Self-Striving: How Self-Focused Attention Affects Effort-Related Cardiovascular Activity

20

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20.1 Introduction

Unlike most animals, humans can mentally represent themselves and their actions. We can think about ourselves, reflect on our pasts, consider what we are doing, and envision what we might do instead. As a result, human action is flexible: People can intervene in the flow of behavior and direct their actions. Many streams of social thought have addressed the consequences of our capacity for self-reflection, from theories of personality concerned with how people judge themselves (e.g., Freud 1923) to sociological theories of how people internalize and experience social norms (e.g., Shibutani 1961).

In social-personality psychology, the first modern theory of self-regulation was probably Duval and Wicklund's (1972) theory of objective self-awareness. Duval and Wicklund proposed that reflecting on the self causes self-evaluation: People judge themselves against salient standards and become motivated to meet them. The theory has been unusually fertile since then, sparking a family of related theories (e.g., Carver and Scheier 1998; Duval and Silvia 2001; Gibbons 1990; Hull and Levy 1979) and applications to many clinical and applied problems. The present chapter digs into one of the theory's fundamental problems: How does self-awareness influence effort? When people reflect on the self, why do they strive harder for goals or decide that the goal is not worth the effort? How do beliefs about goal attainment, such as self-efficacy and positive expectancies, influence effort?

This chapter reviews a line of psychophysiological research that takes a novel perspective on the classic problem of self-awareness, self-regulation, and effort. Using motivational intensity theory as a model of effort (Brehm and Self 1989), we show (1) how the self-regulatory dynamics presumed by self-awareness theory can be grounded in physiological processes, and (2) how the predictions made by self-awareness theory can be refined and extended. Intersecting self-awareness theory and motivational intensity theory thus offers a new look at some classic problems in self-regulation.

20.2 Objective Self-Awareness Theory

Objective self-awareness theory, first developed by Duval and Wicklund (1972), proposed that people could experience the self subjectively or objectively. Subjective awareness of the self involves experiencing the self as the agent of action. In this mode, people are absorbed in what they are doing, whether it is thinking, behaving, feeling, or interacting with others. Objective awareness of the self, in contrast, involves experiencing the self as the object of thought. People

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reflect on themselves just as they would reflect on other people or on objects in the world. Objective self-awareness is typically prompted by reminders of the self as an observable object, such as seeing one's image in a mirror or video monitor (Duval 1976; Silvia and Phillips 2004; Wicklund and Duval 1971), being watched by other people (Carver and Scheier 1978), sticking out in the social context (Silvia and Eichstaedt 2004; Snow et al. 2004), or having self-knowledge activated via priming (Macrae et al. 1998; Silvia and Phillips 2013). Over the years, alternative terms for "objective self-awareness" have become more common, such as self-awareness, self-focused attention, self-focus, and self-consciousness.

When people hold the self as the object of attention, they can think about it and evaluate it. Duval and Wicklund (1972) proposed that objective self-awareness evokes an automatic process of self-evaluation, which consists of comparing the self to internalized standards of correctness. If people fall short of their standards, then heightened self-focus creates negative affect and motivates them to strive to meet the standard. The self-to-standard comparison process was thought to be the fundamental consequence of self-awareness. Thus, although the term *self-regulation* was not widely used in the early 1970s, it is clear that the original self-awareness theory was fundamentally a self-regulatory theory. The nature and dynamics of self-awareness have been expanded by many later models, some of which emphasized self-regulation (Carver and Scheier 1998), information processing (Hull and Levy 1979), and inner experience (Gibbons 1990). Readers interested in the contemporary state of self-awareness research can consult several recent reviews (Carver 2012; Duval and Silvia 2001; Silvia and Duval 2001a; Silvia and Eddington 2012).

Most of the evidence for the self-regulatory effects of self-awareness has used two classes of methods: self-reports and behavioral measures. The most diverse, self-report measures have examined a wide range of outcomes that reflect striving to meet standards. Some studies have examined how people's self-reported beliefs align with their standards. When self-focused, people are more likely to report attitudes and preferences that align with internalized standards and values (Baldwin and Holmes 1987; Gibbons 1978). Other studies have shown that increasing self-focus will change self-reported positive and negative affect (Phillips and Silvia 2005) and reduce state self-esteem (Ickes et al. 1973) when discrepancies from standards are made salient. Finally, self-awareness shifts the self-reported attributions people make for failing to meet standards. When self-focused people feel able to meet a standard, they attribute failure to themselves (Duval and Silvia 2002); when they feel unable to meet a standard, they attribute failure defensively to the standard (Dana et al. 1997; Duval and Lalwani 1999) or to other people (Silvia and Duval 2001b).

Behavioral measures have played a large role in self-awareness research, largely due to the emphasis on behavior in the early experiments. Some studies measured behavioral avoidance. When success is unlikely, people can reduce awareness of a self-standard discrepancy by avoiding self-focus, such as by leaving the situation (Greenberg and Musham 1981) or immersing oneself in distracting activities (Moskalenko and Heine 2003). Typically, however, studies have measured motivation to meet a standard. These studies explicitly seek to measure motivation, and they have done so using measures of *performance* (how well people do) and *persistence* (how long they spend).

Performance outcomes assess motivation to meet a standard based on how well people actually perform. For example, if the standard is to do well on a computer-based cognitive task, researchers can measure whether self-focus improves response times or accuracy (e.g., Eddington and Foxworth 2012; Silvia and Phillips 2013). Another approach is to measure how close people get to achieving a goal (Carver et al. 1979b) or to assess observers' ratings of how well people performed a task (Burgio et al. 1986; Silvia and Phillips 2004, Study 2). In all cases, motivation is presumably reflected in greater success. Persistence outcomes, in contrast, assess motivation to meet a standard based on the duration of activity. Persistence is usually measured in units of time. For example,

researchers have used the time spent working on a task—often an unsolvable one—as a measure of motivation (e.g., Carver et al. 1979a). In other cases, persistence is measured as units of work. Several studies, for example, have asked people to copy foreign text and quantified motivation as the number of words copied (e.g., Duval and Lalwani 1999; Wicklund and Duval 1971).

One theme of the large self-awareness literature is that people's expectancies are critical moderators of the effects of self-awareness on motivation. When self-focused attention reveals a discrepancy between the self and a standard, people will vary in their perceived ability to reduce the discrepancy. Carver and Scheier (1981) proposed that people's expectancies moderated whether self-focus caused approach or avoidance. Most work has viewed expectancies as simply favorable or unfavorable, akin to self-efficacy for attaining the standard (Carver and Scheier 1998). In later work, Duval et al. (1992) suggested that perceived *rate of progress*—people's expectancies for attaining the standard in light of how far away they are—more accurately captures the nature of people's expectancies. In either case, many experiments have found interactions between self-focus and expectancies: People are most likely to strive to meet a standard when they are self-focused and feel they might be able to attain it (for reviews, see Carver 2012; Duval and Silvia 2001).

The self-awareness literature is deeply interested in self-regulation and motivation, but its measurement of motivation has conflated some important distinctions. In particular, it is essential to distinguish between *effort, performance,* and *persistence* as aspects of motivated action. Effort, the intensity aspect, reflects the intensity of motivation recruited during goal striving. Effort seems to be what most researchers intended to measure, but they assessed it obliquely using performance (the quality aspect) and persistence (the duration aspect). These three aspects can covary, of course, but they have important differences. For example, some tasks can be completed successfully in a short period of time, so high effort and high performance will entail low persistence. In other cases, high persistence can reflect a distracted and listless approach to a task—something familiar to professors who have heard students say they stayed up all night studying—so high persistence can involve low effort and low performance. And in other cases, high performance need not entail high effort. How well people perform is affected by many things—level of effort, cognitive abilities, and task-specific strategies and skills—so effort is but one of many factors. In many cases, high effort can be associated with poor performance. Compensatory effort—such as when people try harder to make up for stress or fatigue—is a classic example of high effort in the face of poor performance (Hockey 1997).

20.3 Motivational Intensity Theory

Understanding how self-awareness affects effort requires intersecting self-awareness theory with a theory of effort dynamics. Motivational intensity theory (Brehm and Self 1989), developed by Jack Brehm during the late 1970s, offers a graceful and productive model of why and when people mobilize and withdraw effort. It starts with the reasonable assumption that effort involves mobilizing energy for the purpose of attaining a goal. Because effort is not free—both in expending caloric energy and in creating wear and tear on the body due to gearing up—the intensity of effort is guided by rational principles aimed at conserving energy (Richter 2013).

Motivational intensity theory is reviewed in detail in several other chapters in this volume (see chapters by Brinkmann and Franzen; Richter; Wright; and Gendolla and Silvestrini) as well as in several recent reviews (Gendolla and Richter 2010; Richter 2013; Wright 2008; see also Wright and Gendolla 2012), so only the main ideas will be covered here. Unlike many models of motivation, which seek to encompass all possible variables with a morass of arrows and boxes, motivational intensity theory emphasizes two abstract variables that influence effort: the *importance* of the goal and the *difficulty* of achieving it. The joint effects of these factors are shown in Fig. 20.1. The importance

of the goal determines *potential motivation,* the amount of effort people are willing to expend if needed. Importance thus establishes a ceiling on the level of effort. The difficulty of attaining the goal, in contrast, determines the actual amount of motivation expended. Motivation is low when difficulty is low and then increases as difficulty increases. Eventually, motivation will decline for one of two reasons. In some cases, people hit the ceiling of potential motivation—they could attain the goal with further effort, but the goal is not important enough to do so. In other cases, the goal seems impossible to attain—expending more effort for an impossible goal is fruitless, so motivation should decline for impossible tasks.

Tasks with a fixed level of difficulty are "all or none" tasks: People either perform at the required level and achieve the goal or they do not. Some tasks, however, do not have a level of difficulty. Such tasks are sometimes known as piece-rate tasks, do-your-best tasks, or unfixed-difficulty tasks; for simplicity, we will use *unfixed tasks* (Wright et al. 2002). In piece-rate work, for example, people receive a reward for each unit of work. In research, these tasks either offer a reward for each successful action or simply tell people to do their best and accomplish as much as they can during the task period. For such tasks, the theory predicts that the degree of effort should be a function of the value of the reward. Effort for unfixed tasks is thus defined by the level of potential motivation (Wright 2008).

Much of the power of motivational intensity theory comes from its links to physiological measures. Wright (1996; Wright and Kirby 2001) integrated motivational intensity theory with Obrist's (1981) psychophysiological research on autonomic activity during active coping. Wright highlighted the significance of the sympathetic branch of the autonomic nervous system as a marker of effort. Cardiovascular measures of sympathetic activity have been the most popular. One effect of increased sympathetic activity on the heart is increased contractility (Drew and Sinoway 2012; Mohrman and Heller 2010), the force of the heart muscle's contraction. Increased contractility increases cardiac output, the amount of blood pumped per minute, which (all else equal) increases systolic blood pressure (SBP; the peak pressure during a contraction period). SBP is thus an indirect marker of the influence of sympathetic activity on the heart. Although less direct and precise than metrics such as the cardiac pre-ejection period (PEP; the time in milliseconds between the onset of contraction and the opening of the aortic valve; Kelsey 2012), SBP has been more widely used, in part because of its methodological simplicity and its intuitive bridges to the study of stress and health.

20.4 Integrating Self-Focus and Motivational Intensity

Motivational intensity theory's two parameters—difficulty and importance—give it enormous breadth. The many influences on effort, from personality traits to transient states, can be understood as factors that shift difficulty or importance, not as singular causes of effort in their own right. Given the theory's scope and elegance, it is not surprising that it has emerged as a major perspective in modern motivational science (see Gendolla et al. 2012).

How might we intersect self-awareness theory with effort dynamics? The two key variables found in the self-awareness literature—expectancies and self-focused attention—align well with the difficulty and importance parameters in motivational intensity theory. People's expectancies regarding their ability to achieve a goal dovetail naturally with the difficulty parameter. Furthermore, self-focused attention probably influences the importance parameter. Theories of self-focus generally agree that self-focused attention brings about a self-evaluative state that can reveal unpleasant discrepancies between the self and its goals, values, and standards (Carver 2012; Duval and Silvia 2001). Other models have suggested that self-focus makes standards more salient (Gibbons 1990) or self-relevant (Hull and Levy 1979). In all cases, however, self-focus can be easily seen as a factor that increases the importance of meeting goals and standards (Gendolla and Richter 2010).

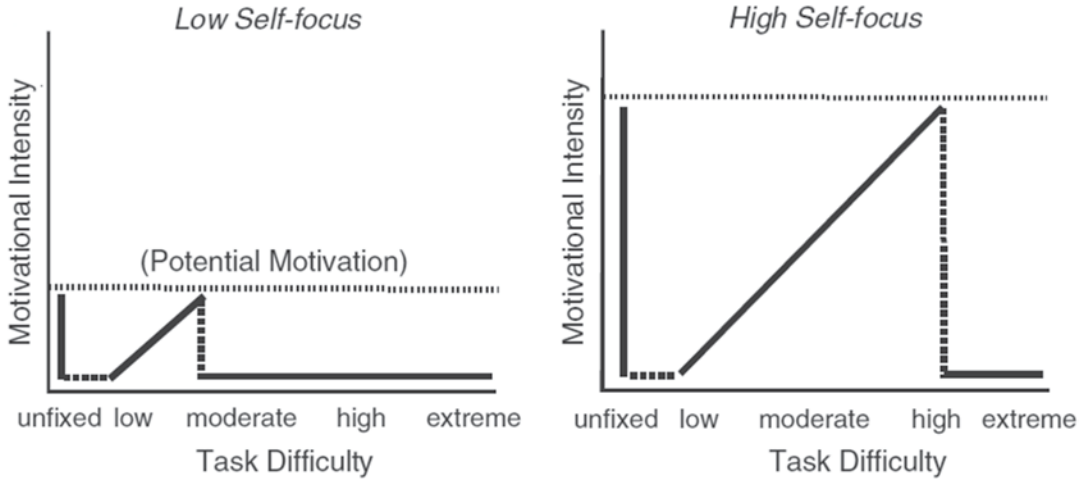

Fig. 20.1 The joint influence of potential motivation and task difficulty on the intensity of motivation. For unfixed tasks, motivation is a function of potential motivation; for fixed difficulty tasks, motivation rises until it hits the ceiling of potential motivation and then declines. (From Gendolla et al. 2008, Fig. 1. Reprinted with permission)

Motivational intensity theory does more than simply recast the literature on self-awareness; it can make nonintuitive and refined predictions concerning effort. Specifically, motivational intensity theory offers several new ideas for the study of self-awareness.

First, self-focus and task difficulty should jointly affect effort in a nonlinear function (see Fig. 20.1). When self-focus is low and success is thus less important, effort should be relatively low regardless of task difficulty. But when self-focus is high and success is thus more important, effort should be a nonlinear function of difficulty: low for easy tasks, higher for harder tasks, and low again for impossible tasks. This prediction is contrary to the prevailing predictions in the self-awareness literature, which presume that positive expectancies foster higher motivation. In Carver and Scheier's (1998) model, for example, self-focused people should try hardest when they have positive expectancies. According to the rational conservation of resources implicit in motivational intensity theory, however, it would be wasteful to gear up for an easy goal, regardless of how important it is.

Second, the type of task—unfixed or fixed in difficulty—should be an important moderator. Social-personality research on motivation has not generally appreciated this distinction, and it has tended to use unfixed tasks or tasks held constant at a challenging level. For unfixed tasks, effort should be solely due to self-focus, which affects the ceiling of potential motivation; for fixed tasks, effort should be a joint function of self-focus and task difficulty.

And third, we should expect dissociations between effort, measured physiologically, and behavioral performance, measured by how well people actually do on the task. The distinction between effort, performance, and persistence has not seeped into social-personality research, but it is critical. One would expect self-focus and task difficulty to have different effects on performance in some circumstances. When self-focused people face an easy goal, for instance, we would expect low effort but high performance.

The rest of this chapter reviews a series of experiments that examined the effect of self-focus on effort. Using motivational intensity theory as a framework, these studies assessed effort using changes in sympathetic cardiovascular activity. The general method involved assessing SBP, diastolic blood pressure (DBP), and heart rate (HR) during a baseline period and again during a task period. An increase in SBP—higher reactivity from baseline to task—can be interpreted as reflecting higher effort-related sympathetic activity. This chapter focuses solely on the effects for

SBP, but it is worth noting that DBP effects appeared in some studies and HR effects appeared in a few. Unlike SBP, DBP is less consistently affected by beta-adrenergic sympathetic influence on the heart and relatively more affected by alpha-adrenergic peripheral resistance, making it a less reliable marker of beta-adrenergic sympathetic activity than SBP. HR is strongly affected by both sympathetic and parasympathetic branches (Drew and Sinoway 2012), so changes in HR are not easily understood without concurrent assessment of parasympathetic activity.

The first block of studies used explicit manipulations of self-focus, such as mirrors and video cameras. These classic manipulations are "explicit" in that they use obvious stimuli in the environment to evoke strong, conscious feelings of self-awareness. The second block of studies, in contrast, used implicit manipulations, such as rapid masked priming of people's first names. Theories of self-awareness contend that self-focus has the same effects regardless of how it is evoked, so using subtle methods to activate self-knowledge outside of awareness can test the robustness of self-focus's effects on effort. Finally, our third block used individual differences, known as trait self-focus.

20.5 Effects of Explicit Manipulations of Self-Focus on Effort

The most common manipulations of self-awareness are explicit, such as placing people in front of large mirrors or having people view their image on a video monitor. People feel much more self-conscious and know that the stimulus is the cause, so there is both a conscious experience of self-focus and knowledge about its source. These are among the earliest and most popular manipulations (Carver and Scheier 1978; Wicklund and Duval 1971), so they were the natural first step for examining effort dynamics.

In our first experiment (Gendolla et al. 2008, Study 1), we used video recording to manipulate self-focused attention. In the high self-focus conditions, the experimenter used a video camera to record the participant, who could see the image on a small monitor placed on his or her desk. In the low self-focus conditions, no recording was conducted. After a baseline period, people worked on a cognitive task known as the d2 task (Brickenkamp and Zillmer 1998). This task presents *d*s and *p*s on the screen. Each letter has zero, one, or two apostrophes above and below it. People have to indicate whether the letter is a d2 (a *d* with two apostrophes above or below it, or a *d* with one above and one below it) versus any other item. The task is well suited for effort research because it has simple rules and is easily adapted to different difficulty levels and reward structures. In some conditions, people completed an unfixed version of the d2 task: They were told simply to do their best and to get as many correct in the 5-min task period. In other conditions, people completed an easy version of the d2 task: The item appeared on the screen for 3000 ms, and people were told that the standard was to respond correctly 90 % of the time. Responding early did not terminate the trial—the items stayed on the screen for the full 3000-ms response window—so people could not work at their own pace or accelerate the easy task.

Figure 20.2 shows the pattern of results. For the unfixed task, high self-focus increased SBP reactivity; for the fixed-easy task, SBP reactivity was low, regardless. A second experiment (Gendolla et al. 2008, Study 2) used three task levels: an unfixed condition, a difficult condition, and an impossible condition. The unfixed condition, like before, asked people to do their best and work at their own pace. In the fixed conditions, the goal was to get 90 % of the trials correct, and the response windows were 600 ms (difficult but feasible) and 350 ms (impossible). Figure 20.3 shows the results, which again supported our predictions. High self-focus increased SBP reactivity in the unfixed condition and in the difficult condition. In the impossible condition, effort was low. All told, the findings revealed that self-focus increases potential motivation: When the task demanded more effort, self-focused people tried harder. But when the task demanded little effort or was impossible, effort was low, regardless.

A later study examined the biggest difference between traditional self-awareness models and

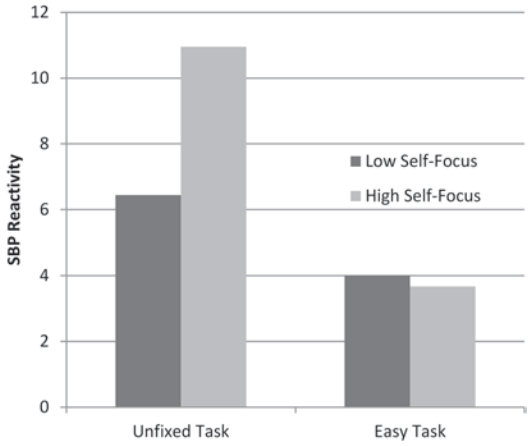

Fig. 20.2 Effects of self-focus on systolic blood pressure (*SBP*) reactivity for unfixed and easy tasks. (Data from Gendolla et al. 2008, Study 1)

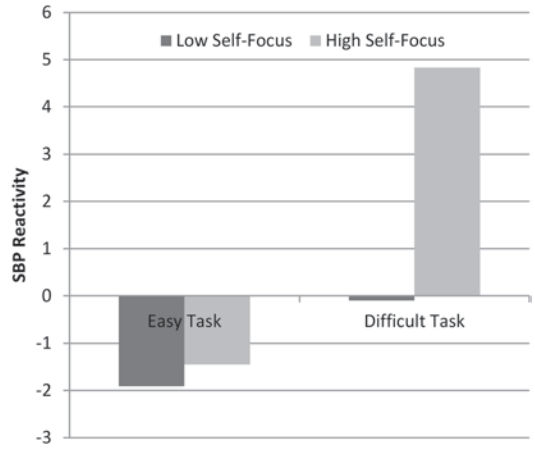

Fig. 20.4 Effects of self-focus on systolic blood pressure (*SBP*) reactivity for easy and difficult tasks. (Data from Silvia et al. 2010)

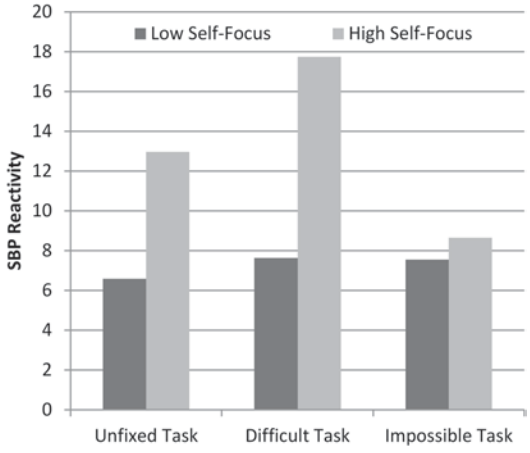

Fig. 20.3 Effects of self-focus on systolic blood pressure (*SBP*) reactivity for unfixed, difficult, and impossible tasks. (Data from Gendolla et al. 2008, Study 2)

motivational intensity theory—effort for easy tasks. People have very favorable expectancies for such tasks, so self-awareness theories expect higher motivation (Carver and Scheier 1981). Motivational intensity theory, however, contends that easy goals demand little effort, regardless of how important they are, so effort should be low. In an experiment (Silvia et al. 2010), we varied self-awareness using a large mirror and had people work on a version of the d2 task that was either easy (a 3000-ms response window) or challenging (a 650-ms window). The results, shown in Fig. 20.4, supported our application of motivational intensity theory. When the task was easy, SBP reactivity was low regardless of self-focus; when the task was hard, however, SBP reactivity was high only in the high self-focus condition, consistent with our view that self-focus increases potential motivation. Self-report measures confirmed that people in the easy conditions had much more favorable expectancies regarding goal success, but people only put forth more effort when the goal required it (high difficulty) and merited it (high self-focus).

20.6 Effects of Implicit Manipulations of Self-Focus on Effort

After establishing that motivational intensity can illuminate how self-awareness affects effort, we tested the limits of these effects. Instead of manipulating self-focused attention using conscious methods, we used implicit priming to directly activate self-knowledge. A handful of past studies had found that masked priming of last names (Macrae et al. 1998) and first-person pronouns (Koole and Coenen 2007) were effective, and in our recent behavioral studies, we had found that masked first-name priming replicated mirror manipulations (Silvia and Phillips 2013).

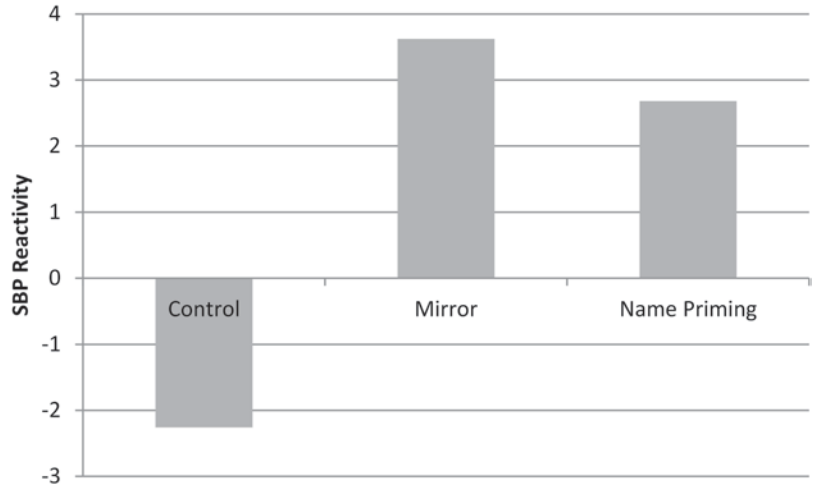

Fig. 20.5 Effects of explicit self-focus (a mirror) and implicit self-focus (first-name priming) on systolic blood pressure (*SBP*) reactivity for an unfixed task. (Data from Silvia 2012, Study 1)

Implicit manipulations are interesting for a few reasons. For one, they allow a test of the generality of self-awareness's effects on effort. Furthermore, they directly target an assumption of self-awareness theory—that self-evaluation is an automatic consequence of directing attention to the self (Carver 2012; Duval and Silvia 2001). The self-evaluative consequences of self-focus thus ought to be apparent when self-focus is sparked outside of conscious awareness. Finally, there is an emerging interest in implicit influences on effort (e.g., Gendolla 2012; Gendolla and Silvestrini 2010), so studying implicit name priming contributes to the broader problem of implicit aspects of effort regulation.

In our first study (Silvia et al. 2011a), we explored how first-name priming during an unfixed version of the d2 task affected SBP reactivity. Because some work had suggested that prime frequency—the percent of trials with a prime—could be important (Silvestrini and Gendolla 2011), we evaluated four conditions. In a control condition, 0% of the trials had primes; in the other conditions, 33%, 67%, or 100% of the trials started with the participant's first name, which was presented rapidly (27 ms) and masked. We found a significant 3 versus 1 effect of priming: All prime levels beyond 0% increased SBP reactivity, so the specific frequency seemed less important. The remaining studies thus used either 67% or 100% frequencies. In a later study, implicit and explicit manipulations—first-name priming and a large mirror—had the same effects on SBP reactivity during an unfixed task (Silvia 2012, Study 1). As Fig. 20.5 shows, both the mirror and name-priming conditions had higher SBP reactivity than a control condition. These studies support the view that self-focused attention has the same self-evaluative effects regardless of how it is evoked (Duval and Silvia 2001).

We then turned to examining how implicit first-name priming influenced SBP reactivity for fixed-difficulty tasks. In a series of experiments (Silvia 2012, Studies 2 and 3; Silvia et al. 2014), we varied the task difficulty across a range of levels, from very easy to challenging to impossible. As expected, we found the predicted nonlinear functions for SBP reactivity. First-name priming increased the amount of effort people were willing to expend, as shown by increases in effort from easy-to-hard conditions (Silvia 2012). When the task seemed impossible, however, effort declined (Silvia et al. 2014). Most of these experiments manipulated both explicit and implicit self-focus and found that they had the same effects, further supporting the claim that different routes to self-focus have the same effects.

20.7 Effects of Individual Differences in Self-Focus on Effort

Thus far, we have considered experiments that manipulated self-focused attention. A few of our studies, however, have explored individual differences in self-focus. Early in self-awareness research, researchers speculated that people might differ in their habitual tendencies toward focusing on the self (Fenigstein et al. 1975). The early self-consciousness scales proposed dimensions of private self-consciousness, public self-consciousness, and social anxiety (Fenigstein et al. 1975). Over the years, private self-consciousness has attracted the most attention, largely because it is conceptually closest to manipulations of state self-awareness. Because the self-consciousness scales tend to have poor internal consistency, we measured trait self-focus using the self-reflection scale (Grant et al. 2002), either alone or in combination with the revised private self-consciousness scale (Scheier and Carver 1985). The self-reflection scale has a strong internal consistency and performs well (Silvia and Phillips 2011).

In one experiment (Silvia et al. 2011b), we found that trait self-focus had an analogous influence on potential motivation: People high in trait self-focus were more willing to put forth effort than people low in trait self-focus. After completing measures of individual differences, people worked on the d2 task, which was manipulated to be either easy (a 2500-ms window), difficult (a 1250-ms window), or very difficult (a 750-ms window). As shown in Fig. 20.6, people high in trait self-focus had higher potential motivation: They were still willing to expend effort at the highest level of difficulty, whereas people low in trait self-focus had already withdrawn effort. Additional support comes from the implicit priming experiment, reviewed earlier, that varied four levels of priming during an unfixed task (Silvia et al. 2011a). We had measured trait self-focus in that study as well, and we found a significant interaction between trait self-focus and implicit name priming. People high in trait self-focus had higher SBP reactivity regardless of priming, which suggests that they had higher potential motivation.

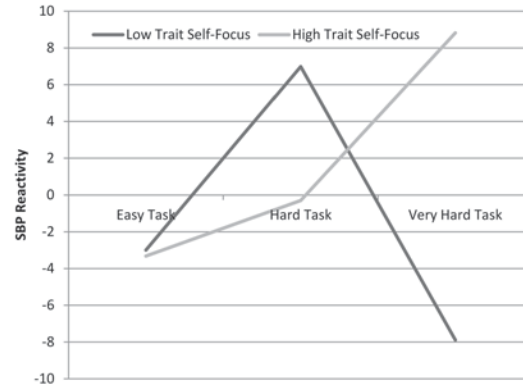

Fig. 20.6 Effects of individual differences in trait self-focus on systolic blood pressure (*SBP*) reactivity for an easy, difficult, or very difficult task. (Data from Silvia et al. 2011a)

But there is probably more to trait self-focus than making goals more important. A curious feature of trait self-focus is that it makes people more sensitive to influences in the environment. Hull's model of self-focused attention has emphasized that self-focus can make ideas and goals more self-relevant (Hull and Levy 1979; Hull et al. 1988). As a result, self-focused people might experience primes as more relevant, causing stronger priming effects. In fact, several studies have found that people high in trait self-focus are more influenced by priming (DeMarree and Loersch 2009; Hull et al. 2002; Wheeler et al. 2008). We thus explored whether trait self-focus amplified the effects of other implicit primes on effort. In an experiment (Silvia et al. 2013), we manipulated both importance and difficulty using rapid masked priming. Importance was varied using name priming (first names vs. no priming); difficulty was varied using words implying an easy task (e.g., *easy, simple*) versus a hard task (e.g., *hard, difficult*). These primes were presented sequentially, using multiple masks, prior to each trial of a d2 task. The task was held constant at a challenging level.

Figure 20.7 shows the results, which were estimated based on regression interactions. When trait self-focus was low, the importance and difficulty primes had minor effects at most on SBP reactivity. But when trait self-focus was high, SBP reactivity followed the pattern predicted by

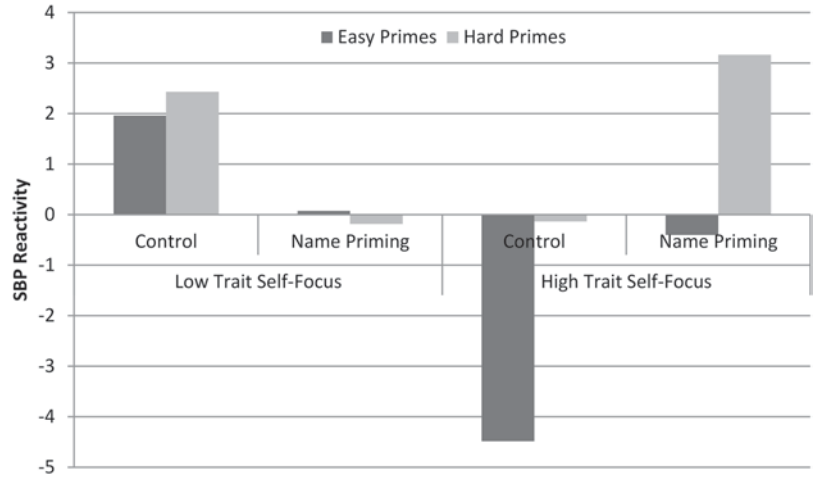

Fig. 20.7 Moderating effects of trait self-focus on the effects of implicit first-name primes and implicit difficulty primes. *SBP* systolic blood pressure. (Data from Silvia et al. 2013)

motivational intensity theory: Effort was highest when success was relatively more important (name priming) and difficult (difficulty priming). The findings thus reveal an additional role for trait self-focus in the regulation of effort. By making importance and difficulty information more self-relevant, trait self-focus amplified their effect on effort. People high in trait self-focus are more likely to capitalize on environmental information that is relevant to goal pursuit, which should make their self-regulatory processes more effective.

Conclusions

This chapter reviewed the interface of two major traditions in motivational science: objective self-awareness theory, a prominent model of self-regulation; and motivational intensity theory, a leading model of effort. Self-awareness research has emphasized the role of self-reflection in behavioral self-regulation; motivational intensity research has emphasized why and when people put forth effort. Together, the models offer new and insightful predictions about the biobehavioral regulation of effort when people are striving for goals.

Self-focused attention can be understood as a factor that makes achieving a goal more important. It is thus like other factors, such as self-relevance and monetary rewards (e.g., Gendolla and Richter 2010; Richter and Gendolla 2009), that affect effort via the importance parameter. People's goal expectancies, like factors such as fatigue and moods (e.g., Gendolla 2012; Wright and Stewart 2012), influence the difficulty parameter. With these assumptions, we can derive predictions about biological effort regulation from motivational intensity theory. As this chapter has shown, these predictions have received strong support.

First, the type of task—unfixed or fixed in difficulty—yields the expected effects. For unfixed tasks, effort is due solely to importance and hence to self-focused attention; for fixed tasks, effort is a joint function of both self-focused attention and task difficulty. Second, extensive support was found for the nonlinear effort functions predicted by the theory. In particular, several studies supported motivational intensity theory's most controversial prediction: that effort is low when expectancies are high, a view that conflicts with the notion that high self-efficacy and positive goal expectancies are themselves motivating (e.g., Bandura 1997; Carver and Scheier 1998). Several experiments found lower effort, measured with SBP reactivity, when tasks were easy than when they were hard (Gendolla et al. 2008; Silvia 2012; Silvia et al. 2010). Although counterintuitive, it follows logically from the assumptions that people would not waste biological effort for tasks that do not require it (Richter 2013).

Finally, we found support for the breadth and generality of self-focused attention. The predicted effort patterns were found for a wide range of methods, including traditional explicit manipulations of self-focus, novel implicit priming manipulations, and self-reported individual differences in trait self-focus.

The integration of these theories has clearly been fertile, and there are many problems remaining that deserve attention in future research. As one example, implicit aspects of self-regulation and effort are an intriguing point of intersection between these literatures. Theories of self-awareness have presumed that the self-evaluation follows automatically when people focus attention on the self (Duval and Silvia 2001). The present studies support this position—implicit methods of inducing self-focus worked at least as well as explicit methods—and they suggest some additional roles for self-focus, such as amplifying the effects of other implicit influences (Silvia et al. 2013). As another example, there are several interesting motivational contexts that have yet to be explored, such as cases in which people are uncertain about how hard a task will be (e.g., Richter and Gendolla 2006) and when people confront challenges that vary unpredictably in difficulty from trial to trial. Finally, the role of motivationally relevant parasympathetic changes have only recently attracted attention in motivational intensity research (e.g., Richter 2010), and it is likely that assessing both autonomic branches will provide rich insight into the control of effort (e.g., Kreibig et al. 2012). In any case, these experiments highlight the value of motivational intensity theory, which can serve as a versatile and powerful framework for a wide range of motivational problems.

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