The Importance of Framing: Maintaining Self-Control through Motivation

A Thesis in Psychology

by

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Abstract

Self-control is defined as overriding behaviors, emotions, and desires that interfere with an individual's current goals (Muraven, Shmueli & Burkley, 2006). There is a large body of literature that demonstrates that self-control resources are reduced after completing one or more self-control demanding acts (a phenomenon known as ego depletion; Beedie & Lane, 2011). Although most studies have attributed the observed ego depletion effects to the claim that self-control is a limited resource (Muraven, Tice & Baumeister, 1998), recent research raises questions about the nature of self-control (Beedie & Lane, 2011; Job, Dweck & Walton, 2010). Instead, there is reason to believe that the observed depletion effects might really be a reflection of a shift in motivation, as described by the Process Model of Self-Control (Inzlicht & Schmeichel, 2012). This study explores whether motivation introduced before the *first* depleting task will also prevent a reduction in performance on a second task, possibly by reducing self-licensing effects, using a two-by-two between-participants design. After a motivation manipulation in which participants were told that the first task is very important for understanding the cognitive processes behind Alzheimer's disease, they completed a Stroop test and an anagram task, both requiring self-control. A significant main-effect of motivation indicated that participants that were motivated on the first task persisted longer on the second task. The Stroop main effect and the motivation-Stroop interaction were not significant. In support of the process model, the results indicate that the framing of a task as important predicts the ability of individuals to continue exhibiting self-control without ego-depletion effects. The impact of framing was not limited to self-control performance on the first task but

also impacted persistence on the second, unrelated task. Findings from this study shed light onto the nature of self-control and the role of motivation.

Table of Contents

The Importance of Framing: Maintaining Self-Control through Motivation

Because the amount of energy that a body has available to expend at any given time is limited, humans are equipped to save as much energy as possible without sacrificing long-term goal pursuit. In order to maximize desirable behavioral outcomes while minimizing energy used, humans' cognitive functioning occurs through both automatic and controlled processes.

Automatic processes are defined as happening outside of awareness; they are involuntary, unintentional, and effortless (Bargh, 1994). Automatic processes occur without conscious intention, and habits and the situational cues that activate automatic processes relieve individuals from having to think through options and make decisions, which may require conscious thought (Bargh & Chartrand, 1999). For example, beginners use a lot of conscious thought when learning to drive. However, with practice, switching gears, turning on the blinker, and looking in the mirror before changing lanes all become automatic. This is true of other skills too, like playing an instrument or writing in cursive. However, non-skilled behaviors can also become automatic through repeated association of two ideas or a behavior with a particular context (Bargh & Chatrand, 1999). For example, a person may be in the habit of checking her mailbox before entering her house and walk over to the mailbox without thinking upon arriving at home. Many people have reported arriving at a destination without remembering the drive, or walking into a room without remembering their reason for doing so. These are examples of non-skilled behaviors that often happen automatically due to habits, and practiced or repeated behaviors.

Controlled processes, on the other hand, are defined as conscious, under intentional control, and effortful, and individuals are aware of their occurrence (Bargh, 1992). One situation in which controlled processes occur is when individuals put forth conscious effort to alter the course on which automatic processes are taking them. These processes are very important because they enable people to resist behaviors that stand in the way of their long-term goals and pursue difficult behaviors that bring them closer to their goals. For example, individuals who are dieting will have to use controlled processes to resist automatic urges to eat chocolate cake for the sake of their long-term goal of losing weight.

Automatic processes do not require as much energy as controlled processes, just as going downhill requires some energy but not nearly as much as going uphill (Muraven & Baumeister, 2000). Because humans must conserve energy, most behavior is automatic. At the same time, humans are relatively distinct for their ability to reflect on the future and pursue their long-term goals, so the self actively participates to control behavior to keep people in line with their goals (Muraven & Baumeister, 2000). The need to both conserve energy and improve overall quality of life through goal pursuit requires a balancing act between automatic and controlled behaviors.

Self-Control

The ability to override automatic impulses, behaviors or urges in the present in order to pursue long-term goals in the future is one way to define self-control, a phenomenon that clearly builds on our understanding of both automatic and controlled processes (Bargh, 1994; Muraven & Baumeister, 2000). In fact, the ability of human

beings to act on our environment is one variable that distinguishes us from other species, which mostly remain in the automatic process domain (Carver & Scheier, 1981; Wegner & Pennebaker, 1993). The unique ability of humans to regulate behavior is analogous to an actress changing her lines during a performance instead of following her script. Automatic processes would be like following the script, which does not require active participation of the self. However, humans can revise the script through a conscious, intentional act of self-regulation, or self-control.

An individual's ability to self-regulate has major implications for many areas of life. Compared to people with low levels of self-control, those who have high levels of self-control have superior academic performance (Duckworth & Seligman, 2005), have better interpersonal relationships (Finkel & Campbell, 2001), are more able to cope with stress (Shoda, Mischel & Peake, 1990), and have better eating habits (Kahan, Polivy & Herman, 2003). A lack of self-control, on the other hand, is associated with criminal behavior (Gottfredson & Hirschi, 1990) and therefore has personal and societal repercussions (Baumeister, 1998; Funder & Block 1989; Martin & Tesser, 1989). Participants with low levels of self-control behave more aggressively upon provocation than participants with high self-control (DeWall, Baumeister, Stillman & Galliot, 2007), are more prone to depression (Pyszczynski, Holt & Greenberg, 1987), and struggle more with obsessive and ruminating thoughts (Martin & Tesser, 1989). Clearly, self-control is vital for achieving successful outcomes. Identifying ways to improve self-control performance and understanding the process behind successes and failures of self-control

is therefore very important to understanding human behavior, as well as to social psychological theory and application.

Early research on self-control noted the strong relationship between self-control and goal setting. For example, in their feedback loop model of self-regulation, Carver and Scheier (1981, 1982) identified three main variables for understanding the self-control process: standards or goals, the comparison of actual state to the standards, and the operate phase, where individuals recognize that their actual state falls short of the desired state. In other words, they identified that the reason self-control is important is because individuals have desired states that do not match their actual states and they need to set goals where they use conscious and intentional self-control to adhere to behaviors that bring them closer to their goals.

Bandura (1991) agreed with Carver and Scheier (1981, 1982) and argued that feedback about people's progress compared to their goals will guide their self-regulation behavior. He noted that variation in personal goal-setting and motivation result in differences in self-regulation success and goal achievement. Particularly, he focused on the role that self-efficacy, or the belief in one's ability to exercise control, played in one's choices, aspirations, level of perseverance and effort, and as a result, self-regulation. Individuals with high self-efficacy attribute their failure to achieve a goal to insufficient effort; they believe that they have the ability to accomplish the goal, but they simply weren't working hard enough to make it happen. As a result, these individuals will put forth more effort to achieve their goals as they continue to pursue them, thereby successfully engaging in self-control. Those with low self-efficacy tend to attribute

failures to insufficient ability, resulting in less effort and less self-control. Bandura contributed to the body of literature on self-control by demonstrating the important role that self-efficacy plays in the self-regulation process.

Other work framed self-control as the ability to delay gratification. A well-known study by Mischel, Ebbesen and Raskoff Zeiss (1972) had children chose between receiving immediate gratification, one marshmallow, or delayed but desired gratification, two marshmallows. The value of the ability to delay the need for gratification was evident from the beginning, and researchers attempted to see which factors are related to this ability. For example, in a longitudinal study, children who were able to delay their gratification were described as more intelligent, focused, cooperative, and attentive, while those who were not able to delay their gratification were described as irritable, whiny, easily offended and more fidgety (Funder, Block, & Block, 1983). Clearly, the ability to regulate the self by delaying gratification produced appealing personality and behavioral outcomes.

To explain individual variation in the ability to delay gratification, Mischel (1996) proposed reviving the idea of willpower, which then sparked much of the more recent work on self-control. In general, this work assumed that a large amount of human behavior is a result of active thought and is consciously controlled by individuals (Corr, 2010). This would mean that if people wanted to change their current state, they had to set a goal that high levels of self-control would then allow them to achieve; they could do so by consciously and constantly choosing goal-consistent behaviors and overriding automatic impulses that would deter them from the goal pursuit path. Because of the

assumption of constant consciousness of people, individual differences in self-control were studied extensively. As a result, identifying the mechanism behind moment-to-moment self-control patterns was not at the forefront of this research. However, with the growing understanding that many of our most important cognitive processes, including those involved in goal pursuit, can occur unconsciously (see Bargh & Chartrand, 1999, for a review), researchers also realized that there could be environmental influences and processes outside of conscious awareness that affected people's seemingly deliberate behaviors. In other words, not all self-control processes have to be a result of deliberate choices and clear conscious rationales (Bargh & Ferguson, 2000). After establishing that an individual can exert intentional and controlled effort only minimally, researchers who were studying self-control began framing their questions differently (e.g., Baumeister, Bratslavsky, Muraven & Tice, 1998).

After a classic study by Baumeister (1998), interest in the nature of self-control increased. Initially, evidence seemed to point to the idea that self-control has a limited nature, where after first exerting self-control, performance declined in subsequent attempts. This is known as the strength model of self-control. This paper will review evidence for the strength model, research that cannot be explained by the strength model, a new model of the nature of self-control and the contributions of the present study to the understanding of self-control.

The Strength Model of Self-Control

Baumeister and his colleagues proposed that at any given moment, use of self-control draws on a limited resource (for a review, see Muraven & Baumeister, 2000). Just

as conscious cognitive processes cannot be utilized in all situations, self-control, as a conscious process, can only be utilized in short bursts before that resource is exhausted. If this is true, then self-control is in limited supply, so initial exertion will lead to depletion of self-control. In other words, exhibiting self-control on one task reduces the supply of self-control strength that will be available for future tasks requiring self-control. As a result, performance on subsequent tasks that require self-control will decrease after initial exertion of this limited resource (Baumeister, Vohs & Tice, 2007; Muraven & Baumeister, 2000). This phenomenon is known as ego-depletion. It could occur because the body is trying to conserve a valuable resource for a more pressing time, or it could occur because there is literally less of a resource available. Regardless, Baumeister's initial theory about self-control was that it relied on a limited resource, with exertion resulting in ego-depletion.

Muraven, Tice, and Baumeister (1998) conducted a classic study that explored this strength model of self-control. They used a two-task paradigm: the first task was a manipulation depleting half of the participants by engaging them in a task that required self-control and not depleting the other half by engaging them in a task that did not require self-control. Performance on a second task then served as a measure of self-control. In studies that test the strength model, self-control is defined as having to overcome an automatic urge. So in the Muraven et al. study, participants sat at a table with freshly baked chocolate chip cookies and radishes on it. Some of the participants were allowed to eat the cookies, as they probably wanted to do. Others were told that they could only eat the radishes. Not eating the freshly-baked cookies is an act of self-control

for most people; they have to overcome the automatic desire to eat the cookies and instead eat the radishes. After this task, participants were presented with several unsolvable problems and told that they could spend as much time working on this task as they wanted. The amount of time spent on this task was a measure of self-control because it required the participant to override the impulse to give up. Persistence measures are often used as measures of self-control performance (Baumeister et al., 1998). Participants who were only allowed to eat radishes, and thereby had to exhibit self-control on the first task, persisted less on the problem-solving task than participants who were allowed to eat cookies. In other words, using self-control on the first task by resisting the cookies led to less successful self-control on the second task. This effect was not mediated by the mood of the participants. Decreased performance cannot be the reason for depletion. The authors argued that these findings support the idea that self-control is a limited resource; it can be depleted through use, and then is unavailable for subsequent tasks.

Many replications of the ego-depletion phenomenon have been observed, and almost all have used this two-task paradigm. Muraven et al. (1998) found that participants who engaged in a variety of depleting tasks performed worse on future tasks requiring self-control than participants who were not depleted. For example, participants who were depleted by regulating their affect performed worse on a subsequent muscular endurance task. Participants who suppressed their thoughts were less able to persist on a frustrating anagram task and were less able to control their facial expressions while watching an entertaining video. These findings clearly demonstrate the prevalence of

ego-depletion, and that ego depletion results from a variety of tasks, all of which have in common that they require self-control.

Many more examples of ego depletion have been observed empirically as well. Participants who had to suppress their emotions while watching a film performed worse on an anagram task (Baumeister et al., 1998), persisted less on a test of handgrip stamina (Muraven et al., 1998), snacked more in a subsequent task (Vohs & Heatherton, 2000) and had lowered performance on the Stroop Task (Friese, Binder, Luechinger, Boesiger & Rasch, 2013) than participants who were allowed to watch the film without suppressing their emotions. Participants who had to suppress thoughts about a white bear persisted less on an anagram task (Muraven et al., 1998). Suppressing a forbidden thought also resulted in less ability to stifle laughter in a subsequent task (Baumeister et al., 1998). Deciding between choices about which speech to give depleted participants and resulted in less persistence on a subsequent difficult task than those who did not have to make that decision (Baumeister et al., 1998). Completing the Stroop Task resulted in less persistence on a figure-tracing task (Wallace & Baumeister, 2002). Participants depleted by taking multiple exams engaged in their habitual eating habits more than those who were not depleted (Neal, Wood, & Drolet, 2013). Evidence suggests that alcoholics trying to quit drinking tend to struggle regulating their moods, thoughts and attention more than individuals not trying to break those habits because resisting the temptation already consumes most of their limited self-control (Ludwig & Stark, 1974). It seems like a large variety of tasks that require self-regulation all seem to draw upon the same resource, as performing one of these tasks depletes the participants from performing as

well on a subsequent task, even though it is a different task. Again and again, researchers have been able to demonstrate the depleting effects of exhibiting self-control.

Baumeister et al. (2007) expanded the strength model by comparing self-control to a muscle. Repeated use of the muscle without rest causes muscle fatigue, which decreases performance (i.e., ego depletion). The other side of this analogy is that the muscle can be strengthened with practice. Muraven, Baumeister and Tice (1999) tested whether practicing exhibiting self-control would lead to increased capacity for exhibiting self-control in the future. They had college students spend two weeks doing self-control exercises. Afterwards, the students performed three tasks requiring self-control. Individuals who practiced self-control were less vulnerable to ego depletion effects than those who did not practice self-control. Muraven (2010) found similar results after controlling for possible potential mediating variables, like self-efficacy and confidence, that come from practicing self-control. The results of these studies fit with the tenets of the strength model because the symbolic muscle of self-control can be strengthened with practice, just as it can be depleted with exertion.

Clearly, many studies have demonstrated ego-depletion in seemingly unrelated acts of self-control. Repeatedly, participants are less successful at using self-control after they have already exerted self-control on a previous task, regardless of mood. Additionally, practicing self-control strengthens the "self-control muscle." On the other hand, a number of recent studies cast doubts on the ability of the strength model to account for all of the findings about self-control. The following section will take a closer

look at opposing evidence and review a newer model that might more successfully explain all of the existing research on self-control.

Findings that are Inconsistent with the Strength Model

If the strength model of self-control is true, then ego-depletion effects should follow whenever people engage in a task that requires self-control. However, the following review shows that knowledge of the demands of future tasks, motivation, perceptions of depletion and beliefs about the nature of willpower are all variables that eliminate ego-depletion effects.

With any limited resource, individuals must make decisions about how to ration this resource. The same is true of self-control: given its limited nature, individuals are motivated to conserve any remaining self-control strength after exerting it in the event that they will need it later. These decisions probably happen unconsciously, but this conservation has been demonstrated empirically. For example, in one study, participants who were told that they would have to participate in a future task requiring self-control displayed symptoms of conservation (Muraven, Shmueli, & Burkley, 2006). Participants were given three self-control tasks. After the first task, some of the participants were told that the third task would require self-control. Participants who exerted self-control in the first task and expected to exert self control in the third task performed more poorly on the second task than the other participants, suggesting that after being depleted, participants were compelled to ration their self-control on the second task so that they could use it on the third task. Importantly, the participants in this condition then performed just as well on the third task as the control group; their conservation strategy was successful. Those

who were initially depleted but did not expect another task requiring self-control did the most poorly out of all of the participants. At first glance, this study may look like evidence in favor of the strength model, as it shows that people are motivated to conserve their limited self-control abilities to stop them from being completely exhausted. However, if self-control were truly a limited resource, knowing about a future task (the third task, in this case) and whether it requires self-control or not, should not be able to replenish a resource that has already been physically depleted. The ability of foreknowledge of a future task to eliminate the depleting effects of self-control behaviors raises a question about whether self-control is truly limited.

Muraven and Slessareva (2003) tested whether motivation might be another variable that eliminates self-control depletion effects. After completing a first task that required self-control, participants were provided with motivation to do well on a second task (e.g., money). Participants who were depleted and motivated to do well persisted just as long on a second demanding task as those in the control group, who were not depleted. The participants who were depleted but not motivated persisted the least, which is the typical self-control depletion effect. In other words, motivation to do well on the second demanding task eliminated the ego depletion effect. If self-control is a limited resource, then motivation should not matter because there is literally less of the limited resource available.

Expectations about self-control depletion also matter. Clarkson, Hirt, Jia, and Alexander (2010) wanted to see if *perceptions* of depletion had an effect on self-control performance independent of actual depletion. First, participants completed a task that

either was highly depleting or slightly depleting. Afterwards, participants were given feedback about their depleted states. Half of them were told that the task they just completed left them mentally exhausted, or depleted, and the other half were told that the task replenished them mentally. Then they proceeded to a second self-control task. The results showed that the perception of ego-depletion better predicted self-control performance than actual depletion. Participants who were highly depleted persisted longer on the second task if they were told that they were highly depleted. These participants had an explanation for their depletion (i.e., the first task), so the carryover effects of that task simply weren't relevant to the subsequent task; in other words, they used the feedback to explain their state and then were able to move on to perform well on the second task. If participants were told that they were replenished but they were actually highly depleted, they persisted less than those who were told that they were depleted. On the other hand, participants who were only slightly depleted performed well on the second task if they were told that they were replenished on the first task, while those who were told that they were depleted performed worse. This pattern of findings cannot be possible if self-control relies on a limited resource. Individuals who were highly depleted should not have performed well on the second task after simply being told that they were depleted. Understanding one's state does not make more of a limited resource become available. The overpowering effects of perception and explaining one's state over actual depletion calls into question the limited nature of self-control strength.

Similarly, Job, Dweck, and Walton (2010) found that people's beliefs about the nature of willpower, specifically whether it is a limited or unlimited resource, moderated

depletion effects. In other words, individuals who do not believe that self-control is a limited resource do not experience the depleting effects that the strength model predicts: They do not show diminished performance on a second task after completing a first task that requires self-control. If a resource is truly limited, then believing that it is actually unlimited would not make the limited resource suddenly unlimited.

What all of these studies have in common is that they reveal a moderating variable that eliminates the depleting effects of self-control exertion on subsequent self-control. In other words, the commonly observed finding where self-control performance suffers after initial exertion of self-control was not observed when manipulating or measuring another variable, like expecting to use self control in the future, motivation, perceptions of depletion and beliefs about the nature of self control. These variables predicted whether the participants would exhibit ego-depletion effects better than if they were actually depleted in the first task or not. Together, these findings cast doubt on whether self-control draws from a truly limited resource, as the resource seems to be instantly restored under the right conditions.

Another concern with the strength model of self-control is that the limited resource that allows self-control to occur remains unidentified. Many studies have demonstrated that a wide array of behaviors that require self-control, from physical endurance to response inhibition to decision-making, all "deplete" this same limited resource. However, these studies have not addressed what this hugely important underlying resource could be. If one resource is responsible for so many vital capabilities, it is crucial to find out what that resource is.

There have been some recent attempts to address this issue. Galliot et al. (2007) reasoned that perhaps people run out of willpower after exerting self-control because they literally have less of an energy source. They tested whether the physical resource that gets depleted after exertion of self-control is glucose. First, they found that performing a task that requires self-control uses a significant amount of glucose. Further, the extent of depletion on future tasks was directly related to the amount of glucose that participants used in the initial self-control task. They then gave participants glucose to see whether those who ingested glucose were replenished and were able to withstand the depletion that was expected to occur after exhibiting self-control multiple times. Participants who drank lemonade made with actual sugar, which contains glucose, performed better on a subsequent self-control task than participants who drank lemonade with artificial sweetener, which does not contain glucose.

Upon further examination, however, researchers found the methods and conclusions from these studies to be controversial (Beedie & Lane, 2011; Job, Walton, Bernecker & Dweck, 2013). Kruzban (2010) rebutted the findings of Galliot et al. by drawing attention to their ineffective measurement of blood glucose content, and Beedie and Lane (2011) point out that Galliot et al.'s conclusions do not make sense biologically, as glucose is quickly delivered from the brain to other organs of the body when needed, making it unlikely that the brain itself would "run out" of glucose after performing a few self-control tasks. Job et al. (2013) even found that glucose only eliminated depletion effects for those who held the belief that self-control was limited or were led to endorse that belief. Those who believed that self-control was not limited or those who were led to

endorse that belief did not need glucose to sustain their high performance on self-control tasks. All of these findings undermine the validity of the idea that the limited resource in the self-control strength model is glucose. The fact that the nature of this limited resource, which is so central to the model, is still a mystery raises questions about whether the resource model is too simplistic.

The contribution of the strength model to our understanding of the ego-depletion phenomenon and self-control more generally is undeniable. A meta-analysis of the ego-depletion literature found 83 studies that replicated ego-depletion effects using a variety of initial depleting tasks and measures of self-control (Hagger, Wood & Stiff, 2010). Many more studies not included in this analysis also demonstrated that initial exertion of self-control leads to decreased performance on subsequent self-control tasks. The strength model explains that this phenomenon occurs because self-control strength may be a limited resource. However, after reviewing the literature, it is clear that the effects of moderating variables, like motivation or beliefs about will power, are not predicted by the strength model. Further, the physiological analog for this limited resource has not been identified. Therefore, modifications to the strength model, or a completely new model, are necessary to fully explain the existing data.

The Process Model of Self-Control

Although the strength model successfully outlined the phenomenon of ego-depletion, the existence of variables that eliminate depleting effects and the failure to identify the limited resource suggest that revisions should be made to the strength model

of self-control to accurately reflect the complete body of literature on self-control depletion. Alternatively, a new theory could be proposed.

After identifying the weaknesses in the strength model, Inzlicht and Schmeichel (2012) did just that: they proposed an alternative process model of self-control that can account for ego-depletion effects, as well as explain why particular moderators have the effects that they do. The process model proposes that self-control does not rely on a limited resource, but rather, individuals have unlimited access to self-control. The model suggests that individuals initially engage in self-control and other cognitive work to achieve particular goals. However, after initially engaging, individuals are motivated to seek a reward for the work that they have done. According to this model, then, the reason that ego-depletion occurs is because after exhibiting self-control, people lose motivation to continue engaging in cognitive work. What Baumeister and his colleagues have called ego depletion, therefore, is when mental work, like self-control, becomes increasingly less appealing and mental pleasure, such as rest, becomes more appealing (Inzlicht, Schmeichel, & Macrae, 2014). This shift from mental work (i.e., self-control) to mental pleasure reflects a motivational shift. In other words, individuals have not exhausted their supply of self-control after they exert self-control initially. They also are not less motivated. Instead, their motivation switches from being directed towards goal-pursuit to being directed towards reward pursuit. Basically, in order to achieve goals but still enjoy rewards, individuals alternate between being motivated to control themselves and being motivated to reward themselves.

Because this model is new, there is relatively little research that directly tests the process model's tenets. However, some evidence in support of this shift in motivation can be pieced together from published findings. For example, motivation to self-regulate comes from recognizing a disparity between one's desired state and one's actual state (Carver & Scheier, 1981; Inzlicht et al., 2013). Interestingly, Inzlicht and Gutsell (2007) found that after exerting self-control, the neurological systems that detect gaps between one's goals and one's actions become less sensitive. As a result, participants are not as compelled to exert self-control because they do not see as much of a need for self-control. The process model would argue that people then shift their focus away from the signals that indicate a discrepancy between their current state and their desired end state (and therefore fail to see how the action of not exerting self-control deters them from their goals). Instead, attention would be placed on cues related to rewards and gratification. This aspect of the process model is supported by a study done by Schmeichel, Harmon-Jones and Harmon-Jones (2010), who found that depletion heightens attention to reward-related stimuli. After being depleted, participants were asked to make quick judgments about symbols associated with rewards, like dollar signs, and other symbols, like percent signs. Depleted participants more accurately perceived reward-related symbols than other symbols. Thus, the neural systems responsible for detecting the difference between desired and actual states are dulled with depletion, and presumably as a result, depleted participants become more sensitive to reward-related cues instead of self-regulation-related cues. This evidence shows that the reasoning behind the process model is biologically plausible.

Additionally, the process model would suggest that after a depleting task, participants can be reminded of the inadequacy of their actual state compared to their desired state to overcome ego-depletion effects (a finding that the strength model would not predict). Simply having participants set a goal before engaging in a self-regulation task and providing them with feedback on how they measure against their goal throughout the task is enough to keep participants motivated to self-regulate, thereby overcoming ego-depletion effects (Wan & Sternthal, 2008). Another example of redirecting participants from gratification back to self-regulation is when motivation is externally provided. Muraven and Slessareva's findings (2003) showed that motivation to self-regulate eliminated ego-depletion effects. A finding such as this would only occur if self-control does not rely on a limited resource, but relies instead on continuous motivation to self-regulate. In other words, these data suggest that people tend to turn away from self-regulation after initially exhibiting self-control unless they are redirected with feedback that keeps them on task or motivation. This tendency is what the process model describes as a shift in motivation, from self-regulation to gratification; these findings do not align with the resource model.

Another possible explanation for the shift in motivation from self-regulation to gratification is self-licensing, which would occur when people feel entitled to work less hard on a second task in a research setting because they have already done their part for the research process. They feel entitled to a break or a reward because, after all, they just engaged in energy-draining mental work. De Witt Huberts, Evers and De Ridder (2012) assessed self-licensing behavior in participants who were not depleted. They had

everyone complete the same, initial non-depleting task. They broke up the activity into two tasks for one group, while the other group did the same exact task in one sitting. Those who did the activity as if it were two tasks said they exerted more effort than those who did the task in one sitting. Furthermore, on a subsequent task requiring self-control, those who did the task in two parts performed worse than those who did the first task in one sitting. Yet again, these findings show that self-control performance may not solely rely on actual depletion of a self-control resource. Instead, when "slacking off" can be justified, self-control performance may depend on whether participants engage in self-licensing. If the participants in this study engaged in self-licensing even though they were not depleted, it is likely that depleted participants also engage in self-licensing, which may explain why the shift in motivation from self-regulation to gratification happens after engaging in a cognitively demanding task.

This self-licensing idea can further explain the findings of Muraven et al. (2006). In their study, after being depleted, some individuals were told that they would engage in two more tasks, the third one requiring self-control. The process model would predict that participants will seek gratification, or rest, on the second task, and then switch back to self-regulation for the third task. Being told that only one of the two upcoming tasks requires self-control provides justification to slack off on the second task. The results align with this prediction: participants who were told about the future tasks did more poorly on the second task than other participants. Importantly, they also did just as well on the third task as those who were not depleted at all. Thus, theoretically and empirically, the self-licensing effect is a reasonable explanation for observed shifts in

motivation from self-regulation to self-gratification; the self-licensing effect cannot be explained by the strength model but aligns well with the process model.

The strength model powerfully outlined the prevalent phenomenon of ego depletion and potential failures in self-control. However, as this literature grew, it became clear that the resource model could not explain all of the newest findings. The process model, on the other hand, accounts for not only the evidence that supports the strength model, but also the research that the strength model could not explain. Instead of explaining depletion as an effect of using up a limited resource, the process model argues that it is a result of a shift in priorities, where individuals switch from being motivated to do mental work to seeking mental relief. Thus far, the data aligns with the process model.

The Current Research

The link between motivation and self-control was established long before the process model was proposed, despite the fact that the strength model cannot fully account for these effects. Intuitively, the relationship between motivation and self-control makes sense. It is easy to accept that if people are motivated to do something, they are willing to put forth effort even if their goal requires mentally-taxing work. This idea is supported by empirical research on self-control as well, which indicates that motivation can override commonly-observed ego depletion effects. For example, Muraven and Slessareva (2003) found that after exhibiting self-control, participants who were motivated to perform well on a second task performed just as well as participants who were not previously depleted, showing that motivation alone can override ego depletion effects. From these findings, we know that participants would have exhibited ego-depletion effects on the second task

had the researchers not intervened to give them motivation. When interpreted in light of the process model, these findings demonstrate that self-control is not a limited resource (because motivation should not replenish it) and that motivation is important for maintaining self-control. To more directly test the process model, however, examining the relationship between motivation, self-licensing, and ego-depletion is necessary. If the process model is true and ego-depletion is due to a shift in motivation as a result of self-licensing, providing motivation to participants *before* the first task would make self-licensing unlikely and should therefore eliminate ego-depletion effects.

The current research tests this idea. Unlike most of the previous ego-depletion studies that have explored motivation, where the intervention variable was introduced after depletion had already occurred (or not), this study attempts to provide a motivation intervention *before* any possible shift in motivation takes place via self-licensing. In other words, before participants are depleted (or not), they will be given motivation to perform well on a first task. It is expected that providing this incentive for the hard work that will follow will eliminate the self-licensing effect. Because participants believe they are doing hard work for a good cause, they will be less likely to experience the self-licensing effect that would normally result in ego depletion effects on a second task.

The process model asserts that depletion effects are evident after acts of self-control because individuals are motivated to seek gratification after exhibiting self-control. They may feel like they are entitled to slack off on the next task after working hard to control themselves on the first task. If, however, participants are motivated to do well on the first task by being told that it's important, they can explain their effort and

hard work to be a result of the motivation given to them. Because they worked hard for a reason, they are not entitled to slack off on the subsequent task. Motivating participants before the first act of self-control may eliminate the depleting effects observed on a second task because it will stop self-licensing.

The purpose of this study is to preliminarily test the process model of ego depletion, specifically whether motivation before depletion eliminates self-licensing, thereby eliminating ego-depletion effects. Unlike previous studies, where motivation was provided after depletion, in the study, motivation will be provided before the first act of self-control. If the process model is correct, then motivated participants will not exhibit ego-depletion effects on the second task because they did not engage in self-licensing after the first task. The hypothesis is that individuals who are motivated to perform well on the first task will remain motivated on the second, unrelated task because they do not feel entitled to slack off on the second task because they worked hard for a reason.

Method

Participants

Eighty-one students from a small liberal arts university were recruited to participate in a psychology study for course credit in their Introduction to Psychology course. They were told that they would participate in a 30-minute study on creativity and cognitive processes. Participants arrived to the study in small groups, but were directed to small rooms where they completed the study individually on a computer.

Design

In a two-by-two between participants design, participants completed two tasks with follow-up questions after each task. The two manipulations were motivation and Stroop condition, each manipulation having two levels. For the motivation manipulation, half of the participants were given information about the importance of the task to be completed (motivation condition), while the other half of the participants were not given this information (no motivation condition). For the Stroop manipulation, half of the participants received a depleting Stroop task, which required much self-control, while the other half of the participants received a non-depleting Stroop task, which did not require much self-control.

The dependent variable is how long participants persisted on the second task, which consisted of solving five anagrams (two of which were not solvable). Persistence was measured by time spent on the activity.

Procedure

Before completing the first task, half of the participants were told that they were about to complete a task that will help researchers discover a cure for Alzheimer's disease, a motivation manipulation previously used by Muraven and Slessareva (2003). Next to an image of the logo for the Alzheimer's Association, the following was written: "It is well known that Alzheimer's disease is a highly degenerative disease that greatly impairs cognition. The following task will provide valuable information about cognition, which will lead to the development of new therapies for patients with Alzheimer's disease. This task will require you to use different ways of thinking, which will help researchers understand how cognitive processes become limited in diseases like

Alzheimer's, which target cognition." The other half of the participants were not told anything about the task other than the instructions.

After the motivation manipulation, participants completed a Stroop test with eighty trials (refer to Appendix A for an example). A Stroop task displays color words (e.g., "red") in colored fonts. The participants were instructed to note the color of the font, not the color word written. Half of the participants were in the depletion condition, where the color of the font did not match the color the word spelled (e.g., the word "blue" was written in red font). Previous studies have shown that completing the Stroop test depletes self-control because participants must use self-control to override the impulse to read the word instead of paying attention to the color of the font, and this specific task was used to deplete participants of self-control in other ego depletion studies (e.g., Muraven, Roseman & Gagne, 2007). The other half of the participants were in the control condition, where the color of the font matched the word spelled (e.g., the word "blue" was written in blue font). The amount of time it took for participants to identify the right answer was recorded for each trial.

Participants then completed several manipulation check questions about task difficulty, personal frustration, and task importance on seven point Likert scales, with 1 being "not at all" and 7 being "completely." Participants then completed three sub-scales of the Situational Motivation Scale (SIMS; Guay, Vallerand & Blanchard, 2000; refer to Appendix B), which assessed motivations for engaging in a particular behavior: four items measured intrinsic motivation (e.g., "Because I think that this activity is interesting"), four items measured external motivation (e.g., "Because I feel that I have to

do it"), and four items measured internal regulation (e.g., "Because I think that this activity is good for me"). Each item was rated on a 7-point Likert scale, with 1 being "corresponds not at all" and 7 being "corresponds exactly." Participants were also asked to fill out the Brief Mood Inventory Scale (BMIS) on a 7-point Likert scale, with 1 being "corresponds not all" and 7 being "corresponds exactly" (refer to Appendix C). After completing these measures, participants moved on to the second task.

The second task was an anagram task, where participants were asked to unscramble five words, two of which were unsolvable (e.g., Muraven et al., 2006; refer to Appendix D). Participants were told to spend as much time as they wanted to attempt to solve the anagrams. Self-control was measured by the persistence participants displayed on this task; unbeknownst to them, the amount of time they spent on this activity was recorded.

When participants chose to move on, they answered the same follow-up questions as they did after the first task. They were then asked several questions to assess suspicion (e.g., You completed two different tasks. Do you think there was a relationship between them? Do you think something that you did in the first task affected how you did on the second task?). The participants were then debriefed and thanked for participating in the study.

Results

Manipulation Checks

Participants were asked how important it was to do well on the first task as a manipulation check for motivation. Because both manipulations had occurred by the time

participants answered this question, a two-way ANOVA with both motivation and Stroop conditions as the independent variables was conducted. Participants who were in the motivation condition (M = 3.30, SD = 1.48) thought the task was more important than those in the no motivation condition (M = 2.78, SD = 1.54), although this was only a marginally significant effect, $F(3, 78) = 2.89$, p =.09. Interestingly, participants who were depleted (M = 3.33, SD = 1.62) also thought that the first task was significantly more important than participants who were not depleted (M = 2.71, SD = 1.37), $F(3, 78) = 4.03$, p = .05. The interaction between motivation and Stroop condition was not significant, $F(3, 78) = .70$, p = .40.

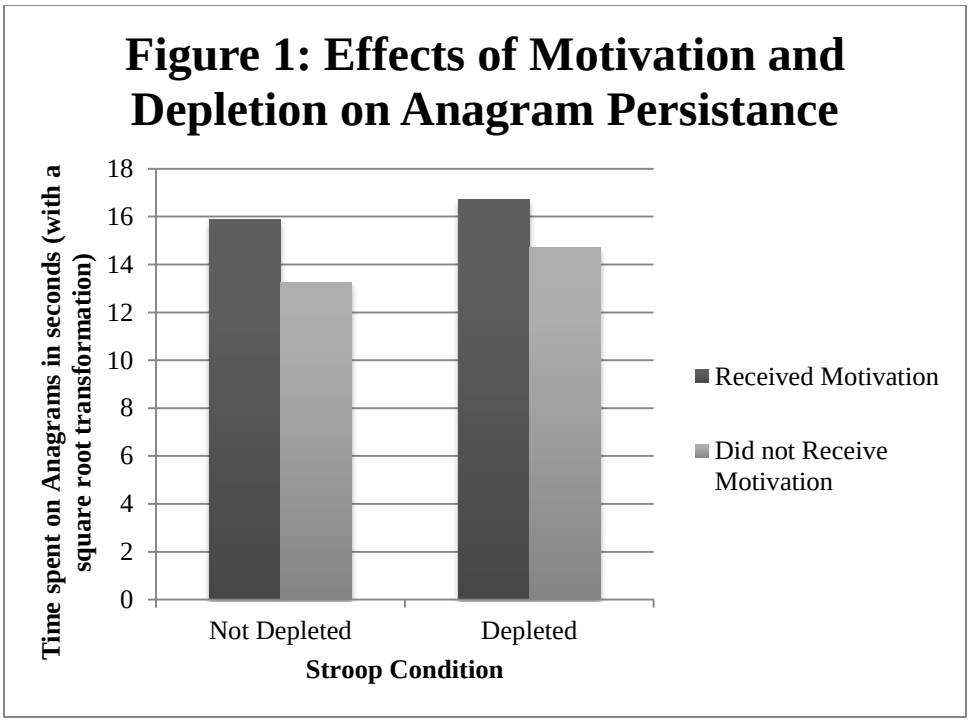
Participants were also asked how difficult and frustrating they felt the first task was to check the Stroop manipulation. Two-way ANOVAs were performed on each item. Those in the depleting condition (M =1.54, SD = .14) thought that the task was significantly more difficult than those in the control condition (M = 1.13, SD = .52), $F(3, 78)= 5.45$, p = .02. There was no main effect for motivation, $F(3,78) = 2.32$, p = .13, or an interaction, $F(3,78) = .03$, p = .87, on the difficulty variable. Neither the main effect for motivation, $F(3, 78) = 1.53$, p = .21, the main effect for Stroop, $F(3, 78) = 1.49$, p = .22, nor the interaction were significant, $F(3, 78) = .55$, p = .45, on the frustration measure.

To assess a more general level of motivation, participants responded to twelve items measuring three types of motivation on the SIMS. Scores for each subscale were calculated, as was a total score, and two-way ANOVAs were conducted on each variable; no significant main effects or interactions were found on the SIMS scores (all ps > .05).

To assess mood, items on the BMIS were separated into two subscales: positive mood and negative mood. An overall mood score was calculated by subtracting the average negative mood from the average positive mood. A two-way ANOVA on this measure revealed no significant main effects or interaction (all *p*s > .23).

Persistence on Task 2

One participant's persistence time on the second task was severely skewed (i.e., it was more than three standard deviations from the overall mean), so this person's score was removed from this analysis. Without this outlier, the distribution of persistence times was still positively skewed, with a skewness ratio of 3.0. A square root transformation on the persistence data removed the skew (a ratio of .28 was obtained after this transformation). A two-way ANOVA conducted on this transformed measure revealed a significant main effect of motivation on persistence times, $F(3, 77) = 4.57$, $p = .03$. Participants in the motivation condition spent significantly more time on the anagrams ($M = 16.30$, $SD = .77$) than participants in the no motivation condition ($M = 13.98$, $SD = .76$). The main effect of Stroop condition was not significant, $F(3, 77) = 1.13$, $p = .29$. Although it was hypothesized that there would be an interaction between motivation and Stroop condition, the interaction was not significant either, $F(3, 77) = .07$, $p = .78$. Means for the interaction are presented in Figure 1.



The number of anagrams correctly solved (out of three) was also recorded. A two-way ANOVA on this measure revealed only a significant main effect of motivation. Participants in the motivation condition (M = 1.63, SD = 1.64) solved significantly more anagrams than participants in the no motivation condition (M = 1.20, SD = 1.60), $F(3, 78) = 3.62$, $p = .06$. The main effect of Stroop condition was not significant, $F(3, 78) = .042$, $p = .83$, nor was the interaction, $F(3, 78) = .14$, $p = .70$.

Participants were asked the same follow-up questions after the second task as they were after the first task. There was a slight trend for participants in the motivation condition for the first task (M = 4.60, SD = 1.24) to think that the second task was more important than those in the no motivation condition (M = 4.10, SD = 1.65), $F(3, 78) = 2.18$, $p = .14$. There was no main effect for Stroop condition or an interaction of the

independent variables on this measure. Participants in the depleting condition (M= 6.17, SD = .92) thought that the second task was significantly more difficult than those in the control condition (M= 5.61, SD = 1.25), $F(3, 78) = 5.23$, p = .03, and participants in the motivation condition (M = 5.61, SD = 1.17) thought that the second task was significantly less difficult than those in the no motivation condition (M = 6.17, SD = 1.02), $F(3, 78) = 5.29$, p = .03. The interaction between the motivation and Stroop variables on difficulty of the second task, however, was not significant. Depleted participants (M = 5.68, SD = 1.36) also thought that the second task was significantly more frustrating than not depleted participants (M= 4.85, SD = 1.91), $F(3, 78) = 4.64$, p= .03, although the main effect of motivation and the interaction were not statistically significant.

Discussion

Review of the Results

The purpose of this study was to assess whether motivation to complete a first task (that was either depleting or not) would eliminate potential depletion effects on a second task. Manipulation checks indicated that both the motivation and the Stroop manipulations were successful. Participants who were in the motivation condition thought that the first task was more important than those in the no motivation condition, consistent with previous research (Muraven & Slessareva, 2003). The Stroop manipulation was also successful because those in the depleting condition thought that the task was significantly more difficult than those in the control condition. No interaction effects were obtained on either of these measures. There were no significant results found on participants' SIMS scores (a point to which I return later), and mood

cannot account for any of the observed findings because there were also no effects of the manipulations on mood (also consistent with previous research; e.g., Muraven et al., 1998).

Whereas the typical ego depletion effect was expected to occur in the no motivation condition, it was hypothesized that participants who were motivated for the first task would persist longer on the second task regardless of whether they were depleted on the first task. In other words, an interaction between motivation and Stroop conditions was expected on persistence on the second task. The observed interaction, however, was not statistically significant. There was a main effect of motivation: participants who were motivated on the first task spent significantly more time working on the anagrams in the second task than participants who were not motivated on the first task. The main effect of Stroop condition was not significant, meaning that participants in the depleting and non-depleting Stroop conditions did not differ significantly from one another on the time they spent on the anagrams. The lack of interaction on the persistence measure suggests that the observed motivation effect occurred for both depleted and non-depleted participants. Not surprisingly, given that they spent more time on the task, participants in the motivation condition also successfully solved significantly more anagrams than participants in the no motivation condition. Although the number of anagrams solved was not a measure of self-control per se, this finding is consistent with the idea that having motivation on a first task will increase self-control performance on a second task. There was no main effect of Stroop condition or an interaction on the performance measure.

Participants answered the same follow-up questions after completing the second task as they did after completing the first task. Participants in the motivation condition for the first task thought that the second task was slightly more important than those in the no motivation condition for the first task, suggesting that the motivation manipulation may have carried over and affected feelings about the second task as well. Additionally, participants in the depleting condition thought that the second task was significantly more difficult and frustrating than those in the control condition, affirming the notion that an initial exertion of self-control affects people's perceptions of subsequent exertion attempts. This would align with the persistence results if depleted participants actually exhibited ego-depletion effects. Participants in the motivation condition thought the second task was significantly less difficult than those in the no motivation condition. This further highlights the crucial role of motivation in the self-control process.

Interpretation of Results

The SIMS was included in the current study because most previous studies on ego-depletion and motivation did not explicitly measure motivation level after manipulating it. The one study that did include a motivation measure (Muraven et al., 2007) utilized the SIMS, and Inzlicht and Schmeichel (2012) commended them and recommended that future studies follow in their footsteps. Unfortunately, no effects on this measure were obtained in the current study; in hindsight, however, this may not be particularly shocking. The items on the SIMS seem to target why participants were doing the second task rather than if they were motivated to do the second task. Participants evaluated their *reasons* for engaging in the second task; for example, they were asked

questions that assessed internal motivation (e.g., “Because I believe that this activity is important for me”) and external motivation (e.g., “Because I am supposed to do it”). Based on the wording of the items, I decided that being internally motivated should be an indication of motivation to do the task. However, because participants were clearly instructed to move on to the second task by the experimenter, it makes sense that they responded that they were doing the second task because they were told to do it. The items may not work to assess motivation in a research context in which the participants wouldn’t have engaged in a task if they hadn’t been directly asked to do so. In other words, while measuring motivation directly is important, this particular measure seems like it might not have been the best way to tap into that conceptual variable.

Although the hypothesized interaction between the motivation and depletion conditions that was central to this study was not statistically significant, there are many results that expand our understanding of self-control, and the important role that motivation plays in this process. Contrary to the hypothesis, the interaction between motivation and depletion was not significant. The lack of an interaction indicates that this study did not replicate the well-established ego-depletion finding, with participants who initially performed a depleting task performing more poorly than those in the control condition on a subsequent task (in the no motivation condition). Because the Stroop task has been used as an initial depleting task (Muraven et al., 2007) and persistence on anagrams has been used to measure subsequent self-control (Muraven et al., 2006), it is unclear why participants did not exhibit an ego-depletion effect here.

However, there is an interesting possible explanation for the pattern of effects on the persistence measure that involves both motivation and self-licensing. Participants who completed the depleting Stroop task indicated that they thought the first task was significantly more important than participants who completed the non-depleting Stroop task. Their reports on this scaled question are buttressed by their answers to the open-ended questions at the end of the study, which revealed that participants who completed the non-depleting Stroop task thought that it was less meaningful and useful than those who completed the depleting Stroop task. It seems that participants who saw a color word in a matching color font saw little reason for completing this boring and easy task. This may have led them to disengage from the study, perhaps even allowing them to self-license on the second task, even though they were not mentally depleted by the first task. Participants who were depleted, however, may have recognized that when the color word and font color are not matched, they must over-ride an automatic impulse. Although the activity was mentally taxing and difficult, they might have assumed that the test had a purpose and was therefore important. If they believed that what they were doing on the first task was truly meaningful, they may have been satisfied with the fact that they did something useful and felt good about the fact that they contributed, making them unlikely to self-license on the second task. In other words, they were actually motivated on the first task, despite the fact that they were not in the manipulated motivation condition, and their internal motivation was enough to negate the depletion effect that would have been expected on the second task. It is important to note that this potential explanation for the lack of ego-depletion effects reflects post-hoc theorizing. Future studies will have to test

these ideas in more detail, particularly the idea that task framing might be another variable that reduces people's ability to self-license on subsequent tasks.

Regardless of whether future studies support these specific ideas, it is clear that motivation plays a vital role in the self-control process, more so than the strength model would suggest. Even though it was made clear to participants that they were moving on to a different part of the study when the first task was completed, their motivation "spilled over" to the second task and increased persistence, even though they did not receive any additional motivation for the second task. The spill-over effect could mean that motivating participants before engaging them in self-regulation tasks will eliminate ego-depletion effects, consistent with the self-licensing idea and the process model more generally. Initial motivation (and perhaps even internally-generated motivation) gave participants a reason for working hard on that first task. Exerting effort for a reason left them feeling less justified to slack off on the following task, as they would feel if they had just worked hard without a reward or a reason. Presumably the motivation makes participants less prone to self-licensing; because they were motivated to do the first task, they had a reason for all their effort. This finding is consistent with the process model, which would predict that participants experience ego depletion because they experience a shift in motivation that may be due to self-licensing (Inzlicht et al., 2013; Inzlicht & Schmeichel, 2012). This study found that providing motivation on the first task makes it difficult for participants psychologically to justify slacking off on future tasks. If they cannot self-license on the second task, they will not exhibit ego depletion effects.

Therefore, the way a task is framed, whether as important because it may help researchers figure out a cure for Alzheimer's, or not, seems to frame the way participants interact with the task itself. If simply telling them that the task they are about to do is important, psychologically, they may not look at the task as depleting. The mental strain experienced from a task framed as important may not be viewed the same way as the mental strain experienced from a task that was not framed at all, or a task that was defined as unimportant (either by the participants themselves or by the researchers). If participants view the task as important, it is harder for them to justify decreasing their efforts on future tasks. Framing a task as being meaningful may eliminate ego-depletion effects in the same way that the way people think about self-control has implications for whether they experience depletion effects or not. People who did not think self-control was contingent on a limited resource did not experience ego-depletion effects (Job et al., 2010), so perhaps those who view their to-do lists as meaningful and important will also experience less ego-depletion than those who do not. This way of thinking about self-control aligns well with the process model instead of the strength model.

Current Results in the Context of Past Literature

The fact that the classic ego-depletion patterns were not found in the no motivation conditions in this study and because this was the first study to manipulate the motivation variable *before* the first task was completed, it is somewhat difficult to compare the results of the current study to previous findings. However, both the recent previous literature and the current research provide support for the process model instead of the strength model. First of all, Muraven and Slessareva's three studies (2003) and this

study all suggest that motivation greatly predicts self-control performance: motivation must be taken into account when explaining how self-control works. The strength model reduces self-control to a limited resource that depletes with exertion and does not address the crucial role of motivation. The process model, on the other hand, by asserting that a shift in motivation is exactly what leads to self-control failure, makes motivation an integral element of the mechanism by which self-control happens.

Additionally, the current research reveals a spill-over effect in motivation for future tasks. This result is not easily explained by the strength model because whether someone is motivated to complete a first task should have no effect on the amount of limited resource available for a second task. However, because the process model states that after initial exertion, motivation shifts from self-regulation to self-gratification, it makes sense that if self-licensing is reduced or eliminated, motivation will not shift from self-regulation to self-gratification. The spill-over effect would be a manifestation of the lack of shift in motivation. Clearly, the importance of motivation and the ability for motivation to be maintained under certain circumstances are difficult to explain with the strength model but align well with the process model.

Finally, the importance of task framing can also be more easily explained with the process model rather than the strength model. The strength model would predict that the limited resource on which self-control presumably relies would be depleted after initial exertion, regardless of how a task is framed (as important or not) for participants. However, the process model would predict that framing is crucial because ego-depletion occurs because motivation shifts from self-regulation to self-licensing. If motivation was

redirected towards self-regulation, participants would not exhibit ego-depletion effects on future tasks, which is what the results of the current study indicate. In sum, then, the current research provides more support for the process model of self-control than the strength model of self-control.

Application and Future Directions

As demonstrated before, research on self-control is helpful for personal improvement and for individuals' ability to achieve their goals. On the individual level, people can harness the idea that framing a task in a motivating way may keep them engaged longer. For example, it is likely that people who are in the habit of thinking through *why* they are doing a task will be more committed to the task and will persevere in it longer. If they make themselves aware of why what they are doing is important, it may decrease their likelihood to self-license any slacking behavior. This framing idea is also valuable in a group setting. For example, leaders can use it to create an environment where people engage in self-control for optimal productivity. If leaders introduce a project or assignment and frame it as important, their subordinates will likely be motivated longer and persist working diligently than if the project was simply assigned. This can also be applied in behavior adjustment strategies. Perhaps authority figures in schools can focus discipline on why exhibiting self-control by avoiding fights and aggression is important. As a result, students may be motivated to self-regulate instead of acting impulsively. These are examples where understanding the mechanism behind self-control failure would help to solve many societal and systemic problems.

Future studies must be done to test the process model more explicitly. Because the model emphasizes motivation, perhaps an alternative to the SIMS could help researchers trace the motivation levels of participants throughout the study in order to see whether those who are depleted experience a shift in motivation after the first task. If the process model predicts that after engaging in self-control, participants shift their motivation from self-regulation to self-gratification, future studies should set up a scenario where this shift could be observed directly. Perhaps by measuring a baseline of motivation and motivation after each task, researchers could trace what happens over time. Also, studies similar to this one could measure directly whether those who were not motivated were engaging in self-licensing. By explicitly measuring why participants controlled themselves less on later tasks, researchers can test whether the process model is explaining the reasons for the shift accurately.

Another future direction for self-control research is to examine the role of framing in maintaining motivation in self-control tasks. Researchers can expand on the idea of framing a task by introducing the same task in different ways to see if motivation and self-licensing play a role in people's self-control performance. For example, researchers should examine whether adding the importance of a task in the instructions changes the way participants frame that task. According to the present research, one could expect that framing a task as important will increase motivation for that task, which in turn will increase participants' willingness to engage in that task.

Conclusion

This study was an initial exploration of the role of motivation and self-licensing effects on self-control. While all of the other literature on ego-depletion used a two-task design with a moderating variable introduced after depletion, this study was the first to offer motivation before any depletion occurred. The previous studies, which manipulated motivation after the first task, provided evidence for the importance of motivation and the possibility that self-control does not rely on a limited resource. This study, by manipulating motivation before the first task, not only affirms the importance of motivation, but also contributes the idea that motivation before any effort is exerted may increase an individual's motivation more generally, eliminating ego-depletion effects on subsequent tasks. The results provide preliminary support for the process model, but because the process model was proposed recently, there is much more research to be done to test it directly and to understand how to maximize people’s self-control capability.

References

Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes, 50*(2), 248-287.

Bargh, J. A. (1994). The Four horsemen of Automaticity: Awareness, intention, efficacy, and control in social cognition. In R.S. Wyers & T.S. Srull (Eds.) *Handbook of Social Cognition* (pp. 1-41). Hillsdale, NJ: Erlbaum.

Bargh, J. A., & Chartrand, T. L. (1999). The unbearable automaticity of being. *American Psychologist, 54*(7), 462-479.

Bargh, J. A., & Ferguson, M. J. (2000). Beyond behaviorism: The automaticity of higher mental processes. *Psychological Bulletin*, 126, 925–945.

Baumeister, R.F. (1998). The Self. In D. Gilbert, S.T. Fiske & G. Lindzey (Eds.) *Handbook of Social Psychology* (pp. 680-740). Boston: McGraw-Hill.

Baumeister, R.F., Bratlavsky, E., Muraven, M., & Tice, D.M. (1998). Ego depletion: Is the active self a limited resource? *Journal of Personality and Social Psychology, 74*, 1252–1265.

Baumeister, R.F., Vohs, K.D., & Tice, D.M. (2007). The strength model of self-control. *Current Directions in Psychological Science, 16*, 351–355.

Beedie, C. J., & Lane, A. M. (2011). The role of glucose in self-control: Another look at the evidence and an alternative conceptualization. *Personality and Social Psychology Review, 20(10),* 1-11.

Carver, C. S., & Scheier, M. F. (1981). *Attention and self-regulation: A control-theory approach to human behavior*. New York: Springer-Verlag.

Carver, C. S., & Scheier, M. F. (1982). Control theory: A useful conceptual framework for personality–social, clinical, and health psychology. *Psychological Bulletin*, *92*(1), 111- 135.

Clarkson, J.J., Hirt, E. R., Jia , L, & Alexander, M. B. (2010) When perception is more than reality: the effects of perceived versus actual resource depletion on self-regulatory behavior. *Journal of Personality and Social Psychology, 98,* 29–46.

Corr, P. J. (2010). Automatic and controlled processes in behavioral control: Implications for personality psychology. *European Journal of Personality, 24*: 376-403.

DeWall, C. N., Baumeister, R. F., Stillman, T. F., & Gailliot, M. T. (2007). Violence restrained: Effects of self-regulation and its depletion on aggression. *Journal of Experimental Social Psychology*, *43*(1), 62-76.

Duckworth, A. L., & Seligman, M. E. (2005). Self-discipline outdoes IQ in predicting academic performance of adolescents. *Psychological Science*, *16*(12), 939-944.

Finkel, E. J., & Campbell, W. K. (2001). Self-control and accommodation in close relationships: an interdependence analysis. *Journal of Personality and Social Psychology*, *81*(2), 263.

Friese, M., Binder, J., Luechinger, R., Boesiger, P., & Rasch, B. (2013). Suppressing emotions impairs subsequent Stroop performance and reduces prefrontal brain activation. *PloS One*, *8*(4), 1-11.

Funder, D. C., & Block, J. (1989). The role of ego-control, ego-resiliency, and IQ in delay of gratification in adolescence. *Journal of Personality and Social Psychology*, *57*(6), 1041- 1050.

Funder, D. C., Block, J. H., & Block, J. (1983). Delay of gratification: Some longitudinal personality correlates. *Journal of Personality and Social Psychology, 44*(6), 1198-1213.

Gailliot, M.T., Baumeister, R.F., DeWall, C.N., Maner, J.K., Plant, E.A., Tice, D.M., et al. (2007). Self-control relies on glucose as a limited energy source: Willpower is more than a metaphor. *Journal of Personality and Social Psychology, 92*, 325–336.

Gottfredson, M. R. & Hirschi, T. (1990). *A General Theory of Crime*. Stanford, CA: Stanford University Press.

Guay, F., Vallerand, R. J., & Blanchard, C. (2000). On the Assessment of situational intrinsic and extrinsic motivation: The Situational motivation scale (SIMS). *Motivation and Emotion, 24*(3), 175-213.

Hagger, M. S., Wood, C., Stiff, C., & Chatzisarantis, N. L. (2010). Ego depletion and the strength model of self-control: a meta-analysis. *Psychological Bulletin, 136*(4), 495- 525.

Inzlicht, M., & Gutsell, J.N. (2007). Running on empty: Neural signals for self-control failure. *Psychological Science, 18*, 933–937.

Inzlicht, M. & Schmeichel, B.J. (2012). What is ego depletion? Toward a mechanistic revision of the resource model of self-control. *Perspectives on Psychological Science, 7(5)*, 450-463.

Inzlicht, M., Schmeichel, B. J., & Macrae, C. N. (2014). Why self-control seems (but may not be) limited. *Trends in cognitive sciences, 18* (3): 127 – 133.

Job, V. Dweck, C.S., Walton, J. M. (2010) Ego depletion – is it all in your head? Implicit theories about willpower affect self-regulation. *Psychological Science, 22,* 1686–1693.

Job, V., Walton, G.M, Bernecker, K., & Sweck, C.S. (2013). Beliefs about willpower determine the impact of glucose on self-control." *Psychological and Cognitive Sciences, 110*(37):1- 6.

Kahan, D., Polivy, J., & Herman, C. P. (2003). Conformity and dietary disinhibition: A test of the ego-strength model of self-regulation. *International Journal of Eating Disorders*, *33*(2), 165-171.

Kruzban, R. (2010). Does the brain consume additional glucose during self-control tasks? *Evolutionary Psychology, 8*(2): 244-259.

Ludwig, A. M., & Stark, L. H. (1974). Alcohol craving: Subjective and situational aspects. *Quarterly Journal of Studies on Alcohol, 35,* 899-905.

Martin, L. L., & Tesser, A. (1989). *Toward a motivational and structural theory of ruminative thought*. Hillsdale, NJ: Lawrence Earlbalm.

Mayer, J. D., & Gaschke, Y. N. (1988). The experience and meta-experience of mood. *Journal of Personality and Social Psychology, 55*, 102-111.

Mischel, W., Ebbesen, E. B., & Raskoff Zeiss, A. (1972). Cognitive and attentional mechanisms in delay of gratification. *Journal of Personality and Social Psychology*, *21*(2), 204- 218.

Mischel, W. (1996). From good intentions to willpower. In E Goll-witzer & J. Bargh (Eds.), *The psychology of action* (pp. 197-218). New York: Guilford Press.

Muraven, M. (2010). Building self-control strength: Practicing self-control leads to improved self-control performance. *Journal of Experimental Social Psychology*, *46*(2), 465-468.

Muraven, M., & Baumeister, R. F. (2000). Self-regulation and depletion of limited resources: Does self-control resemble a muscle? *Psychological bulletin*, *126*(2), 247 - 259.

Muraven, M., Baumeister, R. F., & Tice, D. M. (1999). Longitudinal improvement of self regulation through practice: Building self-control strength through repeated exercise. *The Journal of Social Psychology*, *139*(4), 446-457.

Muraven, M., Rosman, H., & Gagne, M. (2007). Lack of autonomy and self-control: Performance contingent rewards lead to greater depletion. *Motivation and Emotion, 31(4),* 322-330.

Muraven, M., & Slessareva, E. (2003). Mechanisms of self-control failures: Motivation and limited resources. *Personality and Social Psychology Bulletin*, *29*(7), 894-906.

Muraven, M., Shmueli, D., & Burkley, E. (2006). Conserving self-control strength. *Journal of Personality and Social Psychology, 91(3),* 524-537.

Muraven, M., Tice, D. M., & Baumeister, R. F. (1998). Self-control as limited resource: Regulatory depletion patterns. *Journal of Personality and Social Psychology, 74(3),* 774-789.

Neal, D. T., Wood, W., & Drolet, A. (2013). How do people adhere to goals when willpower is low? The profits (and pitfalls) of strong habits. *Journal of Personality and Social Psychology, 104*(6), 959-974.

Pyszczynski, T., Holt, K., & Greenberg, J. (1987). Depression, self-focused attention, and expectancies for positive and negative future life events for self and other. *Journal of Personality and Social Psychology, 52*(5), 994-1001.

Schmeichel, B. J., Harmon-Jones, C., & Harmon-Jones, E. (2010). Exercising self-control increases approach motivation. *Journal of Personality and Social Psychology, 99*(1), 162- 173.

Shoda, Y., Mischel, W., & Peake, P. K. (1990). Predicting adolescent cognitive and self-regulatory competencies from preschool delay of gratification: Identifying diagnostic conditions. *Developmental Psychology*, *26*(6), 978-986.

Vohs, K. D., & Heatherton, T. F. (2000). Self-regulatory failure: A resource-depletion approach. *Psychological Science, 11*(3), 249-254.

Wallace, H. M., & Baumeister, R. F. (2002). The performance of narcissists rises and falls with perceived opportunity for glory. *Journal of Personality and Social Psychology*, *82*(5), 819- 834.

Wan, E. W., & Sternthal, B. (2008). Regulating the effects of depletion through monitoring. *Personality and Social Psychology Bulletin, 34*(1), 32-46.

Wegner, D. M., & Pennebaker, J. W. (1993). *Handbook of Mental Control*. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Witt Huberts, J. C., Evers, C., & De Ridder, D. T. (2012). License to sin: Self-licensing as a mechanism underlying hedonic consumption. *European Journal of Social Psychology*, *42*(4), 490-496.

Appendix A: Task 1- Stroop Test Example

Appendix B: Situational Motivation Scale (SIMS)

Read each item carefully. Using the scale below, please circle the number that best describes the reason why you are currently engaged in this activity. Answer each item according to the scale.

1: corresponds not all; 2: corresponds a very little; 3: corresponds a little; 4:corresponds moderately; 5: corresponds enough; 6: corresponds a lot; 7: corresponds exactly.

I am very motivated to perform well on this task. 1 2 3 4 5 6 7

Why are you currently engaged in this activity?

1. Because I think that this activity is interesting 1 2 3 4 5 6 7

2. Because I am doing it for my own good 1234567

3. Because I am supposed to do it 1234567

4. Because I think that this activity is pleasant 1234567

5. Because I think that this activity is good for me 1234567

6. Because it is something that I have to do 1234567

7. Because this activity is fun 1234567

8. By personal decision 1234567

9. Because I don’t have any choice 1234567

10. Because I feel good when doing this activity 1234567

11. Because I believe that this activity is important for me 1234567

12. Because I feel that I have to do it 1234567

Codification key: Intrinsic motivation: Items 1, 5, 9, 13; Identified regulation: Items 2, 6, 10, 14;

External regulation: Items 3,7, 11, 15.

Appendix C: Brief Mood Introspection Scale (BMIS)

INSTRUCTIONS: Circle the response on the scale below that indicates how well each adjective or phrase describes your present mood.

(definitely do not feel) (do not feel) (slightly feel) (definitely feel)

XX X V VV

Lively XX X V VV	Drowsy XX X V VV
Happy XX X V VV	Grouchy XX X V VV
Sad XX X V VV	Peppy XX X V VV
Tired XX X V VV	Nervous XX X V VV
Caring XX X V VV	Calm XX X V VV
Content XX X V VV	Loving XX X V VV
Gloomy XX X V VV	Fed up XX X V VV
Jittery XX X V VV	Active XX X V VV

Overall, my mood is:

Very Unpleasant Very Pleasant

-10 –9 –8 –7 –6 –5 –4 –3 –2 –1 0 1 2 3 4 5 6 7 8 9 10

Appendix D: Task 2

Please unscramble the following anagrams to the best of your ability. Spend as much time as you need to solve each anagram. You may skip an anagram if you are stuck.

1. Tiylgu (guilty)

2. Mefar (frame)

3. Ulbemya (unsolvable)

4. Defmore (freedom)

5. Haolin (unsolvable)