Rosnow and Rosenthal 1989). The High Self-Focus/Difficult Task condition was coded as +3; the other three conditions were coded as −1.

For SBP, the measure most strongly reflective of effort in past work, the interaction contrast was significant, $t(66) = 2.95$, $p = .004$, and the contrast residual was not ($F < 1$), indicating that the contrast captured all significant variance. Table 1 presents the means and standard errors; Fig. 2 displays the pattern and 95% confidence intervals. As we predicted, SBP was significantly higher (via two-tailed tests) in the High Self-Focus/Difficult Task condition than in the High Self-Focus/Easy Task condition ($p = .017$), the Low Self-Focus/Difficult Task condition ($p = .028$), and the Low Self-Focus/Easy Task condition ($p = .01$).

The contrast was also significant for DBP, $t(66) = 3.32$, $p < .001$, and the contrast residual was not ($F = 1.78$). The pattern of means (see Table 1) was roughly similar to the pattern for SBP; Fig. 3 shows the pattern and 95% confidence intervals. DBP was significantly higher in the High Self-Focus/Difficult Task condition than in the High Self-Focus/Easy Task condition ($p = .003$), the Low Self-Focus/Difficult Task condition (marginal at $p = .091$), and

Table 1 Effects of self-focus and task difficulty on SBP, DBP, and HR

Difficulty level	Low self-focus *M* (SE)	High self-focus *M* (SE)
SBP		
Easy task	−1.91 (1.59)	−1.45 (1.66)
Hard task	−0.92 (1.97)	4.83 (1.88)
DBP		
Easy task	−2.28 (1.23)	−1.58 (0.87)
Hard task	0.68 (1.32)	3.59 (1.24)
HR		
Easy task	−1.17 (1.06)	−1.09 (0.95)
Hard task	0.57 (1.06)	1.71 (1.83)

Note: Means represent baseline-to-task change scores. The scores for SBP and DBP are baseline-adjusted values

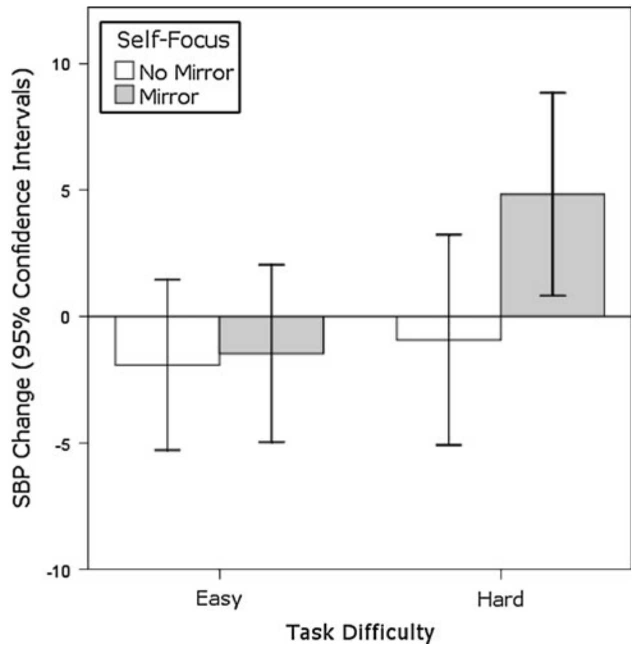

Fig. 2 Effect of self-focus and task difficulty on change in SBP. *Error bars* show the 95% confidence intervals

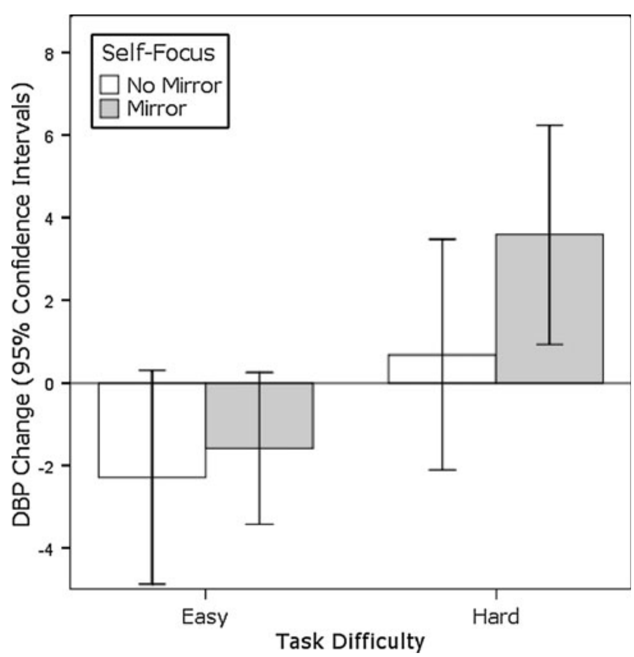

Fig. 3 Effect of self-focus and task difficulty on change in DBP. *Error bars* show the 95% confidence intervals

the Low Self-Focus/Easy Task condition ($p < .001$). Additionally, DBP tended to be lower in the Low Self-Focus/Easy condition than the Low Self-Focus/Hard condition (marginal at $p = .075$).

For HR, the contrast was not significant, $t(66) = 1.54$, $p = .12$. None of the four means differed significantly from the others (see Table 1).

Task performance

Presenting people with objectively easier and harder tasks effectively manipulates performance expectancies—our major aim—but it also makes some task-performance effects less informative, given that the participants didn't all complete the same task. Nevertheless, it is typical in this literature to analyze task performance, if only for exploratory purposes.

For response times, a 2 (self-focus: no mirror, mirror) by 2 (task difficulty: easy, hard) ANOVA revealed a significant main effect for task difficulty, $F(1, 64) = 144.3$, $p < .001$, a main effect for self-focus, $F(1, 64) = 4.68$, $p = .034$, and a significant interaction, $F(1, 64) = 4.41$, $p = .040$. When the task was hard, people in the no-mirror ($M = 464.5$, $SE = 22.6$) and mirror conditions ($M = 465.9$, $SE = 24.3$) had equal response times. When the task was easy, people in the no-mirror condition ($M = 698.3$, $SE = 22.9$) responded more quickly than people in the mirror condition ($M = 798.9$, $SE = 23.6$). Because the standard was an accuracy standard (i.e., get 90% correct), slower responses in the self-focus condition likely reflect the trading of accuracy for speed. Consistent with a speed–accuracy tradeoff, RT and error percentages were weakly correlated in the easy condition ($r = .15$, $p = .378$) but negatively correlated in the hard condition ($r = -.36$, $p = .042$).

For error percentages, a similar ANOVA found only a main effect of task difficulty, $F(1, 64) = 97.9$, $p < .001$; the main effect of self-focus and the interaction were not significant, both Fs < 1. Consistent with the manipulation of task difficulty, people in the easy condition made proportionally fewer errors ($M = .035$) than people in the hard condition ($M = .341$).

To explore relations between effort and performance, we computed correlations between performance and the CV scores within each level of task difficulty. In the easy condition, the only correlation larger than .30 was between SBP change and error percentages ($r = -.357$, $p = .035$). In the hard condition, error percentages correlated with change in SBP ($r = -.320$, $p = .069$) and DBP ($r = -.327$, $p = .063$), and response times correlated with change in SBP ($r = .480$, $p = .005$) and DBP ($r = .358$, $p = .041$). Overall, effort in the hard condition was apparently associated with a speed–accuracy tradeoff, in that higher SBP and DBP predicted slower response times and fewer errors.

Discussion

The present experiment examined how self-focus and task difficulty influence physiological correlates of effort. The manipulation of task difficulty successfully shifted performance expectancies: people in the easy condition had more optimistic expectancies than people in the hard condition. Effort—assessed as cardiovascular reactivity, particularly SBP change—was a function of both self-focus and task difficulty, but the pattern was more consistent with Brehm's motivational intensity model (e.g., Brehm and Self 1989) than with self-awareness theories (e.g., Carver and Scheier 1981). When self-focus was low, effort was low regardless of task difficulty (and hence of performance expectancies). When self-focus was high and success was thus more important, effort was higher for the hard task than for the easy task. It seems counterintuitive that people with less favorable expectancies mobilized more effort, but it is consistent with a central assumption of motivational intensity theory—people will only mobilize as much energy as necessary, so it is pointless to ramp up the body for an easy task.

Regarding the effects on the single cardiovascular parameters, besides the anticipated effect on SBP we found a similar effect on DBP but no effect on HR. However, among the cardiovascular measures taken in this study, SBP reactivity is the most reliable index of effort (Wright 1996; Wright and Kirby 2001) because of its systematic link to sympathetically mediated cardiac contractility (e.g., Richter et al. 2008). Effects on DBP are more likely to be masked by changes in total peripheral resistance than effects on SBP (Levick 2003). However, several experiments have found DBP adjustments in active coping (e.g., Al'Absi et al. 1997; Gendolla and Richter 2005), suggesting either that effort mobilization is sometimes associated with vasodilatation (e.g., Iani et al. 2004) or that cardiac output is sometimes so high that it also elevates blood pressure between pulse beats, resulting in increases of DBP. Unlike SBP and DBP, HR relies on the independent impacts of both sympathetic and parasympathetic arousal. Thus, HR effects related to task engagement are sometimes found (e.g., Eubanks et al. 2002), but they should only occur when the sympathetic impact is stronger, which is not always the case (Berntson et al. 1993).

We should note that the cardiovascular effects seem unlikely to be due to heightened threat of failure. If the difficult task was threatening to the participants, and if self-focused attention magnified the feelings of threat (e.g., Scheier et al. 1979), then one might expect higher cardiovascular reactivity. A threat explanation, however, is easy to rule out based on past work. First, research that has measured feelings of challenge and threat has found that moderately difficult tasks are seen as more challenging than easy tasks but not as more threatening (Nolte et al. 2008). Second, extreme levels of task difficulty—levels that ought to be the most threatening—are associated with low, not high, cardiovascular reactivity (Gendolla et al. 2008). Taken together, past work more strongly supports an effort analysis than a threat analysis.

Brehm's model offers an elegant way of organizing the large body of work on self-awareness and motivation. In this respect, Brehm's model is not a competing theory so much as it is a more general theory—the dynamics emphasized by past work can be seen as special cases of motivational intensity. For example, Duval and Wicklund's early work was generally concerned with the effects of self-awareness on simple unfixed tasks, such as open-ended prose copying tasks that allowed people to work at their own pace (e.g., Duval and Lalwani 1999; Wicklund and Duval 1971). Similarly, Carver and Scheier's work on expectancies was generally concerned with fixed difficulty, especially the region of difficult-yet-feasible to impossible. For example, college students had to complete challenging tests of fluid intelligence (Duval et al. 1992) or unsolvable cognitive tasks (Carver et al. 1979b), people with snake phobias had to approach and hold a snake (Carver et al. 1979a), and students had to make a good impression on a stranger (Burgio et al. 1986). Many experiments show that people will withhold effort when the task exceeds their abilities or requires more effort than it is worth (Wright 1996; Wright and Kirby 2001). In the expectancy experiments by Carver and colleagues, it seems likely that "positive versus negative expectations" referred to people who found the task "difficult" versus those who found it "too difficult."

The distinctions between effort, achievement, and persistence are essential to our criticism of past work, and psychological research on self-regulation usually obscures them. Effort, the intensity aspect of motivation, refers to the mobilization of resources to meet a goal. It is thus not the same as achievement—how well people actually perform on a task—or persistence—how long people choose to spend on a task. Achievement on a task depends on a wide range of factors, such as ability, expertise, effort, and task-specific strategies. Someone could mobilize high effort yet nevertheless perform poorly, such as if someone fixates on an ineffective strategy. Similarly, someone can show high task persistence but low effort, such as when people listlessly perform boring tasks. We aren't claiming that effort is more important or interesting than other aspects of motivated action, but we think it is important to be clear about what is being measured. Achievement and persistence aren't interchangeable with effort, and few studies in the self-awareness literature have actually measured effort.

When these distinctions are recognized, the complexity of motivated action becomes more apparent. For example, for an easy task self-focus doesn't boost effort, but it could nevertheless boost performance and persistence. Similarly, self-focused people, because they find the task more important, may search for strategies that will enable better performance. If such a strategy exists, then it would make the task easier, thereby enhancing performance but reducing effort. For these and other reasons, it is important to avoid using behavioral measures of achievement and persistence as proxies for measures of effort.

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