

SOCIAL, PERSONAL, AND ENVIRONMENTAL INFLUENCES ON SELF-
CONTROL

by

Michelle Renee vanDellen

Department of Psychology and Neuroscience

Duke University

Date: _____

Approved:

Rick H. Hoyle, Ph.D., Supervisor

Kenneth A. Dodge, Ph.D.

Mark R. Leary, Ph.D.

James Y. Shah, Ph.D.

Timothy J. Strauman, Ph.D.

Dissertation submitted in partial fulfillment of
the requirements for the degree of Doctor of Philosophy
in the Department of Psychology and Neuroscience
in the Graduate School of Duke University
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ABSTRACT

Current accounts of self-control are highly individualistic. When individuals succeed at exerting self-control, we assume that they possess some positive internal characteristic that explains their success. Similarly, when individuals do not succeed, we blame their failure on an internal flaw. Yet many factors may influence the likelihood that an individual will exert self-control, including not only internal characteristics of individuals but also external factors. In this dissertation, I develop a framework for understanding the multiple sources of influence on individuals' state self-control that groups these factors into three categories: social, personal, and environmental. Further, I detail the multiple mechanisms by which the factors in the Social, Personal, and Environmental Control of Self (SPECES) model may influence self-control. Specifically, I examine the potential role of regulatory accessibility as a mechanism of influence on state self-control. In Study 1, I show that individuals who think about a friend with good self-control demonstrate increased performance on a persistence task than do participants who think about a friend with bad self-control. In Study 2, I replicate this effect, showing increased inhibitory capacity among individuals who wrote about a friend with good self-control compared to a control group, and decreased inhibitory capacity among individuals who wrote about a friend with bad self-control. In Study 3, I show that regulatory exertion increases among individuals subliminally primed with the name of a friend with good self-control and that regulatory exertion decreases among individuals primed with the name of a friend with bad self-control. These findings support my hypothesis that models of self-control should account for sources of influence external to the individual, as well as explore the multiple pathways by which regulatory exertion is

influenced. These findings support my hypothesis that social factors influence regulatory exertion, or state self-control. Further, they provide evidence that state self-control is influenced not only by regulatory capacity, but also by other mechanisms, including regulatory accessibility. Further research following the SPECS model will investigate the combined influence of social and environmental influences on self-control and the indirect influences of personal characteristics, such as trait self-control, on regulatory exertion.

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INTRODUCTION

Current accounts of self-control are highly individualistic. When individuals succeed at exerting self-control, we look to their positive traits to explain their success. When they fail, we assume that they possess some internal flaw that prevents them from being able to manage their behavior. This tendency to attribute self-control only to internal characteristics of individuals is surprising given what we know about the power of situational influences on behavior (e.g., Milgram, 1963; Mischel, 1969; Zimbardo & White, 1972). Given the known influence of situational factors and the extent to which situational and individual factors interact (Bolger, & Schilling, 1991; Diener, Larson, & Emmons, 1984; Howard, 1979), our current understanding of self-control processes is likely constrained by a persistent focus on internal characteristics. In all likelihood, individuals' ability to exert self-control is influenced not only by their own internal characteristics but also by the situational and interpersonal factors that have long been studied in social psychology.

One line of research that has successfully integrated understanding of internal processes with interpersonal context is work on individuals' performance in groups. Classic research on social facilitation demonstrated that individuals' performance is influenced by the physical presence of others (Zajonc, 1965). At times the presence of others leads to improved performance, particularly on familiar and easy tasks, by way of increased arousal (Blascovich, Mendes, Hunter, & Salomon, 1999). The presence of others does not always lead to improvements in behavior. Rather, the presence of others may lead to a sense of diffused responsibility and therefore less exertion of effort (Ingham, Levinger, Graves, & Peckham, 1974; Latane, Williams, & Harkins, 1979) or less prosocial behavior (Darley &

Latane, 1968). This influence of others on behavior occurs through increased arousal and attention to personal standards (Blascovich et al., 1999; Carver & Scheier, 1981b).

In the same way that individuals' performance on certain tasks can be construed not only as internal processes, but also as interpersonal ones, self-control should not be viewed as merely internal. As is the case with general performance, at times individuals' ability to exert self-control may improve due to interpersonal factors, and at other times it may decline. The purpose of this paper is to provide a theoretical model of how self-control might operate in an interpersonal context and to report findings from a set of studies investigating various components of this model.

Current Perspectives on Self-Control

Self-control typically involves either inhibition of an automatic impulse (Baumeister, Bratlavsky, Muraven, & Tice, 1998) or effortful activation of a behavior (Muraven, Tice, & Baumeister, 1998). Other perspectives on self-control suggest that it involves engaging in a behavior because of a benefit that it might later provide (Fishbach, Friedman, & Kruglanski, 2003; Fujita, Trope, Liberman, & Levin-Sagi, 2006; Mischel, Shoda, & Peake, 1988). Benefits reaped may be temporally proximal or distal. Over time, a dieter might experience the benefits of weight loss and improved health. More immediately, that dieter might experience positive feelings toward the self because of effort expended in the process of self-regulation (Carver & Scheier, 1990). In reality, most successful acts of self-control involve both inhibition and activation. For instance, going to the gym might involve both inhibiting the desire to stay home and watch television and activating the behaviors of driving to the gym and using exercise equipment. Further evidence supporting the idea that both inhibition and

activation are involved in self-control comes from a meta-analysis in which behaviors of each type similarly deplete regulatory resources (Pascoe, 2007).

An extensive line of research treats capacity for self-control as a resource, something that can be depleted through use, reserved for later use, and restored (Baumeister, Gailliot, DeWall, & Oaten, 2006; Muraven & Baumeister, 2000; Muraven, Shmueli, & Burkley, 2006). When individuals exert self-control, they use some of this resource, leaving less available for later use (Muraven et al., 1998). A variety of activities spanning multiple domains consume this resource, including emotion-regulation (Muraven et al., 1998), attention-regulation (Schmeichel, Vohs, & Baumeister, 2003), thought suppression (Muraven et al., 1998), behavioral regulation (Baumeister et al., 1998), impulse-control (Baumeister et al., 1998), and resisting temptations (Vohs & Heatherton, 2000). These tasks, while varied, all deplete individuals' capacity for self-control.

Similarly, a wide variety of tasks that require self-control lead to deficits after individuals have completed an ego-depletion manipulation. Individuals with limited regulatory resources are less likely to persist on both mental tasks (e.g., anagrams, geometric tracing tasks; Ciarocco, Sommer & Baumeister, 2001; Vohs & Heatherton, 2000) and physical tasks (e.g., handgrip tasks; Ciarocco et al., 2001). They are also more likely to engage in impulsive spending (Vohs & Faber, 2007), be aggressive (DeWall, Baumeister, Stillman, & Gailliot, 2007), and fail to regulate their emotions (Baumeister et al., 1998). Just as the activities that lead to ego-depletion share a component of self-control, the tasks that are affected by self-control share a common denominator of requiring self-control.

In addition to this resource-oriented approach, self-control has been viewed through

a social-cognitive lens. Whereas the strength model of self-control proposes that individuals' capacity for self-control is depleted in the presence of temptations, leading to decreased likelihood of goal-related pursuits, contradictory evidence suggests that individuals' capacity for self-control increases in the presence of temptations (Fishbach et al., 2003). This increase in goal-directed behavior is explained by conceptualizing goals as knowledge structures wherein temptations are associated with goals. When temptation-related cognitions are accessed, so are the goals attached to them. Accordingly, as goals become salient, goal pursuit increases (Fishbach et al., 2003; Fishbach & Shah, 2006).

Social, Personal, and Environmental Control of Self (SPECS) Model

At any moment in time, individuals may vary in the likelihood that they will exert self-control. Influences on their regulatory exertion, or the extent to which they will exert self-control, can be organized into three sources, social or interpersonal influences, personal or individual influences, and environmental or situational influences (see Figure 1). Social influences include the impact of people who are currently present and the psychological presence of significant or salient others. Personal influences include previous demands on the individual, as well as trait capacity for self-control. Environmental influences include elements of the situation such as temptations and distractions. Although some degree of overlap between these sources is evident, each can be considered independently of the others.

The resource-depletion model of self-control emphasizes that the means used in self-control, or regulatory resources, are a consumable entity. That model focuses exclusively on regulatory exertion as a function of regulatory capacity, or the availability of these regulatory

resources. Such motivated behavior are likely influenced by a range of factors,

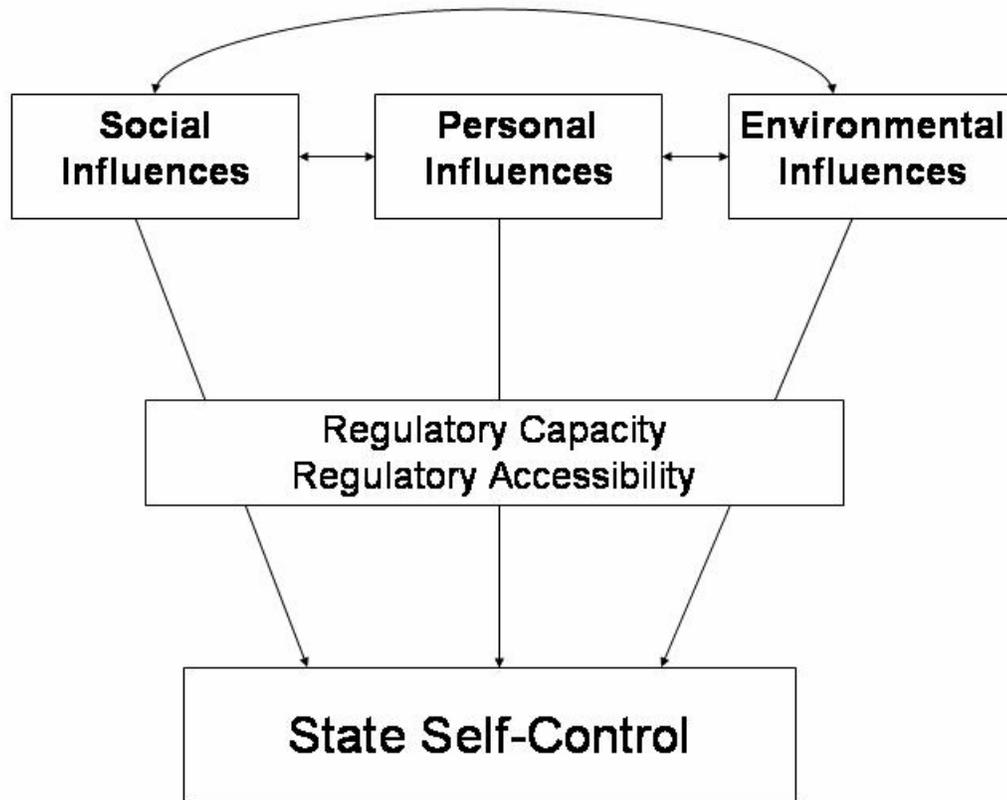


Figure 1: The Social, Personal, and Environmental Control of Self Model

including cues, temptations, and the physical and psychological presence of others. These factors likely influence regulatory exertion through a variety of cognitive and motivational mechanisms.

In this dissertation I examine one specific pathway by which environmental and social factors may influence the likelihood that individuals will exert self-control--accessibility of regulatory behaviors. Social psychological perspectives on accessibility provide a rich source of information about the ways that accessibility might influence behavior. Accessibility is viewed as the readiness with which constructs might be used in

information processing and is contrasted with availability, which involves the presence of cognitive constructs (Higgins, King, & Mavin, 1982). Regulatory accessibility can be construed as readiness to exert self-control (Bruner, 1985). I examine how environmental and social factors influence the likelihood of exerting self-control not only by influencing regulatory capacity but also through regulatory accessibility.

Consider an example. Chris spends Friday afternoon with his good friend Megan, who has surprisingly good self-control. Chris finds himself making better decisions about what to eat and how to spend his money, not only that afternoon, but even later that night when he is not with Megan. Why is Chris's behavior different? A resource-model approach might suggest that Megan's presence somehow bolstered Chris's supply of regulatory resources, possibly by increasing positive affect (Tice, Baumeister, Shmueli, & Muraven, 2007) or practice at exerting self-control (Gailliot, Plant, Butz, & Baumeister, 2007; Muraven, Baumeister, & Tice, 1999). In line with the SPECS framework, Megan could have influenced Chris's behavior by increasing Chris's accessibility of, or cuing, behaviors related to self-control. Because these behaviors would have increased accessibility, they would also likely enable Chris to be better able to exert self-control.

In short, models of self-control should account for multiple pathways by which individuals' likelihood of exerting self-control is influenced. Two possible pathways include regulatory capacity and regulatory accessibility. Next, I delineate the specific ways that each source of influence traverses these pathways to affect individuals' likelihood of exerting self-control.

Social Influences

Individuals interact with a variety of people everyday. Given the importance of these interactions for the self (Wheeler, Reis, & Nezlek, 1983), surprisingly little work on self-control has identified how social interactions influence individuals' capacity for self-control. Here, I discuss how social factors influence regulatory exertion through regulatory capacity and regulatory accessibility.

Regulatory capacity. Individuals may often find that successful interactions with others take a great deal of self-control. Research following the line of ego-depletion has begun to address the regulatory costs of such social interactions. Interacting with irritating individuals and individuals who require help in attaining a goal leads to a loss of capacity for self-control (Finkel et al., 2006; Miller, Sherrill, & Hoyle, 2007). Individuals' capacity for self-control may also decrease after interacting with others who fall into stereotyped groups (Richeson & Trawalter, 2005). In these situations, individuals must monitor their expression of stereotypes in order to prevent them from offending their interaction partners. More generally, social interactions may decrease regulatory capacity because of demands on individuals to engage in self-presentation (Vohs, Baumeister, & Ciarocco, 2005).

In addition to social interactions that require individuals to regulate their own behavior, some interactions require that individuals regulate others' behavior. Have you ever gone to a party with a friend who speaks before he thinks and tried to steer him away from certain people because you knew he would make a fool of himself? Perhaps the best, and most common, examples of how individuals exert effort to regulate others' behavior can be found among parents of small children. Many parents remain constantly vigilant both to train their children in socially appropriate behavior and avoid unwanted outbursts. In the

SPECS model, such effort at regulating others' behavior also carries costs to the self in terms of regulatory capacity.

Simply being around others who are exerting self-control may also be somewhat depleting to ones' stock of regulatory resources. Because individuals tend to overestimate the extent to which they cause others' behavior (Pronin, Wegner, McCarthy, & Rodriguez, 2006), individuals may falsely conclude that they themselves have exerted self-control when others regulate their own behavior. To the extent that this perceived causal influence feels effortful, individuals may experience reduced capacity to exert self-control.

Regulatory accessibility. Current research on goal pursuit has thoroughly demonstrated that significant others influence individuals' goal-directed behaviors. This work reveals that individuals are more likely to engage in goal pursuits of salient others (Aarts, Gollwitzer, & Hassin, 2004; Fitzsimons & Bargh, 2003; Shah, 2003). Other people can have both positive (Aarts et al., 2004) and negative (Leander, Shah, & Chartrand, 2007) consequences for motivation. These goals are knowledge structures stored in networks of associations (Shah, Kruglanski, & Friedman, 2002) that include not only goals but also subgoals, the means necessary to meet goals, temptations associated with the goals, and goal-related affect (Fishbach, Dhar, & Zhang, 2006; Fishbach et al., 2003; Fishbach, Shah, & Kruglanski, 2004; Shah & Kruglanski, 2003). Interpersonal relationships, and the goals associated with them, also are incorporated into the goal system (Fitzsimons, Shah, Chartrand, & Bargh, 2005). In these networks, constructs increase in accessibility when the accessibility of other related components increases (Collins & Loftus, 1975).

Models of contagion draw on the goal network of associations to explain how the

behaviors and emotions of one person can lead to similar behaviors and emotions in another. The spread of activation involves the perception of a behavior by others, the interpretation of that behavior, and the thoughts of oneself performing that behavior (Carver, Ganellen, Froming & Chambers, 1983). Similarly, mimicry is assumed to rely on the perception-behavior link (Bargh, Chen, & Burrows, 1996) such that when people perceive behaviors, the schemas for those behaviors become activated, thereby increasing the likelihood that the behaviors will be enacted by the perceiver (Chartrand & Bargh, 1999). Similarly, goal (Aarts et al., 2004; Dik & Aarts, 2007), attitude (Sinclair, Lowery, Hardin, & Colangelo, 2005; Sinclair & Huntsinger, 2006), and mood (Neumann & Strack, 2000) contagion involve increased accessibility of schemas that lead to corresponding cognition and emotions.

Although this work focuses on specific attitudes, goals, and emotions, self-control may more generally spread from one individual to another by way of regulatory accessibility. When individuals interact with others, schemas associated with self-control may become more or less accessible. Presumably, when individuals interact with others with high trait or state self-control, the accessibility of regulatory behaviors will increase, whereas when they interact with others who are low in self-control, the accessibility of impulsive schemas will increase. When regulatory behaviors are accessible, regulatory exertion should increase, whereas when impulsive behaviors are accessible, regulatory exertion should decrease.

Social interactions with others may also increase regulatory accessibility by increasing processes of self-regulation, wherein the individuals' current status and progress is compared to standards. If undesired discrepancies exist, individuals' standards or behaviors are likely to

change (Rothbaum, Weisz, & Snyder, 1982; vanDellen & Hoyle, in press). Self-regulation increases in response to challenge arousal (Blascovich et al., 1999), expectation of evaluation (Cottrell, Wack, Sekerak & Rittle, 1968; Uziel, 2007), as well as salient personal and normative standards (Carver & Scheier, 1981a, Cialdini, Reno, & Kallgren, 1990). By increasing these factors, social interactions increase general self-regulatory processes, as well as the likelihood that individuals will have accessible regulatory schemas.

Personal Influences

In the SPECS framework, personal influences include the traits and states of individuals relevant to self-control. Individuals vary in the degree to which they are chronically able to exert self-control. Higher levels of trait self-control are associated with higher mental health and academic performance and lower aggression and alcoholism (Funder & Block, 1989; Funder, Block & Block, 1983; Mischel, Shoda, & Peake, 1988; Tangney, Baumeister, & Boone, 2004). Here, I discuss how internal characteristics of individuals influence capacity for self-control.

Regulatory capacity. Trait self-control likely influences regulatory capacity in two ways. First, one way of conceptualizing trait self-control is as an indicator of one's stock of regulatory resources. In other words, individuals with high trait self self-control may have at their disposal more of the resources that are used to exert self-control. When they are faced with situations that require self-control, they may use some of these resources but still typically have enough leftover to engage successfully in additional acts of self-control. In this way, regulatory exertion would be directly predicted by trait levels of self-control. A second way to construe trait self-control is as resilience to resource-depletion effects.

When individuals exert self-control, their capacity for further self-control is reduced (Baumeister et al., 1998; Muraven et al., 1998). If trait self-control is operationalized as resilience against ego-depletion, then we would expect the size of these effects to be smaller for some individuals than for others. Although no work has directly examined this hypothesis, evidence does suggest that individuals who work at self-control over time are more resistant to manipulations of ego-depletion in the lab (Muraven et al., 1999). Individuals with high trait self-control may be better at practicing acts of self-control and might have, over time, built up their resilience to self-regulatory demands. Further, research on genetic risk factors demonstrates that individuals at risk may be the most likely to benefit from environmental influences (Dodge & Sherrill, 2007). Individuals who are at risk, such as those with low levels of trait self-control, may be more likely to be influenced by positive environmental factors. Similarly, we may expect that individuals with high levels of trait self-control are less influenced by negative influences. If trait self-control influences momentary likelihood of exerting self-control because individuals with trait self-control are resilient against regulatory fatigue, we should expect regulatory exertion to be predicted by the interaction between trait levels of self-control and the experience of depleting events.

Regulatory accessibility. Just as little work has addressed how trait self-control plays out in terms of regulatory capacity, we do not know much about what behaviors are chronically accessible for individuals with high trait self-control. We do know that individuals with strong domain-related self-concepts are quicker to recognize domain-related words, evidence of increased domain accessibility (Markus, 1977). We also know that individuals with strong goals have more accessible goal-relevant schemas (Kawada, Oettingen, Gollwitzer, & Bargh,

2004). However, individuals with high trait self-control may not necessarily have a strong self-concept related to self-control. In fact, there is no reason to suspect that individuals are aware of whether or not they have high levels of self-control. Nonetheless, we might still expect individuals with good self-control to generate and select responses to temptations that reflect self-control just as those with high levels of externalizing behavior tend to exhibit increased accessibility of aggressive responses (Dodge & Crick, 1990).

Environmental Influences

Although much of what occurs around us is somewhat social in nature, some features of the environment may not involve interpersonal interaction. Although my husband may have purchased doughnuts, he may then leave them in the pantry and go to work. These doughnuts then become part of my environment, and they are a strong temptation that I will have to resist. Some elements of the environment can be avoided with good planning (e.g., purchasing fruits and vegetables instead of potato chips and ice cream for snacking) whereas others may not be avoided (e.g., you go to a restaurant for lunch intending to order a healthy soup, but they are out of low-calorie options).

Regulatory capacity. Various elements in the environment likely place demands on individuals' regulatory resources, leaving fewer available for later use. These include temptations, which although they elicit goal pursuit (Fishbach et. al., 2003), also require regulatory resources to avoid (Heatherton & Vohs, 2000). One way in which we may conserve regulatory resources rather than expend them on things we are exposed to on a routine basis is through the development of habits (Wood & Neal, 2007). However, habits, which are highly contextualized behaviors, may drain regulatory capacity when situational

constraints change (Baumeister et al., 1998; Wood, Tam, & Guerrero Witt, 2005). For instance, a runner who has a habit of running outside every morning may conserve resources because of his routine. His alarm clock goes off, and he gets up and runs. However, when features of his environment change, perhaps due to travel or weather, he may have to muster self-control to continue his exercise program.

Regulatory accessibility. Likewise, elements in the environment are likely to influence the accessibility of behaviors related to self-control. Broadly speaking, environmental factors clue us in to the types of behaviors we should perform (Aarts & Dijksterhuis, 2003). These clues come from a variety of senses, including scent (Holland, Hendriks, & Aarts, 2005). Evidence of these processes also exists in the goal literature, in which both temptations and means increase the accessibility of the goals associated with them (Fishbach et al., 2003; Shah & Kruglanski, 2003). Temptations and means may also increase the accessibility of behaviors related to self-control and the perception that events are goal-related (Fishbach et al., 2006; Fleeson & Cantor, 1995). When these goals increase in accessibility, so does motivated behavior directed at attaining them.

In addition to elements of the environment, one's general environment may also increase or decrease regulatory accessibility. Individuals report feeling like they have more self-control when they are approached for a study in the library or a classroom than when they are in a residential area (vanDellen, 2007). This is likely because certain environments are places where self-control is normative. The library and the gym, for instance, are places where people go to exert self-control. When individuals go to those places, they may be better able to exert self-control, even on tasks unrelated to the specific environment.

Although most of the work on goal pursuit illustrates positive influences by environmental factors, the likelihood individuals will exert self-control can probably be decreased by environmental factors. Being offered a tempting piece of chocolate cake, while it may elicit thoughts of goal-pursuit (Fishbach et al., 2003), may also increase the accessibility of impulsive behaviors. Research following this possibility has not yet been conducted, although it is particularly interesting. Individuals at a party, for instance, may be less likely to exert self-control simply because a party is a situation in which they expect to be impulsive and indulgent. This environmental influence on regulatory exertion may be compounded by the presence of social factors, such as friends at the party who are drinking alcohol.

The Current Studies

The SPECS framework suggests that self-control involves more than regulatory capacity. Not only must we consider other motivational influences, such as regulatory accessibility, but we must also consider that the source of these influences may be external to the individual facing a test of willpower. The SPECS model provides a framework for understanding that many sources of influence on the likelihood that individuals will exert self-control at any given point in time.

The purpose of the current studies is to test specific hypotheses generated by the SPECS model. The first goal of the studies is to test the assumption that social factors influence individuals' self-control. The second goal of the studies is to test whether regulatory accessibility explains this effect. Study 1 tested whether social factors influence individuals' self-control without manipulating regulatory capacity. Study 2 tested whether the

accessibility of regulatory behaviors account for these social influences on self-control. Study 3 replicated these findings using alternative operationalizations of social influence, accessibility, and self-control.

STUDY 1

The purpose of Study 1 was to test whether the extent to which individuals exert self-control can be influenced by social factors that do not require individuals to use self-control. Specifically, I tested whether increasing the salience of a significant other with good or bad self-control influenced individuals' regulatory exertion.

Method

Participants

Fifty-four participants were recruited from a community pool of individuals interested in participating in social science experiments for cash compensation. All participants were between the ages of 18 and 25 and either held or were pursuing an undergraduate degree.

Procedures

When participants arrived for the study, a female experimenter timed their persistence on a handgrip task. Next, participants completed a computerized writing task in which they thought of and answered questions about a friend they had in college. Participants were randomly assigned to write about a roommate, a friend with good self-control, or a friend with poor self-control (see Appendix A). In addition to answering questions about this person, participants were also asked to recall a specific interaction they shared with their friend. After the writing task, participants again completed the handgrip persistence task.

Results and Discussion

The primary dependent variable of interest was persistence on the handgrip task after the writing task. I used a repeated measures ANOVA to examine the effect of writing

condition on handgrip persistence. The results yielded a significant interaction between time and condition, $F(2, 51) = 3.08, p = .05$. As the means in Table 1 reveal, this effect was driven by decreased persistence at Time 2 among participants who wrote about a friend with bad self-control, $F(1, 51) = 6.10, p < .02$. The difference between participants who wrote about a friend with bad self-control compared to those who wrote about a friend with good self-control was also statistically significant, $F(1, 51) = 5.11, p < .03$. There was not a difference between those who wrote about a friend with good self-control and those who wrote about a roommate, $F(1, 51) = .06, p = .81$.

Table 1: Regulatory Exertion on the Handgrip Task in Study 1 by Time and Condition

	Good Self-Control	Bad Self-Control	Roommate
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
First Grip	37.33 (41.89)	44.39 (46.42)	30.67 (32.53)
Second Grip	44.83 (34.78)	27.72 (30.32)	35.56 (24.82)

The fact that participants who wrote about a friend with good self-control did not differ from those who wrote about a roommate suggests either that there is not a benefit to thinking of someone with good self-control or that the control task increased accessibility of self-control. Although negative self-knowledge is more likely to influence self-evaluation and self-regulation than positive self-knowledge (Showers, 1992; Woolfolk et al., 1995), there is no reason to suggest that negative information about others is more influential than positive information about others. In fact, in Shah's (2003) research, individuals' performance increased when they thought about significant others who positively evaluated a relevant goal. In this

study, the writing task for the control group may have prompted individuals to think about their roommates' level of self-control. In fact, many of the questions ask participants to write about their roommates' goals, which likely brought about recollections of times their roommates engaged in goal-related behaviors.

Nonetheless, these results provide evidence that contemplating others and their varying levels of trait self-control influences the likelihood that individuals will be able to exert self-control. Note that participants' capacity to exert self-control was reduced even when they themselves did not use regulatory resources. Regardless of the fact that no participant was asked to use regulatory resources during the course of the experiment, I found that individuals who had written about a friend with low self-control persisted less on the handgrip task, indicating that they had fewer regulatory resources available for use in self-control.

The traditional resource-depletion approach has focused on regulatory resources as an unknown, but potentially identifiable, set of resources that get spent, as cash, during activities that require self-control. But if we find parallel effects of limited self-control exertion even when individuals did not previously exert self-control themselves, we need to reconsider the pathways by which daily life influences the likelihood that individuals will exert self-control. Evidence from this study points to an alternative mechanism of influence. One specific mechanism may be increased (or decreased) regulatory accessibility. That is, thinking about a friend with good self-control may increase thoughts about self-control and behaviors related to self-control. Thinking about a friend with bad self-control may decrease the accessibility of these thoughts. In turn, this accessibility may influence the extent to which individuals exert self-control.

STUDY 2

The results from Study 1 suggest that individuals' capacity for self-control can be altered without the exertion of self-control. The purpose of Study 2 was to replicate findings from Study 1 and to examine accessibility as a pathway by which thinking about significant others influence capacity for self-control. I expected that thinking about significant others would influence the accessibility of regulatory behaviors, and that this accessibility, in turn, would predict performance on a task requiring self-control.

Because accessibility should influence the exertion of self-control, it may also influence the regulatory capacity of individuals after an opportunity to exert self-control. That is, individuals who have increased accessibility of regulatory behaviors should exert more self-control and should therefore experience a larger reduction in regulatory capacity for later demands than individuals for whom regulatory behaviors are not accessible. To measure this potential downstream consequence of increased regulatory accessibility, I evaluated performance on a secondary regulatory task as a function of both resource accessibility and resource capacity.

Method

Participants

A total of 112 participants were recruited through the Duke University Psychology undergraduate pool. This sample included 42 males and 70 females. Participation was limited to students for whom English was their first language.

Procedures

Participants arrived at the lab and completed a handgrip task using their nondominant

hand. Next, participants completed a writing task similar to the one used in Study 1. These prompts (presented in Appendix B) asked participants to write about one of three friends: a friend who is good at self-control, a friend who is bad at self-control, or a friend who is moderately extraverted. To correct for the possibility that Study 1 participants may have been thinking about the self-control of their roommates, the control condition in this task focused participants on a characteristic unlikely to bring to mind their friend's self-control.

After the writing task, participants completed a computer task designed to measure the accessibility of behaviors related to self-control. During this task, participants were asked to identify whether each of 60 words were verbs or nouns. All words presented in the task consisted of two or three syllables. Half of the presented verbs related to exerting self-control (e.g., *resist*, *abstain*). All nouns and neutral words were generated using an online random words generator. Verbs related to self-control were generated by using a thesaurus. See Appendix C for a complete list of words used in the task. After the accessibility task, participants completed the handgrip task again.

Finally, participants completed a Stroop task. This task, commonly used to measure inhibitory capacity (e.g., Muraven et al., 2006) involves reading the color of the ink with which words are printed. This task becomes difficult because the words printed are color words (e.g., *red*, *green*, *blue*) that do not correspond to the color of the ink with which they are printed. Greater inhibitory capacity is evidenced by individuals who suppress the distraction of the words' meaning and more quickly read the color of the words' ink.

Data Preparation

Missing data. Due to various technical difficulties, some participants were missing

data on some of the measures. Eleven participants' handgrip scores were dropped due to equipment difficulties with the handgrip. Due to an experimenter error, the number of mistakes made on the Stroop task was not recorded for seven participants. Finally, the computer program failed to record reaction time data for ten participants. This missing data is reflected in the various degrees of freedom used in analyses.

Stroop task. Performance on the Stroop task involves both speed and accuracy. In order to account for both facets of performance, I created an index score of performance. First, I calculated each participant's z -scores on speed and accuracy ($r = .22$). Then, I averaged these scores. This index served as my primary dependent measure of Stroop performance. Higher scores suggest that participants took longer on the task and made more mistakes, therefore, higher scores represent less regulatory exertion.

Regulatory accessibility. Because reaction time scores are typically positively skewed, I conducted a natural log transformation on the reaction time data. Following convention, I discarded any trials for which participants took less than 300 or more than 2000 milliseconds to respond (Fazio, 1990). I calculated three scores for each participant: their mean recognition time for nouns, general verbs, and self-control verbs.

Results and Discussion

Regulatory Exertion: Handgrip Task

I used a repeated measures ANOVA to examine the effect of writing condition on regulatory exertion on the handgrip task. The interaction between time and writing condition was not significant, $F(2, 96) = .86, p = .43$. Because the handgrip task requires physical exertion, something that may have been more important to men, I investigated the extent to

which sex may have moderated the influence of writing condition on regulatory exertion. These analyses did not yield a significant interaction between time, sex, and writing condition, $F(2, 96) = 1.87, p = .16$. However, the results from Study 1 suggest that the largest effects might be found when comparing participants who wrote about a friend with bad self-control to the other conditions. Focusing on this comparison revealed a marginally significant interaction between time, sex, and condition, $F(1,96) = 3.13, p < .10$. As the means in Table 2 show, males who wrote about a friend with bad self-control persisted for less time on the second handgrip task than did males in the other two writing conditions, $F(1, 96) = 3.88, p = .05$. This effect, however, was not significant for females, $F(1, 96) = 0.16, p > .35$. I also conducted focused contrast tests examining if

Table 2: Regulatory Exertion on the Handgrip Task in Study 2 by Time, Sex, and Condition

	Good Self-Control	Bad Self-Control	Moderately Extraverted
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
Males First Grip	95.33 (45.36)	143.92 (32.86)	104.85 (57.88)
Males Second Grip	86.42 (45.57)	104.77 (45.67)	87.69 (57.49)
Females First Grip	56.95 (36.26)	69.43 (53.45)	55.68 (43.32)
Females Second Grip	44.61 (27.00)	64.86 (55.63)	51.00 (46.52)

writing about a friend with bad self-control led to less persistence compared to writing about a friend with good self-control. This analysis was significant for males, $F(1, 96) = 4.19, p = .04$, but not for females, $F(1, 96) = 0.07, p = .80$. These results provide partial replication of the pattern in Study 1, where writing about a friend with bad self-control leads participants to demonstrate decreased regulatory exertion.

Regulatory Exertion: Stroop Task

I examined the influence of writing condition on the Stroop task using a 2 (Sex: Male, Female) x 3 (Writing Condition: Good Self-Control, Bad Self-Control, Extraversion) ANOVA. The results yielded a marginally significant effect of condition, $F(2, 108) = 2.46, p < .10$. As the pattern of means in Table 3 suggests, writing about a friend with bad self-control led to less regulatory exertion on the Stroop task compared to the other writing conditions, $F(1, 108) = 4.05, p < .05$. Because the pattern of means suggested that writing about a friend with good self-control also led to a benefit in regulatory exertion, I conducted a contrast test comparing those who wrote about a friend with good self-control to the other conditions. This analysis revealed a marginally significant main effect suggesting that writing about a friend with good self-control led to increased regulatory exertion compared to the other writing conditions, $F(1, 108) = 3.24, p < .10$. Finally,

Table 3: Regulatory Exertion on the Stroop Task in Study 2 by Condition

	Good Self-Control	Bad Self-Control	Moderately Extraverted
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
Stroop Performance	-0.16 (0.67)	0.20 (0.75)	0.00 (0.91)

participants who wrote about a friend with bad self-control performed worse on the Stroop task than did those who wrote about a friend with good self-control, $F(1,108) = 4.88, p < .03$. None of these analyses revealed significant interactions between sex and writing conditions, F 's $< 1.00, p$'s $> .30$.

Because the Stroop task followed the handgrip task, it was possible to examine both the extent to which regulatory accessibility and regulatory capacity influenced it. Participants

who exerted self-control on the handgrip by squeezing it for a long time may have become ego-depleted and suffered a decrease in regulatory capacity. A relationship between regulatory exertion on the handgrip task and regulatory exertion on the Stroop task would support this claim. Indeed, change in handgrip persistence from Time 1 to Time 2 marginally predicted performance on the Stroop, $F(1, 99) = 2.76, p < .10$. However, the effect of writing condition persisted after including change in persistence on the handgrip task in the model, $F(2, 97) = 3.36, p < .05$, and no two- or three-way interactions involving sex, condition, and persistence on the handgrip task emerged as significant, F 's $< 1.00, p$'s $> .30$. This strengthens the claim that these writing manipulations do not influence self-control through a process involving regulatory capacity.

These results provide evidence that the effects of writing about friends with varying levels of self-control appear across operationalizations of regulatory exertion. Further, the effects of regulatory accessibility persisted even after participants engaged in a task that might have interfered with the process by reducing participants' regulatory capacity. These results lend further support for the paths proposed by the SPECS framework, in which regulatory exertion is a function of both regulatory accessibility and regulatory capacity.

Regulatory Accessibility

To examine regulatory accessibility, I conducted a 2 (Sex: Female, Male) x 3 (Condition: Bad Self-Control, Good Self-Control, Extraversion) ANOVA on participants' reaction times to verbs related to self-control. Although writing condition did predict accessibility of verbs related to self-control, $F(2, 91) = 5.02, p < .05$, it did so in the opposite direction hypothesized. As the pattern of means in Table 4 shows, writing about a friend

with good self-control led to decreased accessibility of verbs related to self-control compared to the other two conditions combined, $F(1, 89) = 5.72, p < .05$. Given this unexpected pattern, I also examined the influence of writing condition on accessibility on the other targets in the computerized accessibility task. These analyses revealed that participants who wrote about a friend with good self-control demonstrated accessibility of both general verbs, $F_s > 3.38, p's < .05$, and nouns, $F_s > 2.73, p's < .07$.

Table 4: Regulatory Accessibility and Performance by Condition

	Good Self-Control	Bad Self-Control	Moderately Extraverted
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
Nouns	6.64 (0.11)	6.61 (0.11)	6.58 (0.15)
General Verbs	6.68 (0.14)	6.64 (0.12)	6.59 (0.15)
Self-Control Verbs	6.68 (0.14)	6.63 (0.13)	6.58 (0.15)
Correct Answers	163.73 (5.30)	161.85 (5.84)	161.43 (5.72)

This decreased accessibility may have been due to how vigilant participants were about performing the task correctly. Perhaps those participants who wrote about a friend with good self-control were concerned with not making errors. To examine this possibility, I calculated the mean number of correct responses made by each participant. As Table 4 shows, participants who wrote about a friend with good self-control made more correct responses (i.e., correctly identified nouns as nouns) than did participants in the other two conditions. The overall effect of writing condition showed a trend, $F(2, 98) = 2.09, p < .15$, and the contrast between those who wrote about a friend with good self-control and the other two conditions was significant, $F(1, 99) = 4.05, p < .05$. Although I did not see the predicted effects of decreased reaction times among those who wrote about a friend with

good self-control, these participants did make fewer errors on the task. Because participants who wrote about a friend with good self-control performed differently than participants in the other two conditions, this task may have measured regulatory exertion in addition to regulatory accessibility and exertion. This makes interpreting the meaning of the observed differences in reaction times difficult.

STUDY 3

Study 3 was designed to extend the findings of Study 2 by using alternate operationalizations to examine how salient others influence state self-control. Specifically, in Study 3, I drew from the social-cognitive models of transference and goal pursuit. Findings from these models suggest that individuals store information about others in memory (Anderson & Cole, 1990; Shah, 2003). Given that these significant-other representations are highly accessible in memory (Anderson, Glassman, Chen, & Cole, 1995), I expected priming individuals with the name of a significant other who was good at self-control would increase the likelihood that individuals would exert self-control. Similarly, I expected that priming individuals with the name of a significant other who is bad at self-control would decrease the extent to which individuals would exert self-control. As with Study 2, I expected that the influence of significant other primes should be mediated by the accessibility of cognitions about regulatory behaviors.

Method

Participants

A total of 66 participants (33 females, 33 males) were recruited from the Duke University psychology participant pool.

Procedures

Participants were recruited for a study on brainstorming. Upon arriving at the laboratory session, participants were asked to report the first names of several close significant others. These significant others included someone who was wealthy, someone who was thrifty, someone who was moderately extraverted, someone who was good at self-

control, and someone who was bad at self-control. The requests for significant others involving self-control used the prompts from Study 2. Participants were also asked to indicate how close they were to each significant other. Next, participants completed a filler task consisting of a battery of questionnaires. This task was designed to distract participants from the information that they provided about their significant others.

After the filler task, following the procedures used in Shah (2003), participants were told that the ability to recognize words quickly is related to brainstorming ability. Because of this, they completed a lexical decision task in which they were asked to indicate whether presented strings of letters were words or non-words. Prior to the presentation of each target, individuals were primed with either the name of a significant other or a string of Xs. Half of those primed with the name of a significant other were primed with the one they mentioned who was good at self-control and half were primed with the one they mentioned who was bad at self-control. These primes appeared for 10 ms each and were masked immediately afterwards with a series of asterisks.

After the lexical decision task, participants worked on the first “brainstorming” task. During this task, they were presented with four scenarios and were asked to come up with as many responses to the scenarios as possible. These scenarios (presented in Appendix D) presented a character and a problem. Two of these scenarios presented a problem that would require self-control to overcome (e.g., following a diet and staying in to study). Participants were given 90 seconds to list as many ways that the character might respond to the problem as they could.

After the scenario task, participants completed another “brainstorming” activity.

This activity consisted of the difficult version of the Remote Associations Test (RAT; McFarlin & Blascovich, 1984). On the RAT, participants see three words and are asked to come up with a fourth word that unites the three presented. For instance, a participant shown the words *chocolate*, *fortune*, and *tin* might come up with the word *cookie*. Participants were presented with fifteen RAT items (see Appendix E) in random order and were able to see only one item at a time. They were able to give up on items at any time, but were unable to return to any item once they had continued to the next item. The computer measured their persistence on each item, as well as their performance. Although no prior work has used the RAT as a measure of self-control, many studies have used the RAT to manipulate participants' perceptions that they are performing poorly on a test of reasoning ability. In a study examining the RAT as an experimental tool, participants were correctly able to solve an average of less than two of ten presented items from the RAT (McFarlin & Blascovich, 1984). Similar work on executive functioning measured participants' performance on logic problems from the GRE (Schmeichel et al., 2003). I used the RAT rather than such problems because of its potential to appear as a brainstorming task.

Data Preparation

RAT task. Several measures of performance on the RAT task were created. First, I calculated participants' overall persistence and performance on the 15 problems. Reasoning that performance requires both solving the problems and persisting on the problems, I created an index similar to the Stroop Index from Study 2 in which I calculated the z -scores for both performance and persistence ($r = .47$) and averaged them. Because participants' persistence on a given problem stopped when they supplied an answer, I also calculated their

mean persistence on the items they got correct and the items they got wrong. Additionally, I created two variables representing the least and most amount of time they spent on a single problem that they got correct and that they got wrong.

Stroop task. As in Study 2, I calculated an index of performance on the Stroop that accounted for both speed and accuracy ($r = .16$).

Regulatory accessibility. As part of the brainstorming cover story, participants were presented with various dilemmas and were asked to come up with ideas about how the individuals in these scenarios could behave. Of particular interest was the extent to which these answers reflected accessibility of behaviors related to self-control. Two scenarios were specifically designed to elicit behaviors that involve self-control, with one related to dieting and one related to studying. Four trained coders read the responses to these scenarios and evaluated each according to three dimensions. Coders counted the total number of responses demonstrating self-control and the total number of responses demonstrating impulsivity. In addition, they coded each participant's first response as either demonstrating self-control or not demonstrating self-control. First, the counts of behaviors related to self-control and impulsivity were transformed into z -scores. Scores involving impulsivity were reversed so that higher levels of impulsivity represented lower levels of self-control. Next, four indexes of regulatory accessibility were formed. These included accessibility of self-control on the dieting scenario, accessibility of self-control on the studying scenario, accessibility of self-control across both scenarios, and accessibility of impulsivity across both scenarios. An additional fifth variable was created by summing the total number of coders who had indicated that the participant's first response involved self-control. The range for

this variable was from 0 (no behaviors reflected self-control) to 8 (all behaviors across both scenarios reflected self-control).

Results and Discussion

Analyses on the major dependent variables were conducted using 2 (Sex: Female, Male) x 3 (Condition: Good Self-Control Prime, Bad Self-Control Prime, No prime) ANOVAs.

Regulatory Exertion: RAT Task

Priming condition significantly predicted the longest that participants worked on a problem in order to correctly solve it, $F(2, 45) = 3.29, p < .05$. Figure 2 shows the pattern of means across conditions in this analysis. Contrast tests revealed that this effect was carried

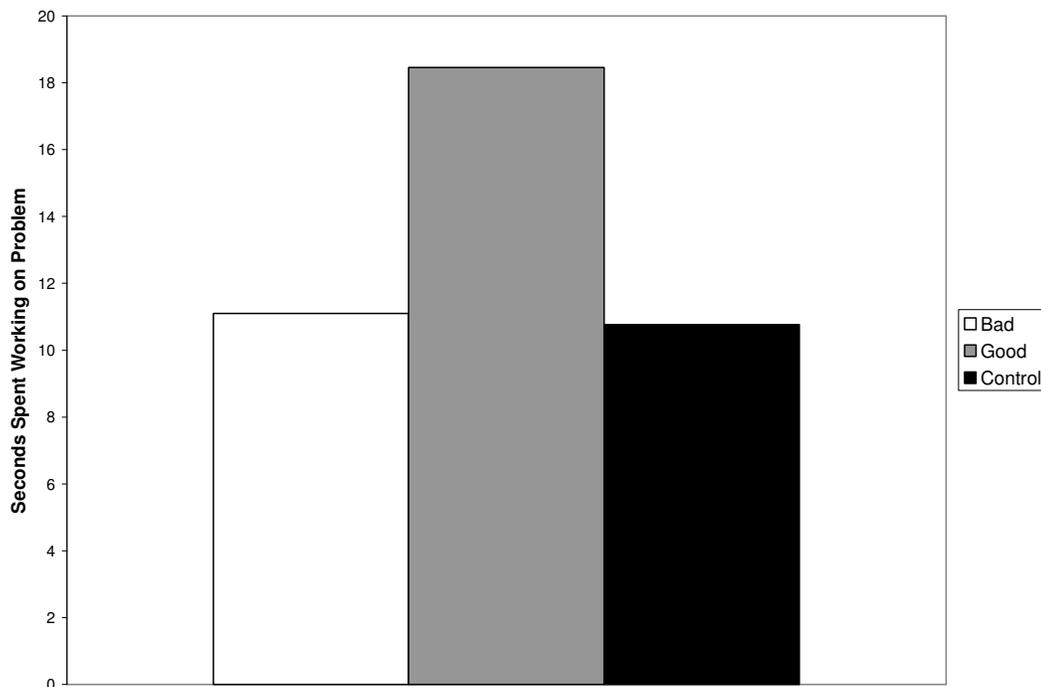


Figure 2: Longest Persistence on a Correctly Solved Problem by Condition

by increased persistence among those who had been primed with a friend who was good at self-control, $F(1,46) = 6.71, p = .01$. Priming condition also significantly predicted the average length of time participants spent working on problems in order to solve them, $F(3, 45) = 3.19, p < .05$. Figure 3 shows the pattern of means across condition in this analysis.

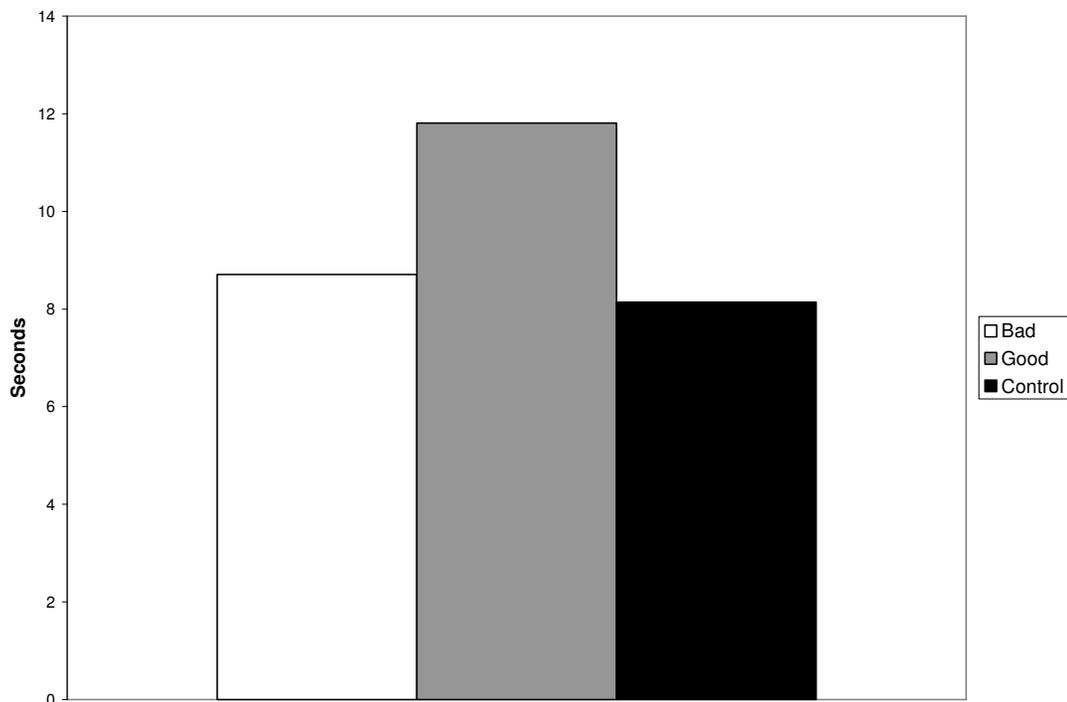


Figure 3: Average Persistence on Correctly Solved Problems by Condition

Again, this effect was carried by participants who were primed with a friend with good self-control, $F(1, 46) = 6.40, p < .02$. Analyses of the other dependent measures were not significant, but all patterns were consistent with the hypotheses, and reflected a general trend such that participants who were primed with a friend with good self-control demonstrated higher regulatory exertion. In several cases, these results were moderated by sex and condition interactions, which revealed the expected pattern among males but not

among females. The results of these analyses are presented in Appendix F.

Regulatory Exertion: Stroop Task

Regulatory exertion on the Stroop was not influenced by priming condition, $F(2,61) = 0.80, p = .45$. Further, none of the performance indices from the RAT task predicted regulatory exertion on the Stroop as either main effects or interactions with condition, $F_s < 1.00, p's > .30$.

Regulatory Accessibility

Writing condition did not significantly predict any of the coded measures of regulatory accessibility, all $F_s < 1.33, p_s > .27$. However, responses to the dieting scenario did predict several indices of performance on the RAT task. Participants who came up with more ways that John could respond with self-control and fewer ways that John could respond impulsively persisted longer on the RAT task, $F(1, 62) = 6.80, p = .01$, and performed better on the RAT index of performance and persistence, $F(1, 62) = 5.22, p < .03$. Because a significant interaction between sex and condition predicted performance on the RAT index (see Appendix F), I examined whether accessibility might mediate this effect. The results of this analysis are presented in Table 5. The only significant effects were the main effect of regulatory accessibility and the interaction between sex and condition.. Rather than suggesting mediation, the F value for the sex by condition interaction increased in size. This increase is likely a result of the reduced error term once regulatory accessibility was entered into the model.

Table 5: Regression of RAT Index on Sex, Condition, and Regulatory Accessibility

Predictor	Degrees of Freedom	F Value
Sex	1	0.12
Condition	2	0.62
Accessibilty	1	5.79*
Sex*Condition	2	3.18*
Sex*Accessibility	1	0.01

* $p = .05$

Several results suggest that regulatory accessibility, as it was measured in this study, did not mediate the relationship between priming condition and RAT performance. First, priming condition did not influence regulatory accessibility. Second, the relationship between priming condition and RAT performance did not decrease after regulatory accessibility was added into the model. Although the proposed mediational pathway did not emerge, these results do suggest that regulatory accessibility may be an interesting variable for future study. Despite the fact that accessibility was not influenced by priming condition, it did influence RAT performance in the expected direction. Participants with greater accessibility of regulatory schemas were more likely to persist on the RAT task.

GENERAL DISCUSSION

Together, findings from these studies tell an interesting story about self-control. This story carries two main messages. First, self-control is influenced by the salience of others who have notable levels of high or low self-control. Second, self-control is more than a function of previous regulatory efforts. Across three studies, I provide evidence that individuals' regulatory exertion is influenced by salient significant others. In two studies, this salience was manipulated by a writing task, in which participants wrote about a friend who was either good or bad at self-control. In a third study, salience was manipulated using subliminal priming, in which participants were primed with the names of friends they had previously indicated were good at, or bad at, self-control. These salient significant others influenced participants' physical persistence, inhibitory capacity, vigilance, and problem-solving performance. Further, I demonstrated that salient others both decrease regulatory exertion (Studies 1 and 2) and increase regulatory exertion (Studies 2 and 3).

As a group, these studies do provide evidence that social cognitions impact self-control. But the story is not as clear as the underlying message might imply; there were several inconsistencies among the results of the studies. At times, the effects worked equally well for men and women (e.g., the Stroop task in Study 2). At other times, the effects were stronger for men than for women (e.g., the handgrip task in Study 1), while at other times, women were unaffected by manipulations of social influence (e.g., the handgrip task in Study 2). Although these inconsistencies can be unsettling, they reflect the complicated nature of studying self-control. Behaviors that require self-control differ across individuals. When my husband and I go out to eat, he frequently, and easily, doesn't eat french fries. For him, there

are just better things on his plate. But for me, french fries are the ultimate temptation and resisting them takes a huge amount of effort. Similarly, the smell of cigarette smoke may require an ex-smoker to muster self-control, whereas for many others, the odor of cigarette smoke is repulsive. In the same way, some tasks may represent opportunities for some groups to exert self-control but not for others. The handgrip task, because it involves physical strength, may be a regulatory task for males but not females. Similarly, one might expect dieting to invoke self-control more among females than males.

In addition to the fact that activities may vary in the extent to which they require self-control, many other factors may also influence performance on these tasks. For example, physical strength influences persistence on the handgrip task. Participants who like word games may find problem-solving tasks, such as the RAT, more enjoyable, and spend longer on the problems. Likewise, experience with certain tasks may improve performance on them. Because these many factors may influence performance on measures of regulatory exertion, we might expect increased variability in effect sizes. Compared to the studies presented in this paper, studies that match participants with outcomes, such as studying dieter's reactions to food temptations, would likely yield larger effect sizes. Although I did not match participants with outcomes, I did incorporate several different measures of regulatory exertion across the studies. This should increase confidence that the findings are not related only to physical exertion, academic motivation, or inhibitory capacity. Future work on self-control might consider measuring the extent to which an outcome represents a regulatory variable for participants. Such measurements might take into account the value that individuals place on performance in that domain (Crocker, Moeller, & Burson, in press)

or the level of discrepancy between participants' actual selves and self-standards (vanDellen & Hoyle, in press).

An additional problem with general operationalizations of self-control is that the very measurements of good self-control may also represent bad self-control. Persistence at unsolvable tasks (e.g., Baumeister et al., 1998) is often considered a measure of self-control. Yet various perspectives on self-regulation and goal pursuit converge on the idea that individuals have a limited amount of effort they can use to pursue multiple goals (Carver, 2003; Muraven et al., 1998; Shah, 2005). Given that individuals likely have many other demands on their time, persisting on unsolvable problems is actually not efficient. This problem is most applicable to the RAT task used in Study 3. Although I attempted to minimize this problem by accounting for both performance and persistence, for some participants, conserving their time and energy for later use may have been an act of self-control (Muraven et al., 2006). Future research should examine how the meaning of a given task changes across individuals and situations. In particular, this research should identify how at one time, good self-control for one individual may be construed as bad self-control by another.

Although these studies suggest that thinking about others influences regulatory exertion, the reason for this influence is less clear. I hypothesized that one mechanism by which thinking about others might influence regulatory exertion is through accessibility of behaviors related to self-control. In Study 2, I attempted to measure accessibility using a lexical decision task. Rather than showing the expected pattern of increased accessibility, participants who had written about a friend with good self-control showed higher vigilance

and avoided making mistakes on this task, which led them to be slower overall at recognizing words. Because of this, I was unable to use this task to test the accessibility hypothesis. In Study 3, I measured accessibility using free responses to two scenarios. This measure allowed participants to come up with as many possible responses to a problem as they could in a short time span. Unfortunately, the cover story for the study stated that I was studying brainstorming. This led participants to come up with many behavioral responses in which the main character demonstrated self-control, as well as many options in which he did not. Perhaps I would have found accessibility effects if I had measured what participants thought the individuals in each scenario *should* do rather than what they *could* do.

Another possible explanation is that social factors influence regulatory exertion by increasing the accessibility of cognitions about outcomes rather than behaviors. Because exerting self-control involves a consideration of short and long-term benefits, as well as costs that might be incurred in order to achieve the long-term benefit, increasing or decreasing the accessibility of these benefits and costs might lead to increased regulatory exertion. Some evidence supports this notion that decreasing the accessibility of immediate rewards (short-term benefits) improves individuals' ability to exert self-control (Mischel & Baker, 1975; Mischel, Ebbesen & Ziesse, 1972). Likewise, thinking about the difficulty of tasks (the costs associated with exerting self-control) may decrease the amount of effort and energy invested in them (Wright & Brehm, 1984). In contrast, increasing the accessibility of long term benefits of self-regulation improves individuals' ability to exert self-control (vanDellen & Hoyle, in press). In this set of studies, the significant others may have represented general notions of regulatory success, and thinking about these successes and

failures may have influenced the accessibility of the long-term benefits of self-control, thereby increasing regulatory exertion.

In addition to examining mechanisms of influence on state self-control, the SPECS framework sets up several hypotheses about how self-control is influenced. So far, I have discussed social, personal, and environmental factors as independent and direct influences on self-control. Future research should examine the extent to which these factors interact with each other. As long as either social or environmental factors influence individuals to exert self-control, their likelihood of doing so may increase. In contrast, future research might find that social and environmental factors additively predict regulatory exertion. Additional research should examine how these sources of influence indirectly influence self-control. For example, an individual might find herself less likely to be exposed to negative environmental factors and more likely to be exposed to positive ones if she is in a social setting where self-control is encouraged. Similarly, one might expect personal influences, such as trait self-control, conscientiousness, self-monitoring, and efficacy, to influence exposure to social and environmental factors.

Although the SPECS model currently depicts regulatory capacity and regulatory accessibility as two pathways by state self-control is influenced, there are other pathways that should be considered, including motivational mechanisms. Interpersonal relationships are strongly linked with motivation (Shah, 2003), and social factors may increase regulatory motivation. Regulatory motivation may increase because individuals are thinking about an audience that might evaluate their behaviors (Baldwin, Carrell, & Lopez, 1987; Baldwin, & Holmes, 1987). If their salient audience expects them to exert self-control, they may be more

motivated to do so, whereas if their salient audience does not expect them to exert self-control, they might be less likely to exert self-control. This factor might be even more salient if the tasks requiring self-control have implications for social acceptance (Baumeister & Leary, 1995; vanDellen, Hoy, & Hoyle, 2008).

One mechanism that has been used to examine the impact of motivation on behavior is a time delay (Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trötschel, 2001). Rather than completing a goal-related task immediately, participants are asked to complete trivial filler tasks before the task. This time delay allows for motivation to increase, but any effect of accessibility that is purely cognitive to decrease. The current studies allow for a preliminary test of this hypothesis. In Study 2, assignment to writing condition influenced participants' performance on both the handgrip and the Stroop task. This finding suggests that the mechanism of influence is not purely motivational because participants' motivation to exert self-control was not satiated by the first test (Chartrand, 2005). However, had I manipulated the time of delay between writing condition and regulatory exertion, I might still have seen an increase in exertion among the delayed participants. Future research should use these strategies to continue to examine the ways in which cognitive and motivational processes work in tandem to influence regulatory exertion.

Each of these mechanisms in the SPECS framework involves processes that most likely occur automatically. Although individuals may at times become aware of them, individuals are not likely to recognize how many resources they have on hand or what sorts of thoughts are highly accessible. Because of the automatic nature of these processes, some may ask how much responsibility individuals should bear for their own behaviors. At the

extreme, one can imagine criminal cases in which the defense argues that defendants are not accountable for their behaviors because of their social and physical environment. In this framework, regulatory exertion is a controlled process, one in which individuals must engage in effortful management of their behavior (Baumeister et al., 1998). Rather than using these influences as excuses for their behaviors, individuals should learn how to recognize when they may be at risk for failures of self-control so that they can avoid pitfalls.

At the same time, these studies should challenge our notion that self-control is only an individual's struggle. People should be encouraged by the knowledge that their own regulatory behaviors can influence those of others around them. By exerting self-control, people can increase the likelihood that others around them will take note of this, and that they will in turn exert self-control. Likewise, when people consider whether they should exert self-control, they should be aware that failing to do so may not only cost them long-term benefits, but also that it might undermine the successes of those around them.

APPENDIX A: WRITING PROMPTS USED IN STUDY 1

Roommate Condition

Take a moment to think about a roommate you have had when you were in school. What is this person like? What is it like to interact with this person? The following questions deal with this person.

1. What is this person's first name (or nickname)? _____
2. Is the person a male or female? a. male b. female
3. How long have you know the person?
 - a. 0-1 years
 - b. 1-5 years
 - c. 5-10 years
 - d. more than 10 years
4. What is your current relationship with this person? (circle all that apply)
 - a. We're best friends.
 - b. We're roommates
 - c. We take classes together
 - d. We're acquaintances
 - e. We're in the same social group (club, fraternity, etc)
5. People pursue goals in a variety of domains. In which of the following does your roommate have a goal? (circle all that apply)
 - a. Studying
 - b. Getting to class
 - c. Not drinking/using drugs
 - d. Working out
 - e. Emotional Needs
 - f. Dating
 - g. Bad habits (watching too much TV, biting nails, etc)
 - h. Friendship
 - i. Family
 - j. Eating or Dieting
 - k. Other (please specify _____)
 - l. Other (please specify _____)
 - m. Other (please specify _____)

Now, think about a specific interaction that you had with your roommate.

6. What season of the year was it?
 - a. spring
 - b. summer
 - c. autumn
 - d. winter

7. What time of day was it?
a. morning b. afternoon c. evening

For the rest of the time, please describe this interaction with your roommate. What was going on? How does this interaction tell you something about your roommate? Had anything similar ever happened before? What led up to the interaction and what happened afterwards?

Bad Self-Control Condition

Take a moment to think about a person you know at school who is always in need of your help. It seems like this person can't get anything done without somebody's help, and frequently it's yours. What is this person like? What is it like to interact with this person? The following questions deal with this person.

1. What is this person's first name (or nickname)? _____
2. Is the person a male or female? a. male b. female
3. How long have you know the person?
 - a. 0-1 years b. 1-5 years c. 5-10 years d. more than 10 years
4. How close are you to this person? (circle all that apply)
 - a. We're best friends
 - b. We're roommates
 - c. We take classes together
 - d. We're acquaintances
 - e. We're in the same social group (club, fraternity, etc)
5. Which of the following things have you helped your friend with? (circle all that apply)
 - a. Studying
 - b. Getting to class
 - c. Not drinking/using drugs
 - d. Working out
 - e. Emotional Needs
 - f. Dating
 - g. Bad habits (watching too much TV, biting nails, etc)
 - h. Friendship
 - i. Family
 - j. Eating or Dieting
 - k. Other (please specify _____)
 - l. Other (please specify _____)
 - m. Other (please specify _____)

Now, think about a specific time that you had to help your friend. This should be a time where it was really pretty inconvenient for you to help, but you did anyway.

6. What season of the year was it?
a. spring b. summer c. autumn d. winter

7. What time of day was it?
a. morning b. afternoon c. evening

For the rest of the time, please describe the instance in which you had to help your friend out. Write about what your friend needed and what you did to help. Was your help related to a goal that your friend had? Why do you think he/she needed your help? Did he/she accomplish the goal you helped with? What did it cost you to help?

Good Self-Control Condition

Take a moment to think about a person you know at school who is always ready to help you out. Even though you might be able to get something done on your own, this friend is always eager to help you out, and you're more effective because of them. It seems like everything gets done better when this friend lends a hand. What is this person like? What is it like to interact with this person? The following questions deal with this person.

1. What is this person's first name (or nickname)? _____
2. Is the person a male or female? a. male b. female
3. How long have you know the person?
a. 0-1 years b. 1-5 years c. 5-10 years d. more than 10 years
4. How close are you to this person? (circle all that apply)
 - a. We're best friends
 - b. We're roommates
 - c. We take classes together
 - d. We're acquaintances
 - e. We're in the same social group (club, fraternity, etc)
5. Which of the following things has your friend helped you with? (circle all that apply)
 - a. Studying
 - b. Getting to class
 - c. Not drinking/using drugs
 - d. Working out
 - e. Emotional Needs

- f. Dating
- g. Bad habits (watching too much TV, biting nails, etc)
- h. Friendship
- i. Family
- j. Eating or Dieting
- k. Other (please specify _____)
- l. Other (please specify _____)
- m. Other (please specify _____)

Now, think about a specific time that your friend helped you out. This should be a time where it might have been inconvenient for them, but they helped you anyways.

6. What season of the year was it?
a. spring b. summer c. autumn d. winter

7. What time of day was it?
a. morning b. afternoon c. evening

For the rest of the time, please describe the instance in which your friend helped you out. Write about what your friend needed and what you did to help. Was your help related to a goal that your friend had? Why do you think he/she needed your help? Did he/she accomplish the goal you helped with? What did it cost your friend to help you?

APPENDIX B: WRITING PROMPTS USED IN STUDY 2

Good Self-Control Condition

Take a moment to think about a person you know from college who has really good self-control. This person should be someone who is really motivated and works hard to meet his/her goals. This person should also be really good at resisting temptations. What is this person like? The following questions deal with this person.

1. What is this person's first name (or nickname)? _____
2. Is the person a male or female? a. male b. female
3. How long have you know the person?
 - a. 0-1 years
 - b. 1-5 years
 - c. 5-10 years
 - d. more than 10 years
4. How close are you to this person? (circle all that apply)
 - a. We're best friends
 - b. We're roommates
 - c. We take classes together
 - d. We're acquaintances
 - e. We're in the same social group (club, fraternity, etc)
5. What sorts of goals have you seen this person pursue (for example, working to get a certain grade in a difficult class, losing weight, quitting a bad habit, etc)? Please list four different goals this person has pursued.
6. What did this person do (or not do) to be successful at meeting these goals?
7. What sorts of temptations have you seen this person be able to resist? How does this person generally resist distractions such as these?

Bad Self-Control Condition

Take a moment to think about a person you know from college who has really bad self-control. This person should be someone who is not particularly motivated and doesn't work hard to meet goals. This person should also be someone who is really bad at resisting temptations. What is this person like? The following questions deal with this person.

1. What is this person's first name (or nickname)? _____
2. Is the person a male or female? a. male b. female

3. How long have you know the person?

- a. 0-1 years b. 1-5 years c. 5-10 years d. more than 10 years

4. How close are you to this person? (circle all that apply)

- a. We're best friends
b. We're roommates
c. We take classes together
d. We're acquaintances
e. We're in the same social group (club, fraternity, etc)

5. What sorts of goals have you seen this person unable to meet (for example, working to get a certain grade in a difficult class, losing weight, quitting a bad habit, etc)? Please list four different goals this person has not been able to attain.

6. What did this person do (or not do) that kept him/her from meeting these goals?

7. What sorts of temptations have been difficult for this person to resist? How does this person generally respond to temptations such as these?

Extraversion Condition

Take a moment to think about a person you know from college who is moderately extraverted. This person should be neither really shy nor really outgoing. This person should also be someone who likes to talk, but isn't the center of the party. What is this person like? The following questions deal with this person.

1. What is this person's first name (or nickname)? _____

2. Is the person a male or female? a. male b. female

3. How long have you know the person?

- a. 0-1 years b. 1-5 years c. 5-10 years d. more than 10 years

4. How close are you to this person? (circle all that apply)

- a. We're best friends
b. We're roommates
c. We take classes together
d. We're acquaintances
e. We're in the same social group (club, fraternity, etc)

5. How does this person act in large groups? What sorts of things might he/she do at a party? Please list four different things this person might do at a large social gathering.

6. What does this person do in order to get to know other people?

7. What sorts of conversations have you had with this person? How does this person generally start conversations?

APPENDIX C: ACCESSIBILITY TASK WORDS FOR STUDY 2

Nouns

Hobby
Cotton
Vinyl
Stranger
Alarm
Panel
Water
Brother
Teacher
Wizard
Content
Shadow
Servant
Entrance

Island
Sequel
Curtain
Friction
Package
Mayor
Values
Blanket
Member
Sandwich
Extension
Description
Medicine
Perspective
Occasion
Warranty

Verbs

Neutral:

Edit
Assign
Debug
Create
Convey
Respond
Attach

Repeat
Install
Transmit
Relax
Situating
Emulate
Verify
Interpret

Self-Control:

Control
Behave
Resist
Persist
Abstain
Withstand
Refuse

Succeed
Avoid
Endure
Prevent
Waited
Continue
Persevere
Hesitate

APPENDIX D: SCENARIOS TO MEASURE REGULATORY

ACCESSIBILITY IN STUDY 3

Scenario 1:

On his way to a party, John is thinking about his diet. He is really hungry and is relieved to remember that his friends are ordering sub sandwiches to serve at the party. Once he gets to the party, he finds out that his friend hasn't ordered the sandwiches yet. His friend offers him some brownies.

What could John do?

Scenario 2:

Katie has a big exam tomorrow. Several of her friends have been trying to get her to go out to celebrate a friend's birthday. Katie thinks she should stay in to study.

What could Katie do?

Scenario 3:

Michael has been playing soccer with his friends. While he's playing, he sprains his ankle. He's worried about how he's going to get around school the next day.

What could Michael do?

Scenario 4:

Sarah was running late to class last week and parked on campus without a parking permit. When she arrived at her car after class, she had gotten a parking ticket. She needs to come up with a way to make \$60.

What could Sarah do?

**APPENDIX E: REMOTE ASSOCIATION TEST ITEMS USED TO
MEASURE REGULATORY EXERTION IN STUDY 3**

Puzzle (Answer)

Bass-Complex-Sleep (Deep)

Chamber- Staff- Box (Music)

Desert- Ice-Spell (Dry)

Base-Show-Dance (Ball)

Inch-Deal-Peg (Square)

Soap-Shoe-Tissue (Box)

Blood-Music-Cheese (Blue)

Skunk-Kings-Boiled (Cabbage)

Jump-Kill-Bliss (Joy)

Shopping-Washer-Picture (Window)

Hot-Butterflies-Pump (Stomach)

Bald-Screech-Emblem (Eagle)

Room-Saturday-Salts (Bath)

Widow-Bite-Monkey (Spider)

Cherry-Time-Smell (Blossom)

**APPENDIX F: ADDITIONAL ANALYSES ON RAT PERFORMANCE IN
STUDY 3**

Outcome	Sex	Condition	Sex * Condition
Total Time	0.61	1.28	1.69
Total Correct	0.30	0.24	1.89
Overall RAT Index	0.60	0.76	2.41*
Longest Wrong	0.05	1.81	0.13
Shortest Wrong	3.08*	0.81	2.79*
Average Wrong	0.34	1.26	2.68*
Average Give-Up	0.66	.023	1.68
Longest Right	0.01	3.29**	1.33
Shortest Right	0.18	1.64	.24
Average Right	0.09	3.19**	0.81

Numbers in each column represent *F* values.

* $p < .10$

** $p < .05$

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BIOGRAPHY

Michelle Renee vanDellen (nee Sherrill) was born on September 9th, 1980 in Landstuhl, Germany. She received a B.S. in Psychology from Asbury College in May, 2002 and an M.S. in Experimental Psychology from the University of Kentucky in August, 2004.

With Kenneth Dodge, she has coauthored two chapters, “Deviant peer group effects in youth mental health interventions”, appearing in *Deviant Peer Influences in Programs for Youth*, and “The interaction of nature and nurture in antisocial behavior”, appearing in *The Cambridge Handbook of Violent Behavior*. With Rick Hoyle, she has coauthored two articles entitled “Possible selves as behavioral standards in self-regulation” and “Future orientation in the self-system: Possible selves, self-regulation and behavior”. She has authored encyclopedia entries in the International Encyclopedia for the Social Sciences titled “Self-Control”, “Self-discrepancy theory,” “Ought self,” “Self-guides,” and “Self-Schemata.”

During her graduate career, Michelle received a PARISS fellowship, the Daniel Reedy Fellowship, a Kentucky Opportunity Fellowship, and a student travel award from the American Psychological Association. She is currently a member of the Society for Personality and Social Psychology, The International Society of Self and Identity, and The Society for the Study of Motivation.