Does ego-depletion impair the ability to identify a self-control conflict?

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ABILITY TO IDENTIFY A SELF-CONTROL
CONFLICT?

by

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Abstract

Research from the past fifteen years suggests that strong exertions of self-control in one instance cause self-control failure in subsequent instances. This phenomenon is called the “ego-depletion effect”. More recently, new theoretical and empirical advances in self-control research suggest a Two-Stage Model of self-control. During Stage One, individuals must identify the need to use self-control by recognizing a conflict between their current behavior and long-term goals, values, or social standards. In Stage Two, individuals must implement self-control strategies or willpower to bring current behavior in line with long-term goals, values, or social standards. To date, ego-depletion research has focused mostly on how strong exertions of self-control undermine subsequent attempts to implement self-control (Stage Two), but not on the effect of ego-depletion on self-control conflict identification (Stage One). This research sought to connect disparate findings in ego-depletion research to create and test a model of how ego-depletion could disrupt self-control conflict identification. Specifically, ego-depletion may cause low mental construal, which could decrease, the saliency of long-term goals, values, and social standards and thus interfere with one’s ability to identify conflicts between current behaviors and such long-term goals, values, or social standards. Two studies tested this model. In Study One, the probe-recognition task was used to determine if ego-depletion reduced the implicit activation of goals, values, and social standards in online participants. In Study Two, ego-depleted and non-depleted participants played an economic dilemma game known to involve self-control conflicts. While participants played the game, the computer monitored several behavioral indicators of self-control conflict awareness (e.g., decision-making time; behavioral variance; decision regret). These indicators were tested as partial mediators in the relationship between ego-depletion and actual choices made during the economic dilemma game. Also in Study Two, each participants'
current state of mental construal was manipulated to test for interactions between construal level and ego-depletion on measures of conflict identification. Results from both studies generally failed to support the theory presented here. Potential reasons and implications for null results are discussed.
Self-control helps us accomplish our goals, follow our values, and maintain important societal standards. Failures of self-control are thought to underlie some of societies greatest ills including excessive drinking (see Osgood & Muraven, in press), aggression (e.g., Osgood & Muraven, 2015a), obesity (Stutzer & Meier, 2015), and crime (Gottfredson & Hirshi, 1990). Unfortunately, self-control often fails. For example, one of the most widely studied phenomena in self-control over the past 15 years is that strong exertions of self-control appear to undermine subsequent attempts to use self-control. This has been coined the “ego-depletion” effect (Baumeister, Bratslavsky, Muraven, & Tice, 1998). Understanding how and why people fail at self-control is of vital importance to individuals and society. However, many basic questions about self-control remain unanswered. Consequently, many processes of self-control still need research and new theories of self-control are still being developed.

One such new theory is the Two-Stage Model of self-control (Myrseth & Fishbach, 2009). According to this model, a person must first identify the need to use self-control (Stage One) and then implement self-control (Stage Two). The Stage One process of identifying the need to use self-control is referred to as self-control conflict identification. In other words, in the first stage, one must identify that one’s current behaviors or choices may be inconsistent with long-term goals, and thus constitutes a self-control conflict (i.e., a conflict between what one prefers, impulsively in the moment, and one’s long term goals, values, or standards). Only after successfully identifying a self-control conflict, would one progress to the second stage of the Two-Stage Model: implementation. Implementation refers to using either one’s willpower or other self-regulatory strategies to resolve the self-control conflict in a way that favors long-term goals, values, or social standards. To date, ego-depletion research has focused only on the implementation of self-control, not on the identification of the self-control conflict.
Consequently, any such underlying mechanisms for an effect of ego-depletion on self-control conflict identification (if such an effect exists) remain unidentified.

In this paper, I propose and test that strong exertions of self-control (ego-depletion) disrupt one’s subsequent ability to identify a self-control conflict. In other words, when in a state of ego-depletion, individuals are less likely to identify that their current behaviors or decisions may conflict with a long-term goal, a value, or a social standard. Specifically, ego-depletion causes low-level construal thinking, which in turn undermines self-control conflict identification. To date, ego-depletion research has largely ignored the effect of ego-depletion on self-control conflict identification, despite conflict identification playing a critical role in nearly all acts of self-control (Myrseth & Fishbach, 2009).

Such a finding would be important for basic and applied research. As self-control conflict identification is a fundamental part of using self-control, the identification of any psychological phenomenon that disrupts this process would have implications across nearly all self-control situations. Moreover, as researchers currently think about ego-depletion solely in terms of disrupting self-control implementation, discovering that ego-depletion also disrupts self-control conflict identification would illuminate a valuable new mechanism linking prior self-control exertion with subsequent self-control failure. This would inform developing theories of ego-depletion and reveal new avenues for understanding and combating the effects of ego-depletion in applied settings.

The introduction of this paper is organized as follows: I begin by reviewing the definition of self-control followed by a general summary of the major theories of self-control. This is followed by specific reviews of ego-depletion (self-control strength) and the Two-Stage Model of self-control, as these ideas are central to the theory presented in this paper. Next, I review the
indirect evidence for and against the idea that ego-depletion undermines self-control conflict identification. I then provide a more detailed description of my theory while highlighting the importance of construal level as an intermediating mechanism.

**Defining Self-Control**

Even a cursory review of the self-control literature would reveal widespread disagreement over the definition of the term. Definitions used by researchers range from delaying gratification to any use of the active self. It is beyond the scope of this paper to resolve this taxonomical crisis. For present purposes, I define a self-control conflict to refer to situations where current behaviors may undermine long-term goals, values, or social standards (Myrseth & Fishbach, 2009). Thus, for the current investigation, self-control can be operationalized as intentionally modifying current behavior to bring it in line with long-term goals, values, or social standards.

This conceptualization is broadly consistent with those used by other theorists. For example, many authors (e.g., Ainslie, 1975; Hoch & Loewenstein, 1991; Mischel, 1974; Rachlin, 1995) define self-control as the preference for larger delayed rewards over smaller, but immediate rewards (i.e., delay of gratification). Others use broader and varied definitions such as substituting a dominant response with a subdominant response (e.g., Schmeichel, Vohs, & Duke, 2011). These “subdominant” responses often reflect behaviors that pose less immediate satisfaction, but are consistent with high-level values, social standards, or better facilitate long-term goals. Similarly, Fujita (2011) defined self-control as resolving dual motive conflicts between the desire to feel good in the moment and higher-level motivations based on values or goals.

Other definitional approaches to self-control emphasize a conflict between automatic vs.
effortful control over behavior (e.g., Baumeister, & Heatherton, 1996; Fujita, 2011; Muraven & Baumeister, 2000). According to these perspectives, self-control is defined as overriding an automatic impulse or urge so to behave in a way that favors long-term goals, values, or social standards. According to these approaches, such actions require the exertion of cognitive effort, which according to some theories is limited in supply (e.g., Muraven & Baumeister, 2000). A final group of definitions emphasize the role of overriding emotions in self-control (e.g., Metcalfe & Mischel, 1999). According to these theories, self-control refers to conscious control over the emotional aspects of decision-making, particularly as they relate to resisting affectively tempting choices that may compromise long term goals. Thus, most definitions share that self-control involves modifying behaviors, thinking, and/or emotions to act in a way that is congruent with long-term goals, values, or social standards.

Major Theories of Self-Control

Intellectual discussion about self-control is extant. For example, the concept of *akrasia*, or command over oneself was central in Plato’s *Protagoras*. In the early days of formal psychological discourse, William James (1898; 2004) emphasized the role of attention in self-control. Indeed, James viewed the regulation of attention toward long-term rewards and away from immediate attentions and emotional desires as central to self-control. Later Sigmund Freud (1959) emphasized the role of conscious and unconscious (but effortful) processes in overriding unacceptable urges and impulses as his model for self-control.

Even in classic theories of self-control, the role of identifying a self-control conflict was important. For example, Freud (1959) suggested that a primary role of the conscious mind (the *ego*) was to identify and then resolve conflicts between the desires of the emotional *id* and the moral *superego*. This tradition continues, with more modern theories of self-control also
considering the importance of first identifying a conflict between current behaviors and long-term goals, values, or standards. For example, Carver and Scheier (1979; 1982) emphasized the importance of identifying incongruity between present states of being and desired states of being in self-control as do Myrseth and Fishbach (2009) even more recently.

However, experimental accounts of self-control have progressed much since the days of Freud and James and this research supports the importance of identifying self-control conflicts in effectively using self-control. The modern experimental investigation into self-control in social psychology is largely traceable to the work of social psychologist Walter Mischel and colleagues with a series of landmark studies in the 1960’s and 1970’s on the delay of gratification in children. The most famous of these experiments are collectively referred to as the “Marshmallow Experiment” with the original experiment taking place at Stanford University in 1970 (Mischel & Ebbesen, 1970). In these experiments, children of various ages were separately asked to wait at a table in a private room. The experimenter would place a marshmallow in front of them and present them with a choice: they could eat the marshmallow immediately, or, if they waited to eat the marshmallow until the experimenter returned in an undefined amount of time, they would be rewarded with a second marshmallow.

Although the purpose of the original experiment was to explore the techniques children use to delay gratification, a strong theory soon developed that emphasized the role of attention in self-control. This theory eventually became known as the “Hot/Cool system of self-control” (see Metcalf & Mischel, 1999; Mischel, Shoda, & Rodriguez 1989). According to this theory, there are two types of processing: the “cool” or “know” system that operates slowly, thoughtfully, reflectively, and is goal-driven, and the “hot” or “go” system that is impulsive, stimulus driven, emotional, and fast. The hot system acts reflexively with immediate desires and produces
appetitive drive toward a tempting stimulus. The cool system is less influenced by present emotional states and guided by future goals and values and thus creates drives more in line with those goals. In part, the role of the cool system is to consider behavior in the context of long-term goals, and increase the salience of the discrepancy between certain current behavioral choices and long-term goals. In other words, the cool system reflects on behaviors to identify self-control conflicts, whereas the “hot” system does not consider this, but acts on immediate desire. Consequently, “hot” system activation is associated with self-control failure, and “cool” system activation is associated with self-control success (Metcalf & Mischel, 1999; Mischel, Shoda, & Rodriguez 1989; Mischel & Baker, 1975; Mischel, Ebbesen, & Raskoff, 1972; Mischel, 1974; Mischel, 1989).

The importance of self-control conflict identification is clearer in the discrepancy-reducing feedback loop model, sometimes called the Test-Operate-Test-Exit model or “TOTE” model of self-control proposed by Carver and Scheier (1979; 1982). According to the TOTE model, people begin by setting a standard or establishing a goal for themselves. They then test to see if they are currently meeting that standard or goal. If they are, they exit the feedback loop and take no action, if they are not meeting this standard, they then operate or engage in actions to reduce the distance between where they are and the standard they want to meet. They then test again to see if they are now meeting the standard, if they are not, they operate again, if they are, they exit, i.e., take no further action. To illustrate this model, consider a dieter trying to reach a weight goal. He or she begins by setting a goal or standard for himself or herself (e.g., “I want to weigh 115lbs”). He or she then tests by using a bathroom scale to identify the amount of discrepancy between his or her current state and his or her desired state (e.g., “I weigh 130lbs, I need to lose 15lbs). He or she then engages in an operation to reduce the discrepancy (e.g., diet
and exercise). He or she periodically retests herself or himself by weekly weighing. He or she continues to operate until he or she reaches a point where there is no discrepancy between his or her desired state and actual state (e.g., he or she weighs 115lbs). He or she may continue to test himself or herself regularly to verify he or she is continuing to maintain his or her desired state. If he or she is, he or she will take no further action beyond normal behavior (i.e., he or she will exit), if he or she is not, he or she will once again operate (e.g., further reduce his or her calorie consumption).

This model enjoys general support. For example, research reveals that clear and specific standards, which are essential for the TOTE process, facilitate self-control (e.g., Gollwitzer & Brandstatter, 1997; Locke & Latham, 2006). Similarly, interventions that enhance self-monitoring also improve self-control (e.g., Vohs & Schmeichel, 2003). Since its publication, the TOTE model has had a significant impact on the field. Indeed, research on self-control and self-regulation grew rapidly following the publication of this model (Vohs & Schmeichel, 2007).

The idea presented in this paper that ego-depletion may disrupt conflict identification would be similar to the idea that ego-depletion could affect the “test” phase of the TOTE model. Although the testing phase of the TOTE model refers generally to comparing one overall current state to a desired state, not specifically comparing one current behavior to a goal, value, or standard, the concepts are very similar. Indeed, I expect that part of the overall test process involves a comparison of one’s current behaviors to those behaviors that foster reaching one’s desired state. For example, in the case of the dieter from earlier, during the test phase, he or she would most likely weigh himself or herself in addition to taking stock of his or her general dietary choices. To date, the vast majority of ego-depletion research has focused on how prior acts of self-control influence the operate stage. But what effect, if any, might ego-depletion have
on the testing phase of the TOTE model; in other words, how could ego-depletion disrupt self-control conflict identification?

Fujita (2008) argued for a construal-level model of self-control that may help better elucidate the testing process and reveal a mechanism through which ego-depletion may have an effect on conflict identification. According to construal theory (Trope & Liberman, 2003), individuals can think about the same situation (e.g., making a list of chores) in either simple, concrete terms (e.g., writing things down) or in higher-level, abstract terms (e.g., getting organized). These different mindsets could impact self-control. In Fujita’s (2008) model, self-control (goal/value/standard oriented behavior) is most likely to occur when one mentally construes a situation in higher level, abstract terms; whereas self-control failure occurs when one mentally construes a situation in low level, concrete terms. Empirical support for a link between high-level construal and self-control success is robust (e.g., Chiou, Wu, & Chang, 2013; Fujita, 2008; Fujita & Carnevale, 2012; Fujita & Han, 2009; Fujita Troupe, Liberman, & Levin-Saga, 2006; Kwitoski, 2011; MacGregor, 2012; Malkoc, Zauberman, Bettmen, & 2010; Roberts, 2011; Schmeichel & Vohs, 2009). According to this model, high construal increases the accessibility of goals, values, and standards; this facilitates identifying if and how one’s current behavior may conflict with those goals, values, or standards. Thus, if ego-depletion affects construal level, this could cause people to fail to identify conflicts between their behavior and higher-level goals, values, and standards.

**Ego-Depletion or the Strength Model of Self-Control**

The view of self-control as a limited resource that diminishes with use has been popular in folk theories of psychology for a long time (Baumeister, Heatherton, & Tice, 1994). In 1996, Baumeister and Heatherton proposed a model of self-control that argued that all acts of self-
control draw from the same limited resource, which they called the “Strength Model” of self-control. They argued for three implications of this model. First, there should be individual differences in self-control strength that are consistent across domains. Second, acts of self-control should create a fatigue effect whereby self-regulatory strength can become temporarily depleted through use, which should affect subsequent efforts to use self-control in all domains. Finally third, it ought to be possible to increase self-regulatory strength over time through practice.

Shortly thereafter, Baumeister and colleagues tested these predictions across two key publications (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Muraven, Tice, & Baumeister, 1998). They demonstrated that exerting self-control causes subsequent failure of self-control on otherwise unrelated tasks, which is a core implication of the Strength Model. This was accomplished using the sequential task paradigm where participants begin by either performing a task that taxes self-control or an equivalently difficult task that does not. All participants then perform a different second task requiring self-control. According to the Strength Model, participants who had to use self-control during the first task should perform worse on the second task than participants who did not use much self-control on the first task, as the prior exertion of self-control would have depleted the former group’s limited self-control resources. For example, participants asked to resist eating a plate of delicious cookies (as opposed to radishes) quit earlier on an anagram persistence task (Baumeister et al., 1998), and suppressing emotions while watching an emotional film caused people to persist less on a test of physical stamina (Muraven et al., 1998). Baumeister and colleagues (1998) named this phenomenon of self-control fatigue the ego-depletion effect. Shortly thereafter, Muraven and colleagues (1999) supported another key implication of the strength model by demonstrating that self-regulatory or “ego” strength can
improve longitudinally with practice. Specifically, they found that college students who spent two weeks performing one of three daily self-control exercises showed significant improvement on a lab based measure of self-control compared to participants who performed non self-control related exercises.

Later, Muraven and Baumeister (2000) published a revised model, which outlined five basic tenets of the self-control strength theory. First, self-control is necessary for executive control or acts of the “active self”. Second, self-control relies on a limited resource. Third, all acts of self-control draw from the same limited resource. Fourth, the likelihood of succeeding at self-control depends on an individual’s current level of self-control resources. Finally, fifth, using self-control depletes (temporarily) the self-control resource. This fifth point is crucial as it distinguishes the limited resource account of self-control from limited capacity models. In limited capacity models (e.g., working memory), one’s ability to perform a cognitive function is limited, but does not fatigue from prior use.

Thus, the core underlying mechanism for the strength model of self-control in early theories was that all acts of self-control draw from a limited cognitive resource that can become diminished with short term use, but adaptively grow larger over time in response to regular use. In general, most research since that time which uses this model has focused on the temporary depletion of self-control (ego-depletion), with only a small number of studies investigating building self-control with practice (See Osgood & Salamone, in press) or individual differences in self-control strength. In the decade that followed the publication of the revised strength model, over 200 experiments were published reporting evidence for the ego-depletion effect, with most studies using the sequential task paradigm. A major meta-analysis of the field concluded that in general, the limited resource model is a useful and valid approach to understanding ego-depletion.
effects (Hagger et al., 2010). More recently, the limited resource model has been extended by recent findings that seem to show various psychological processes may modulate the outcomes. These include personal prayer (Friese & Wank, 2014), the idea of money (Boucher & Kofos, 2012), increased motivation (Muraven & Slessevera, 2003), positive affect (Tice, Baumeister, Shmueli, & Muraven, 2007), decision delays (Osgood & Muraven, 2015a), and acute cardiovascular exercise (Osgood, 2015), among others. Perhaps the most challenging of such findings is that lay beliefs about willpower moderate the ego-depletion effect (Clarkson, Hirt, Jia, & Alexandra, 2010; Job, Dweck, & Walton, 2010; Job, Walton, Berneker, & Dweck, 2013). These studies found that the ego-depletion effect only occurred in individuals who believed that willpower is limited. This finding is difficult to reconcile with a limited resource account of ego-depletion and suggests an approach emphasizing cognitive, emotional, and motivational effects of ego-depletion. For instance, perhaps there is not a limited resource, but people tend to use self-control as if it were a limited resource.

Thus, a major task for ego-depletion researchers over the next several years will be to relate new findings in ego-depletion research to new theoretical developments in self-control. One such general model of self-control is the “Two-Stage Model” (see Fishbach and Wooley, 2015). According to this model, successful self-control requires first identifying the need to use self-control (i.e., identifying a conflict between current behavior and long term goals, values, or standards) then successfully implementing a strategy or effort to resolve that conflict. Thus, self-control failure could result from either failure to identify a conflict, or from failure to implement self-control. Although the field of research on ego-depletion is vast, to date, it has focused almost exclusively on the implementation of self-control. In fact, in most ego-depletion research, self-control conflict identification is obviated by the researchers instructions, which highlight the
conflict for the participant (e.g., “Do not eat those cookies” “Resist the urge to think about a white bear” “State the color of the word, not the color written” etc.). Consequently, participants in these studies need not actively consider their own values or goals when making task decisions; they need only implement the specific instructions given to them. This represents a major shortcoming in the existing ego-depletion literature. In most real world situations, people do not have the convenience of a coach explicitly telling them what is and is not in their best interest and must therefore identify this for themselves. Thus, despite over 15 years of research, it is still uncertain how ego-depletion effects may effect the typical situation where the best response is not immediately obvious.

**Two-Stage Model of Self-Control**

The Two-Stage Model argues that when facing a temptation, individuals must first identify a conflict between current behaviors or choices and long-term goals, values, or standards (Myrseth & Fishbach, 2009). That is, they must first recognize that their current behavior (or potential behavior) could be inconsistent with a long-term goal (e.g., eating cake while on a diet), a value (e.g., stealing from the church coffer), or a social standard (e.g., making a racist remark).

According to the Two-Stage Model, several factors influence the likelihood of identifying a self-control conflict (Fishbach & Wooley, 2015; Fishbach & Myrseth, in press; Myrseth & Fishbach, 2009). First, the probability of identifying a self-control conflict decreases as the perceived cost (to long term goals) associated with a single indulgence decreases. Researchers have coined this *epsilon-cost temptation* (Myrseth & Fishbach, 2009). Myrseth and colleagues (2009a; 2015; in press) argue that mental framing of a temptation is critical for determining if one will view the cost of indulging as high (or low) and thus identify (or fail to identify) a self-
control conflict. Specifically, they argue that at least two factors (and possibly more) influence this mental framing and thus moderate self-control conflict identification.

The first of these framing characteristics is called *width* and refers to the extent to which individuals view their tempting act as multiple opportunities together (wide frame) or as only a single act (narrow frame) (Myrseth & Fishbach, 2009). That is, it is easier to identify that a choice would conflict with a goal, value, or standard, if one is making many choices all together than one at a time. For example, Read, Loewenstein, and Kalyanaraman (1999) asked participants to choose between two kinds of lottery tickets: one offering smaller, immediate payouts, and another offering larger, but delayed payouts. This represents the classic delay of gratification paradigm and a conflict between immediate desires and long-term benefits. When participants were asked to choose only one ticket at a time, they tended to favor a short-term payout. However, when asked to choose all of their tickets at once, they favored the larger, but later reward. Similarly, dieters make better food choices when planning meals for an entire week than when selecting only a single meal or single snack (Kudadjie-Gyambi & Rachlin, 1996; Read, Lowenstein, and Rabin, 1999).

In another study, Sheldon and Fishbach (cited in Myrseth and Fishbach, in press) tested wide versus narrow frames in self-control conflict identification more directly. They asked participants to rate their willingness to engage in a variety of ethically ambiguous workplace practices (e.g., downloading copyrighted material, using sick-days for vacations.). When participants were asked to rate these actions one at a time on separate screens (narrow frame), they were more likely to endorse the questionable behavior than if they were asked to rate them all at one time, on one screen. In a field test of this theory, participants approached a food cart offering both healthy and unhealthy snacks (Myrseth and Fishbach, in press). The sign on the
cart either read “Spring Food Stand” (to induce wide frame thinking) or “April 12 Food Stand” (to induce narrow frame thinking). Participants approaching the “Spring Food Stand” were more likely to choose healthy snacks than those approaching the “April 12 Food Stand”.

The second of these framing characteristics is consistency (Myrseth & Fishbach, 2009). Consistency means that an individual expects similarity in his or her behavior across several opportunities. If an individual views his or her current decision as an isolated incident (unlikely to lead to similar acts in the future), he or she is less likely to identify his or her current behavior as conflicting with his or her long-term goals. Rather, the individual must expect that he or she will make a similar choice each time he or she faces the temptation. Myrseth, Fishbach, and colleagues (Fishbach, Dhar, & Zhang, 2006; Fishbach & Zhang, 2008; Myrseth and Fishbach, 2009) suggested that when someone is facing a choice dilemma between a temptation and a goal, he or she could follow one of two “choice dynamics”. He or she can either highlight the goal, or highlight a balance between the goal and the temptation (Fishbach, Dhar, & Zhang, 2006; Fishbach & Zhang, 2008). If he or she highlights the goal, he or she will forego temptation in favor of goal-consistent choices. However, when pursuing a “balancing” dynamic, one often postpones goal pursuit in favor of instant gratification, thinking that one will “enjoy now and work on their goal later” (Myrseth and Fishbach, 2009).

Fishbach and Zhang (2008) tested this hypothesis using a set of dieting participants. They presented participants with a snack option of either carrots or chocolates. The options were either placed in separate bowls (highlighting the conflict between the two) or together in the same bowl (highlighting balancing between the two and making the conflict seem less severe or obvious). Participants were more likely to consume unhealthy chocolates when they were presented in the same bowl carrots than when the chocolates and carrots were placed in separate bowls.
Another study investigating consistency in self-control conflict identification investigated the effect of psychological connectedness on identifying ethical dilemmas (see Myrseth and Fishbach, in press). Psychological connectedness is the extent to which individuals see their current self as similar and connected to their future self and therefore their current behaviors as predictive of their future behaviors. Sheldon and Fishbach (cited in Myrseth and Fishbach, in press) manipulated participants’ psychological connectedness with a priming exercise and then placed those participants in a room with two stacks of papers they were asked to proofread. One stack contained short, easy papers, whereas the other contained long and difficult papers. Participants were asked to read eight papers and to flip a coin each time to determine which paper they should read. Thus, participants were faced with a dilemma on some trials: to read the difficult papers, or lie and say the coined indicated to read a short, easy paper. Participants primed with “low connectedness “ were generally more likely to report higher than chance short paper coin-flips than “high connectedness participants”.

The Two-Stage Model thus provides specific predictions and evidence for factors that should influence conflict identification. Both width and consistency operate by increasing the saliency of goals, values, or social standards, and the saliency of the threat that one’s current behaviors poses to them. However, width and consistency are likely not the only factors that moderate the identification of a self-control conflict. Indeed, recent research (Fishbach & Wooley, 2015; Toure´-Tillery & Fishbach, 2012) has identified other closely related concepts such as how self-diagnostic of behaviors the choice is as facilitating conflict identification.

Thus, in recent years researchers have identified numerous factors that influence self-control conflict awareness; however, researchers have largely ignored the effect of ego-depletion on conflict identification. Despite this, a variety of closely related findings provide indirect
evidence both for and against a hypothesis that ego-depletion disrupts conflict identification. That is, some findings indirectly suggest that ego-depletion may undermine conflict identification, whereas other findings suggest that ego-depletion ought not disrupt conflict identification. These conflicting findings highlight the importance of identifying an underlying mechanism for the relationship between ego-depletion and conflict identification (if such a relationship exists) so to explain the apparently contradictory evidence. Indeed, leading proponents of the Two-Stage Model have recently called for researchers to investigate the effect of ego-depletion on conflict identification (Myrseth & Wollbrant, 2015).

**Ego-Depletion and Self-Control Conflict Identification**

Evidence suggesting ego-depletion reduces conflict identification. Baumeister and Heatherton (1996) suggested (but did not test) that prior exertions of self-control might compromise a self-regulatory function they called *transcendence*. Transcendence (as described by Baumeister & Heatherton, 1996) is similar to conflict identification. It refers to looking beyond the immediate stimuli to view the current situation in terms of more distal concerns (goals, values, societal standards, etc.). Thus, Baumeister and Heatherton (1996) supplied a terse theoretical nod to the possibility of a relationship between ego-depletion and conflict identification, but neither elaborated on any mechanisms nor empirically tested the idea.

Indirect empirical evidence that ego-depletion may compromise self-control conflict identification are the many findings that ego-depletion slows reaction time on the Stroop task (Hagger et al., 2010). Stroop reaction time is a partial indicator of task monitoring (Robinson, Schmeichel, and Inzlicht, 2010). Furthermore, Stroop reaction time is also related to activity in the anterior cingulate cortex, which is a brain region thought to be involved in conflict identification (Riesel et al, 2013). This suggests that slower Stroop reactions may indicate
delayed conflict identification. However Stroop data on their own are inconclusive as a diagnosis of ego-depletion and conflict identification as the Stroop task is primarily a test of the implementation of inhibitory control, not the identification of a self-control conflict. Moreover, need for conflict identification is minimized in the Stroop paradigm as the participant is given very specific instructions on how to respond.

Better evidence of an effect is found in the relationship between ego-depletion and self- and task-monitoring/awareness. Several studies report that manipulations that increase self-awareness also counteract ego-depletion (e.g., Alberts, Martijin, & Vries, 2011). For example, Wan and Sternhal (2008) found that the effect of ego-depletion on a physical persistence task (handgrip) was smaller when participants were given a clock so they could monitor their performance. Moreover, giving participants a clock running fast made all participants give-up sooner. Another study (Trudel & Murray, 2010) found that depleted people ate less chocolate if given calorie information. Finally, Alberts and colleagues (2011) found that a self-awareness priming activity counteracted the effect of ego-depletion on a handgrip persistence task.

In each of the preceding studies, the authors argue that ego-depletion causes motivational loss that can be overcome by increased self-awareness or task monitoring. For example, Wan and Sternhal (2008) argued depletion causes people to fixate on the fatigue caused by the task, which increases the perceived difficulty of the task. This is demotivating. But a clock distracts them from the energy they are spending, causing them to focus instead on the progress they are making, which increases their motivation. Alberts and colleagues (2011) argue that increasing self-awareness increases the personal importance of performing well, which increases motivation.
Although none of these authors explicitly interpret their findings to mean that ego-depletion disrupts the ability to identify a self-control conflict, these results are also interpretable in this way. For example, perhaps ego-depletion caused the participants in the chocolate study to not think as much about their long term weight loss goal; thus, when offered cake, they did not immediately think about how this might jeopardize their health. However, when provided with calorie information, this may have reminded them of just how harmful cake could be to their goal, and prompted them to identify the conflict.

Although these findings offer indirect support that ego-depletion disrupts conflict identification, they do not do so conclusively, given that the interventions could have facilitated the implementation stage of self-control, such as by boosting motivation. Indeed, the dependent measures in those studies required both identification and implementation of self-control, thus it is not fully clear which stage of self-control was facilitated with the intervention. What is still needed is a dependent measure that captures only self-control conflict identification, but not (or only minimal) implementation. Measures such as handgrip squeezing primarily capture how well one can implement self-control, particularly as the experimenter provides specific instructions to “squeeze as long as you can” thus obviating the need to determine if attempting to squeeze is relevant or important. Yet, it is entirely possible and likely that the fatigue and energy-expenditure focused thinking caused by ego-depletion may cause not only the perception of the task as more difficult but also reduce the attention paid to the link between current behavior and goals, values, or standards.

Related to self-awareness, the results of several studies suggest that inducing a high level of mental construal counteracts ego-depletion (Schmeichel and Vohs, 2009; Agrawal and Wan, 2009). High-level construal is thought to facilitate self-control, in large part by boosting
awareness of self-control conflicts (Schmeichel, Vohs, and Duke, 2011). Again, the authors did not explicitly argue (or test) that ego-depletion undermines self-control conflict identification or that high construal restores one’s ability to identify a conflict following ego-depletion; however their results would be consistent with such a hypothesis. Rather the authors more simply argue that high level construal improves self-control and therefore may be a strong enough to compensate for ego-depletion as a “universal self-control booster” (Schmeichel & Vohs, 2009, pg. 771).

The final source of evidence that ego-depletion disrupts conflict identification comes from the field of social-neuroscience. Two studies utilizing electro-encephalograph (EEG) measured event related negativity (ERN) in ego-depleted (and non-depleted controls) participants during a self-control task (Inzlicht & Gutsell, 2007; Wang, Yang, & Wang, 2014). The ERN indicates activity in the anterior cingulate cortex (ACC) and is thought to reflect self-control conflict identification and monitoring (Riesel et al., 2013). Specifically, the ERN occurs following actions that conflict with a goal, standard or value. Both studies found reduced ERN in ego-depleted participants (compared to control participants), suggesting reduced conflict-awareness. However, this is still only indirect evidence as behavioral measures of conflict identification were not taken and there is debate regarding the exact function of the ACC in conflict identification and the interpretation of the ERN (see Inzlicht & Al-Khindi, 2012).

Evidence suggesting ego-depletion does not reduce conflict identification. Although the previously discussed neuroscience results support a link between ego-depletion and decreased conflict awareness, the first line of evidence suggesting that ego-depletion does not disrupt conflict identification also comes from social neuroscience. Specifically, two recent studies utilizing functional magnetic resonance imaging (fMRI) failed to uncover an effect of
ego-depletion on subsequent ACC activity (Friese, et al., 2013; Hedgcock, Vohs, & Rao, 2012). For example, Hedgcock and colleagues (2012) found that ACC activity did not differ significantly between ego-depleted and control participants on a self-control task where they were asked to make a series of choices.

However, the authors did not actually include any behavioral measures of ability to identify a conflict; they simply monitored brain activity while performing a self-control activity. As previously mentioned, the exact function of the ACC is still debated. Thus, although Hedgcock and others (2012) argue that their results suggest that ego-depletion does not disrupt self-control conflict identification, this is not certain. Still, this result has led some to conclude that ego-depletion does not cause failure to identify a conflict, thus creating a controversy (see Fishbach & Myrseth, 2015).

Overall, evidence is mixed as to whether ego-depletion disrupts self-control conflict identification. In order to settle this issue, one would need to test the effect of ego-depletion on self-control identification directly by using a behavioral measure of conflict identification that did not also require large amounts of self-control implementation. Finally, a clear theory that identifies the underlying mechanisms linking ego-depletion to failure to identify a self-control conflict is needed. To date, all of this is absent from the literature.

**The Present Theory**

I propose that ego-depletion undermines the ability to identify a self-control conflict. By self-control conflict, I refer to when one’s current behavior (or possible behavior) is (or would be) inconsistent with a long-term goal, value, or social standard. Furthermore, I propose that the underlying mechanism of this effect is a change in construal level of thinking (see Figure 1). Ego-depletion induces a low level of mental construal, which in turn reduces the degree to which
people consider their current behavior in terms of goals, values or standards. Thus ultimately making self-control conflict identification less likely.

**Step One: Ego-Depletion Causes Low-Level Construal.** Construal Level Theory posits that the same action can be cognitively represented (construed) at different levels of abstraction (Trope & Liberman, 2003). Specifically, Troupe and Liberman (2003) argue for two levels of mental construal: high and low. High-level construal constitutes more abstract thinking that emphasizes the central features of a situation or choice. High-construal thinking is characterized as abstract, decontextualized, superordinate, and goal relevant. On the other hand, low level construal thinking focuses on more concrete, contextual, and incidental features. Low-construal thinking is characterized as concrete, contextualized, subordinate, and goal irrelevant. Any action can be construed at either a high or low level. For example, someone reading a book can construe the act in high-level construal (e.g., “expanding my knowledge”) or at a low level (e.g., “reading words on a page”). Originally, researchers thought construal level was caused specifically by psychological distance, but subsequent research has found that psychological distance is not the only factor influencing construal level (Fujita, 2008).

Most relevantly, multiple studies have shown that engaging in self-control (ego-depletion) causes low-level construal (e.g., Argwal & Wan, 2009; Bruyneel & DeWitte, 2012; Vohs & Schmeichel, 2003; Wan & Agrawal, 2011). Relatedly, others have found that high construal counteracts ego-depletion (e.g., Schmeichel & Vohs, 2009), which further suggests a link between ego-depletion and low-construal.

Wan & Agrawal (2011) describe, in detail, how ego-depletion may cause low-level construal as ego-depletion prompts feelings of fatigue and resource constraints. Indeed, using self-control activates brain regions associated with perceiving a resource cost (Kool et al., 2013).
and people “conserve” self-control if they expect to need use of it again (Muraven, Shmueli, & Burkley, 2006). This perception generally occurs regardless of whether an actual resource is being constrained (Kool et al., 2013). Similarly, ego-depletion causes one to focus on the expenditure of energy and the passage of time, leading time to appear to pass more slowly (Vohs & Schmeichel, 2003; Wan & Sterthal, 2008). Resource concerns and fixations on highly contextual factors such as the passage of time are related to lower level construal; thus fixating on fatigue and resource constraints induces a low level of construal (Troup & Liberman, 2003). Indeed, Wan & Agrawal (2011) demonstrated that ego-depletion leads to fixation on fatigue, resource concerns, and other highly contextualized information, which, in turn induced a general state of low construal.

Furthermore, MacGregor (2012) describes how self-control dilemmas encourage low-level construal in general. This is because the temporal and physical proximity of the choice (e.g., the cake is right in front of you and can be eaten now) highlights those highly salient features of the choice and situation that are goal irrelevant (e.g., one’s hunger pangs and the decadence of the chocolate frosting). Metcalfe and Mischel (1999) referred to this as “hot” processing and found that it is typical in self-control dilemmas. Thus, because these contextual features are more salient than goals during imminent self-control challenges, these situations foster low-level construal, which compromises self-control. Moreover, there is very low psychological distance between the individual and the temptation, which encourages low-construal (Troup & Liberman, 2003). In order to decrease the pull of the temptation, people must override the typical association between proximity and low-construal to adopt a higher level construal mindset that considers current behavior in terms of values, standards, and goals.
Macgregor (2012) demonstrated empirically that ego-depletion undermines one’s ability to override this automatic association.

Thus, the relationship between ego-depletion and low-construal level enjoys some empirical support. Moreover, there appear to be two main mechanisms of this effect: focusing on fatigue and other contextual factors, and inability to override an automatic association between characteristics common to self-control dilemmas and low-construal. As Macgregor (2012) points out, self-control situations often involve highly salient features that cue immediate gratification, whereas features related to long term goals are less salient. Thus, to identify a conflict, one must break the typical association between self-control situations and short-term thinking. In many cases, people are able to do this. Unfortunately, ego-depletion creates a fixation on proximal features of the situation (Vohs & Schmeichel, 2003; Wan & Sterthal, 2008), which could make it less likely that ego-depleted people would notice the less salient, distal, conflict between current behavior and values, long-term goals, or standards.

**Step Two: Low Level Construal Causes Conflict-Identification Failure.**

Construal level is widely thought to be central to self-control and much research supports that high level construal generally promotes better self-control. Indeed, some theories view self-control primarily through the lens of construal level (e.g., Fujita, 2008). In general, the literature supports a link between high-level construal and successful self-control (e.g., Chiou, Wu, & Chang, 2013; Fujita, 2006; Fujita, 2008; Fujita & Carnevale, 2012; Fujita & Han, 2009; Kwitoski, 2011; MacGregor, 2012; Malkoc et al., 2010; Roberts, 2011; Schmeichel & Vohs, 2009; Schmeichel, Vohs, & Duke, 2011). Furthermore, recent work suggests that high level construal facilitates self-control by improving self-control conflict identification specifically (e.g., Fujita, 2006; Fujita, 2008; MacGregor, 2012 Schmeichel, Vohs, & Duke, 2011).
Several authors delineate how this process occurs (e.g., Fujita, 2006; Fujita, 2008; MacGregor, 2012 Schmeichel, Vohs, & Duke, 2011; Torelli & Kaikati, 2009). In general, goals, values, and standards represent high level, abstract concepts and are core aspects of high (vs. low) construal thinking. In other words, as goal-related information is abstract and more easily accessible at higher levels of construal and less accessible when thinking at a low level of construal. As high level construal increases people’s awareness of goal-relevant implications of their choices, it also increases their ability to identify conflicts between goals, values, and social standards, and current behaviors (Fujita & Carnevale, 2012). Long-term goals and values are high level concerns and are thus cognitively activated at a high level of construal; immediate desires are low-level concerns and cognitively activated at a low-level of construal. So, if someone is operating at a low level of construal, he or she will likely think about his or her choices/current behavior in terms of immediate desires, not long-term goals or values (Eval, Lieberman, & Trope, 2008; Fujita et al., 2006). In fact, the mindset described by many two-stage theorists as important for conflict awareness (“wide-frame thinking” and “consistency focused thinking) are very similar to construal level. For example, both width and consistency can be conceptualized as thinking about self-control dilemmas from a greater psychological distance.

Consistent with this, researchers find greater consistency between values/goals/standards and behavior at higher levels of construal (Eyal, Sarigistano, Trope, Liberman, & Chaiken, 2009; MacGregor, 2012; Liberman et al., 2002; Torelli & Kakati, 2008). For example, in two experiments, Fujita and colleagues (2006) demonstrated that people are less likely to define their current behaviors in terms of long-term goals, values, or standards when taking a low level construal perspective. First, in one study (Fujita et al., 2006: Experiment Four) participants were asked to evaluate words that conflicted with the high level goal of getting good grades (e.g.,
drinking, partying, etc.). Those primed with high-level construal thinking evaluated these words less positively than those primed with low-level construal. This suggests that people having a high-level construal were more able to identify the conflict between these words and the long-term goal of academic success. People operating at a low-level construal did not think about how these activities could compromise long-term goals and therefore did not identify the conflict, and evaluated these words positively. In a second study (Fujita et al., 2006; Experiment Five), participants operating at a high level of construal reported that they would feel worse about giving in to a temptation that compromises a long term goal (e.g., eating cake while on a diet) than those at low level of construal. One explanation of this effect is that high level construal people are more likely to view this action as a greater threat to their long term goals (e.g., “this might lead me to eating more cake”), thus seeing this as a serious self-control conflict whereas low construal people view the behavior as an isolated instance (e.g., “it is only one piece of cake”) and thus not view it as a serious threat to long term goals (i.e., not identify this as a serious self-control conflict).

Thus, to recapitulate the present model, I propose that ego-depletion can cause failure to identify a self-control conflict. Furthermore, I speculate that the mechanism through which this occurs is a change in construal level. That is, ego-depletion has been shown to induce low-level construal, which in turn has been shown to disrupt conflict identification. To illustrate this effect, imagine a participant in a social dilemma study where they must choose whether to share a jointly earned resource with a partner or to greedily keep it for oneself. The participant would thus face a self-control conflict as keeping the resource for oneself would represent an immediate reward at the expense of one’s greater values and long-term goal of maintaining a positive self-concept as a moral person. The current model suggests that if the participant were ego-depleted,
he or she would be less likely to consider the larger ramifications that keeping the resource for oneself would have on their larger values and long-term goal of being a moral person. Rather, he or she would view this as an isolated instance and not consider it with respect to these values or goals. In other words, he or she would operate at a low level of construal and thus not identify the self-control conflict in front of himself or herself. This could cause him or her to keep more of the resource for himself or herself. This interpretation would also be consistent with a recent finding by Osgood and Muraven (2015b) who showed that ego-depletion does not directly increase selfish attitudes, but does diminish economic resource sharing.

To date, the effect of ego-depletion on conflict identification has not been directly tested. If such an effect exists, it would have widespread implications for both basic and applied work in ego-depletion and self-control more broadly as identifying a self-control conflict is a basic component of using self-control and thus applies broadly to all or nearly all self-control situations. In sum, the effect of ego-depletion on construal level as well as the effect of construal level on conflict identification are empirically supported. However, these effects have not yet been linked together into one process; in fact, whether or not ego-depletion compromises the ability to identify a self-control conflict at all has not been tested.

The Present Research

Two experiments tested the theory presented in this paper. The purpose of Study One was to establish a causal connection between ego-depletion and decreased awareness of a self-control conflict. Importantly, Study One sought to accomplish this using a dependent variable that measures conflict identification without requiring any (or only very minimally) implementation of self-control. Study Two was intended to implicate conflict identification as a mediator between ego-depletion and behavioral self-control failure; Study Two was also intended to
implicate construal level as the key underlying mechanism of the effect of ego-depletion on self-control conflict identification by manipulating construal level.

**Pilot Study**

The purpose of the pilot study was to demonstrate that the ego-depletion manipulation used in Study One and in Study Two could work effectively in an online format. The concern was that participants would not follow the typing task instructions correctly without an experimenter present. To that end, participants were recruited online to complete an ego-depleting typing task or a non-depleting version of the typing task. Participants then completed the Stroop task (Stroop, 1935), which is sensitive to ego-deletion (Hagger et al., 2010).

**Participants and Design**

Data collection was conducted online using Inquisit software. 128 participants (54 female; mean age = 33.9), were recruited through Amazon.com Mechanical Turk (MTURK.COM). A website error caused the data for one participant to become lost. As such, data for 127 participants were completely collected for the experiment. MTURK.COM allows researchers to use Amazon.com to recruit participants for online experiments in exchange for a small fee and payment to each participant for their time. MTURK.COM also allows researchers to set participation guidelines to ensure only high-quality participants. To ensure that only high-quality participants were used, enrollment in the experiment was limited to only those MTURK.COM users who had received at least a 90% approval rate based on a minimum of 50 previously completed tasks on MTURK.COM. Participants were paid $1.00 for their successful completion, as the entire experiment could be completed in only 10 minutes or fewer. This form of recruitment offers several advantages. Namely, it allows for a sample that is relatively more representative of the entire population than the undergraduate subject pool, substantially faster
data collection, and larger sample sizes. Several recent empirical analyses of the strengths and weaknesses of MTURK.COM samples have concluded that MTURK.COM samples are of comparable or better quality than undergraduate subject pools if care is taken to screen out low-quality MTURK.COM participants (Paolacci & Chandler, 2014) and are more representative of the national-population than undergraduate convenience samples (Berinsky, Huber, & Lenz, 2012). Furthermore, research testing classic psychological effects using MTURK.COM versus undergraduate students on the same experiments report equivalent results (Goodman, Cryder, & Cheema, 2013). Further, these researchers recommend the usage of MTURK.COM (with restrictions to screen out low-quality participants) for computer experiments where minimal experimenter involvement is needed. Consequently, MTURK.COM has become a popular methodology for collecting data in social-science studies, with over 700 recent articles using MTURK.COM for participant recruitment (Berinsky, Huber, & Lenz, 2012).

**Materials**

**Ego-Depletion Manipulation.** Participants were told to retype a paragraph as quickly and accurately as possible. In the experimental (depletion) condition, participants were asked to type the paragraph without using the letter e or the space bar. This required overriding or inhibiting a well-learned action and has been shown to deplete self-control in previous studies (e.g., Muraven et al., 2006); furthermore, the typing task manipulation (where participants are asked to type a passage while avoiding the use of certain common keys) has been used successfully in past ego-depletion research using MTURK.COM participants (Chow, Hui, & Lau, 2015; Sevincer, Schlier, & Oettingen, 2015; VanDellen, Shea, Davisson, Koval, & Fitzsimons, 2014). Participants in the non-depletion control group typed the paragraph exactly as it appeared. The passages were neutral paragraphs about Brazil nuts. The paragraph included 55
e’s and 104 spaces. Several measures were taken to ensure that participants completed the task correctly. First, both the mouse cursor and “copy” and “paste” functions were disabled by the experimental website for the duration of the typing task. When participants were completing the typing task, the only actions they could take were to either manually type into the text box or quit the experiment (using the “control” + “Q” keys). Second, the participants’ retyped passages were recorded by the website and visually reviewed by the experimenter to verify that all participants followed the instructions correctly. Finally, the website recorded the amount of time participants spent working on the task to determine if any participants completed the task too quickly or too slowly.

**Stroop Task.** All participants then completed a computerized version of the Stroop task (Stroop, 1935) as provided by Millisecond (the creator of Inquisit). For this task, participants were presented with a series of color words which are themselves displayed in various colors. There were three types of stimuli: congruent, incongruent, and control. For congruent stimuli, the font of the word was the same as the semantic meaning (e.g., the word “blue” printed in blue font). For the incongruent stimuli, the font color of the word was incongruent with the semantic meaning of the word (e.g., the word “red” may be displayed in blue font). For the control stimuli, participants were exposed to solid color blocks (e.g., a green square). Participants were asked to identify the font color in which the word is displayed, not the semantic meaning of the word, as quickly as possible by pressing keys on the keyboard that represent each color. Participants performed five practice trials beforehand to ensure that they understood the instructions.

**Manipulation Checks and Self-Reports.** All participants responded to the following manipulation checks on a 7-point Likert scale to verify that those who completed the depletion version of the typing task used more self-control than those who completed the non-depletion
version: “How much effort did you use on the typing task?” and “How much were you trying to control an impulse on the typing task?” Participants also completed a set of demographic questions at the end of the experiment that asked for their race, age, and sex. Participants had the option of declining to answer any of these questions.

**Procedure**

Upon arriving at the experiment website, all participants read and provided informed consent. The website then randomly assigned participants complete either the ego-depletion or no-depletion typing task. Following this, all participants completed the Stroop task. Finally, all participants completed a brief set of self-report manipulation checks and demographic questions. All procedures were approved by the Institutional Review Board at the University at Albany.

**Results**

**Depletion typing task**

Participant’s responses and completion times on the typing task were each reviewed by the experimenter to verify that the participant completed the typing task fully and correctly. Of the 127 participants for whom data were collected, 115 (90.6%) completed the typing task completely (retyped the entire paragraphs) and followed the instructions (i.e., the depletion participants avoided using the excluded keys and the non-depletion participants retyped the paragraphs exactly as they appeared). Of those 115, the non-depletion participants performed the typing task in a mean of 3.1 minutes (SD = 1.6 minutes). Those participants who completed the more difficult depletion version of the typing task took a mean of 4.8 minutes (SD = 2.2 minutes). Z-scores were computed for each participant within their condition to screen for
extreme outliers ($Z < 3$ or $Z > -3$) who completed the task either very quickly or very slowly (suggesting a disengaged participant). No such $Z$-scores were found.

**Manipulation Checks**

The manipulation check responses were recoded such that higher numbers indicate more effort/controlling of impulses. Participants who completed the depletion version of the typing task reported exerting significantly more effort than those who completed the non-depletion typing task (depletion: $M = 5.5$, $SD = 0.9$; non-depletion: $M = 4.8$, $SD = 0.8$), $t(113) = -4.404$, $p < .001$, $d = 0.82$. Similarly, participants who completed the depletion version of the typing task reported greater controlling of an impulse than those who completed the non-depletion typing task (depletion: $M = 5.2$, $SD = 1.7$; non-depletion: $M = 3.3$, $SD = 1.7$), $t(113) = -5.798$, $p < .001$, $d = 1.1$.

**Stroop task**

Stroop task performance (both accuracy and reaction times) is displayed on Table 1 as are statistical tests for between-groups differences. No significant effects were found for either sex or age on any Stroop Task measures. No significant differences were found between those who completed depletion and non-depletion typing tasks on accuracy. However, the effect on ego-depletion on difference in response time from incongruent to congruent trials was marginally significant (see Table 1), with ego-depleted participants actually showing less of a reaction time slowing than non-depleted participants. After statistically controlling for individual differences in control trials response time as a covariate in a repeated measures ANCOVA, the effect of experimental condition on change in response time from congruent to incongruent trials is still marginally significant (albeit closer to traditional significance), $F(1,112) = 3.815$, $p = $
The change in accuracy rate from congruent to incongruent trials did not vary significantly between the experimental conditions, $F (1,113) = 0.552, p = .459, \eta^2 = .005$. However, after statistically controlling for age of the participant, the change in response time from incongruent to congruent was statistically significant $F (1,112) = 4.024, p = .047, \eta^2 = .035$.

Discussion

The purpose of the Pilot Study was to demonstrate that the typing task could be reliably used online as others have used it in the past (e.g., Chow, Hui, & Lau, 2015; Sevincer, Schlier, & Oettingen, 2015; VanDellen, Shea, Davisson, Koval, & Fitzsimons, 2014). Although the change in response time from incongruent to congruent trials did initially not quite reach traditional levels of significance, the effect was significant after controlling for age of participants. This is not surprising. The vast majority of ego-depletion research to date has been conducted using college age samples and ego-depletion may work differently in adults. In fact, a recent paper on age and ego-depletion found that the effects of ego-depletion are much stronger in younger adults than older adults (Dahm, et al., 2012). In light of this research, it seems appropriate to statistically control for age in ego-depletion research. The effect was in the opposite direction than predicted. Ego-depleted participants actually performed significantly better (had less slowing of reaction time on incongruent trials) than non-depleted participants, after controlling for age of participant.

Overall, the Pilot Study clearly demonstrates that the typing task manipulation can be completed reliably online using MTurk participants. Every participant’s response to the typing task was individually read to verify the participant followed directions; over 90% of participants did so. Of those 90%, all of the participants completed the typing task within a reasonable amount of time. Furthermore, the typing task produced very large effect-sizes on self-report
measures of self-control exertion during the typing task manipulation. Specifically, participants who completed the depletion version of the typing task reported working significantly harder to control an impulse and found the task much more difficult than those who completed the non-depletion version of the typing task. Finally, ego-depletion did produce a statistically significant effect on a main measure of Stroop task performance (change in response time).

**Study One**

The present theory predicts that ego-depletion should reduce conflict identification. Moreover, it speculates a very specific reason why: ego-depletion causes a lower level of construal (for reasons elaborated earlier), which reduces the cognitive accessibility of goals, values, and social standards. Several studies (See Custers & Aarts, 2007) have found that if goals, values or social standards are cognitively accessible, then the mind will identify a self-control conflict when exposed to goal-discrepant information and will then automatically activate instrumental concepts that can counteract that goal discrepant threat. For example, if a person has the goal of losing weight and this goal is temporarily or chronically cognitively accessible, then being exposed to a goal discrepant stimulus (e.g., a donut) will cue a goal-conflict and the mind will activate instrumental concepts that could help to resolve that conflict (e.g., seeking alternatives to donuts such as a salad). So after being cued with a donut, dieters will have easier accessibility to the concept of “salad”, but only if their dieting goal is easily accessible and thus the inherent self-control conflict is identified. Consequently, these instrumental concepts are more salient (primed) during subsequent tasks. Using this theory, Custers and Aarts (2007) developed an implicit measure of self-control conflict awareness. In their experiments, participants were exposed to sentences that violated common goals or norms. For example, the sentence “The shoes are dirty.” violates the social norm to maintain cleanliness.
If participants identify the conflict between that situation and the norm to be clean, this should prime instrumental actions to resolve the conflict (e.g., “polish”). To test this, participants were shown sentences, some of which implied goal conflicts, and were then shown a probe word and asked to identify whether the word was present in the sentence. Some of these words represented instrumental concepts that could resolve the latent conflict in the cued sentence (e.g., “polish”). Participants for whom the social norm of cleanliness was more accessible (and therefore likely to identify a self-control conflict between the situation described in the sentence and the social norm) showed greater sensitivity to instrumental words that could resolve that conflict. Specifically, they showed slower reaction times and increased likelihood of erroneously identifying the word as having been present in the sentence. This suggests that they were confusing what they read with what was activated as a consequence of reading. However participants for whom the cleanliness norm was not very accessible were less likely to identify a conflict between the content of the sentence and the social norm and thus did not activate instrumental concepts. Consequently these participants did not show a slowed response time on those words and were no more likely to falsely remember the instrumental concept in the sentence than compared to the unrelated concept words. Taken together, this suggests that slowed response times and increased errors in identifying whether related instrumental concepts were present in a previously read sentence where a goal-discrepant situation was described is a measure of self-control conflict identification. If these reactions are not present, this suggests that the individual did not identify the self-control conflict. Study One tested that the increased sensitivity to instrumental words after being exposed to goal-violating sentences should be reduced following ego-depletion. To rule out that ego-depletion may simply cause people to
respond faster or more accurately in general, performance on the non-instrumental words was used as a statistical control.

Methods

Participants and Design

132 participant (52 female; mean age: 34.4) were recruited through Amazon.com Mechanical Turk (MTURK.COM) using the same screening procedure as in the Pilot Study. Data collection was be collected online using Inquisit software and participants

Materials

Ego-Depletion Manipulation. The typing task procedures were the same as in the Pilot Study.

Experimental Task (probe-recognition task). The modified probe-recognition task was developed by Custers and Aarts (2007) as a measure of self-control conflict awareness. For this task, participants completed a series of rapid trials on a computer. On each trial, participants were briefly exposed (2,000 ms) to a sentence in the center of the screen. This was followed by a brief (1,000 ms) delay. The times chosen for sentence exposure and delays is based on the standard procedure used in the probe-recognition task in previous research (see Custers & Aarts, 2007, Figure 2). After the brief delay, a probe-word appeared at the center of the screen and remained until the participant responded. The job of the participant was to identify whether or not the probe word was present in the previous sentence (see Figure 2). Participants were told to respond as quickly and accurately as possible by pressing one of two keys (one key indicating that the probe word was in the sentence and the other key indicating that the probe word was not in the sentence). Participants completed 70 trials in rapid succession (no delay between trials). The first 10 trials were practice trials and the last 60 trials were measured for results. Before the
start of the first trial, a series of X’s were displayed on the center fixation point of the screen. On
a random set of 10 trials, the sentences described situations where the goal of looking well-
groomed was violated (e.g., “The shoes you put on look dirty”). The goal to look well-groomed
was chosen because research into the taxonomy of goals (e.g., Chulef, Read, & Walsh, 2001)
identifies goals related to physical presentation as one of the top five most common goals. Thus,
it was reasonable to assume that most participants would have this goal. This was also verified
using a manipulation check later in the experiment. Moreover, earlier research using the probe-
recognition task to investigate self-control conflict awareness used the goal of looking well-
groomed (Custers & Aarts, 2007). All 60 trial sentences and probe words are displayed in
Appendix A (note that the order was randomized for each participant). On the 10 critical trials,
the following probe word represented an instrumental action to resolve the goal-violation (e.g.,
“Polish”). If participants identify the self-control conflict implied in the sentence, then they
would automatically cognitively activate instrumental concepts to resolve that conflict. This
means that those instrumental concepts would be activated while reading the sentence (but only
if the individuals identified the self-control conflict). This could cause participants to later think
they had read the probe word in the sentence, when in fact they did not. Thus, the correct answer
on these five trials was always “no”. The 10 critical trials were embedded in 30 filler trials (out
of the 60 trials) where the correct response is “yes” and 20 embedded filler sentences where the
correct response is “no”. On each trial, the participants’ accuracy and reaction speed was
measured. The dependent variable was the change in reaction time from the critical trials (where
the correct answer was always “no”) to non-critical trials where the correct answer was also
“no”. Specifically, reaction time change (RTC) was calculated by subtracting participants mean
reaction time on the non-critical “no” trials from the participants mean response time on the critical trials. The entire task was designed to take fewer than five minutes.

**Manipulation Check Items.** To assess the amount of self-control used during the depletion typing task, participants responded to the following manipulation-check item on a 7-point Likert scale: “*To what extent were you trying to control an impulse during the typing task?*” To verify that the goal of looking well groomed was held by the participants, they responded to the following question on a 7-point Likert scale where 1 = Do not agree at all and 7 = Completely agree: “*It is important to me to look well-groomed.*” This item was embedded among several other questions so not to draw special attention (“*It is important to me to tell the truth.*” “*It is important to me to work hard.*” “*It is important to me to stay in shape.*” and “*It is important to me to spend my money wisely.*”). These manipulation checks were administered after the probe-recognition task so not to inadvertently prime any of these goals prior to the task.

**Procedure.** Upon arriving at the experiment webpage, participants were displayed informed consent and asked to agree to participate. They then proceeded to a screen that provided instructions for the typing task manipulation. A random 50% of participants were assigned to perform the experimental (ego-depletion) version of the typing task whereas the other 50% performed the non-depletion version. Upon completion of the typing task, participants responded to the manipulation check for the typing task. Participants then received the instructions for the probe recognition task and performed that task. Upon completion of the probe-recognition task, participants completed the goal manipulation check items, a short list of demographic questions (age and sex), were thanked for their participation, and paid.
Results

Overview

An analysis of covariance (ANCOVA) was used to test whether ego-depleted participants responded more quickly on the five critical trials (compared to non-critical “no” trials). Thus, the dependent variable was the change in mean reaction time on the five critical trials (all of which are “no” trials, meaning the correct answer was “no” as the probe word did not appear in the previously displayed target sentence) compared to mean reaction time on non-critical “no” trials (abbreviated as RTC for “reaction time change” hereafter). To rule out the possibility that ego-depletion simply increases reaction time variability on the task in general, participants’ reaction time standard deviation (abbreviated RTSD for “reaction time standard deviation” hereafter) across all trials was used as a statistical control. Furthermore, individuals who did not have the goal of looking well groomed would not have been expected to identify a self-control conflict related to looking-groomed (as they did not have that goal). Thus, they would not have instrumental concepts activated when reading the sentence that is discrepant with that goal and thus not show slowed reaction times to the critical probe words, relative to non-critical trials with the same correct answer (“no”). Consequently, individual’s responses to the manipulation check item “It is important to me to look well-groomed” was included as a random factor in the ANCOVA. I sought an interaction between ego-depletion and individual responses on this manipulation check such that the effect of ego-depletion was stronger for those who had the goal of being well groomed than for those who did not (as they would not recognize a goal-conflict under any circumstances, as they did not have that goal).
Data Screening

Missing data. No variable was missing more than 1.5% of data. I used Little’s MCAR test (Little, 1988) to confirm that all missing data were missing “completely at random”; this assumption was confirmed $\chi^2 (40) = 2.845, p > .999$. All missing data were accounted for in three participants, each missing 10% or greater of their data (10%, 15%, and 60%). These participants were excluded from analyses list-wise.

Outliers.

Univariate. There are two forms of univariate outliers that were tested for: extreme response values and unresponsive individuals. To identify extreme responses, z-score variables were computed for RTC and screened for any responses greater than 3.29 (or less than -3.29) as this would only occur .05% of the time or less in real data, suggesting problematic data. One such participant was identified ($Z = 8.5$) and excluded list-wise from analyses. To screen for unresponsive participants, each participant’s overall accuracy on the probe-recognition task was converted to z-scores to identify any participants with z-scores less than -3.29 as this would suggest participants answering haphazardly. No such participants were identified.

Multivariate. Multivariate outliers were identified using Mahalanobis distance (MD). MD values were computed for each participant (using the three independent variables: depletion condition, self-reported importance of looking well-groomed, and participants reaction-time standard deviation (RTSD) and chi-square probabilities were computed for each participants MD value. Participants were screened for probabilities less than .001 as this is the standard convention for excluding data using MD (Fidell & Tabachnick, 2003). One such participant was identified as multivariate outliers and excluded from subsequent analyses.
Normality. The normality of the dependent variable (RTC) and the two numeric independent variables were by reviewing the Q-Q plots as well as the skew statistics directly and the Shapiro-Wilkes test. All three variables had moderate and statistically significant positive skew. This non-normality was corrected using an appropriate data transformation (Fox, 1997). The positive skew was corrected using a square-root data transformation for the RTC variable ($\sqrt{\text{RTC} + 1500}$). The 1500ms adjustment was to accommodate zero and negative RTC values. A square root transformation was also used for the self-reported importance of looking well-groomed variable; however, a Log10 transformation was needed and used to correct the RTSD variable.

Summary. Overall, 18 participants were excluded for not having completed the typing task correctly; two participants were excluded as either univariate or multivariate outliers; three participants were excluded for high levels of missing data (>10%); and one participant was lost due to system failure during collection. Thus, 109 total cases were included in subsequent analyses (51 depletion and 58 non-depletion).

Self-Reports and Manipulation-Checks

Participants who completed the ego-depletion typing task reported significantly more controlling of an impulse while performing the typing task ($M = 4.96$, $SD = 2.06$) than those who completed the non-depletion typing task ($M = 3.67$, $SD = 2.04$), $t(107) = -3.277$, $p < .001$, $d = .63$. There was not a significant difference on the self-reported importance of looking well groomed between the non-depletion ($M = 5.34$, $SD = 1.52$) and depletion ($M = 5.53$, $SD = 1.49$) participants, $t(107) = -.640$, $p = .524$, $d = -.13$.

Probe-Recognition Task Accuracy
The mean accuracy rate did not differ significantly between the non-depletion (92.3%) and depletion condition (92.5%), $t(107) = -0.084, p = .933, d = -0.016$. Overall accuracy was significantly correlated with age of participants, $r(128) = .23, p = .002$. However, mean overall accuracy did not differ significantly between male (M = 90.09%, SD = 14.24%) and female (M = 89.81%, SD = 14.91%) participants, $t(128) = .106, p = .916$. Accuracy was also not significantly correlated with self-reported use of self-control on the typing task, $r(128) = -.05, p = .600$. Nor was accuracy significantly correlated with self-reported importance of looking well-groomed $r(128) = .06, p = .537$.

**Probe-Recognition Task Reaction Times**

Mean reaction times in the probe recognition task are displayed on Table 2. An analysis of covariance (ANCOVA) was used to detect an interaction between depletion condition and having the goal of looking well-groomed (entered as a continuous random factor) on RTC while controlling for RTSD. Table 3 displays the results of this analysis with and without the inclusion of RTSD as a covariate. Although the main effect for RTSD was significant, there were no other significant effects or interactions. RTC was not significantly correlated with age of participants, $r(129) = -.08, p = .389$, and did not differ significantly between male (M = 55.59ms, SD = 557.10ms) and female (M = 67.48ms, SD = 272.71ms) participants, $t(129) = 1.501, p = .136$. RTC was also not significantly correlated with self-reported use of self-control on the typing task, $r(129) = .08, p = .393$. Nor was RTC significantly correlated with self-reported importance of looking well-groomed, $r(129) = .04, p = .624$.

**Discussion**

Slowing of mean reaction times on the five critical trails (relative to non-critical trials with the same correct answer) was used to indicate greater awareness of a self-control conflict as
supported by a variety of prior research (e.g., Custers & Aarts, 2007; Kleiman & Hassin, 2011). I predicted that non-depletion participants would slow their mean reaction times more than ego-depleted participants on critical trials, indicating that non-depletion participants were more aware of the conflict in the target sentences and therefore had instrumental concepts activated, which would have interfered with their memory of the exact sentence, but that ego-depleted participants would not. Further, I predicted that the effect of ego-depletion should be greatest for those individuals who report having the goal of looking well groomed, but weaker or non-existent for those who report not having the goal of looking well groomed. Overall, I predicted a significant interaction of ego-depletion and strength of the goal of looking well-groomed on how much participants slowed their responses on critical trials. Unfortunately, this ANCOVA was not statistically significant while controlling for participants mean standard deviation across all trials to account for individual differences and/or ego-depletion effects on response time variability in general. Nor was the interaction significant without controlling for response time variability in general. In other words, ego-depleted participants did not change their reaction times on the critical trials any more or less than non-depleted participants. On the surface, this casts doubt on the theory that ego-depletion disrupts self-control conflict identification and indeed, this theory being incorrect is one explanation for these null results. However, there are alternative explanations for these null results in the form of methodological shortcomings that should be considered.

These null results do not seem due to either a failure of the experimental manipulation or from the goal of looking well groomed being irrelevant to this sample as participants who completed the ego-depletion typing task reported significantly greater self-control exertion on the typing task than those completing the non-depletion version and both groups reported
looking well groomed as very important. However, there are other explanations for these null results to consider. In particular, overall accuracy on the probe recognition task was very high for both conditions even though reaction times were low. This combination suggests that the task may have been too easy, thus producing ceiling effects. Indeed, it is theoretically probable that if ego-depletion affects self-control conflict identification, then the largest effects would occur when identifying a conflict is challenging whereas only small or no differences would occur when identifying the conflict is trivial. Even though this task has been used before, it has previously been used in undergraduate samples. I was careful to screen our online sample to use only those participants who had proved themselves as high quality across many previous online tasks. Thus, I may have inadvertently selected a sample that is too high performing and motivated for the probe recognition task as used, even though this dependent measure has previously worked with undergraduate (and possibly less motivated) samples. Finally, despite the use of this probe recognition task in previous studies to test for self-control conflict identification, there is reason to suspect the probe recognition task is not an effective measure of self-control conflict awareness given the results of Study One. Namely, RTC, used in this and prior research as the primary measure of self-control conflict identification was not significantly correlated with self-reported importance of looking well-groomed. According to the theory behind the probe recognition task, RTC should be greater for individuals with the goal of looking well groomed than those without this goal; however, that was not found to be the case in Study One. On that note, the results of Study One also represent a failure to replicate the findings of Custers and Aarts (2007). As participants in Study One for whom the goal of looking well groomed was more accessible were not more likely than others to slow reaction time on the trials where this goal was violated, as Custers and Aarts (2007) report finding in their study. Overall,
a different measure of self-control conflict identification, such as one where the conflict is more difficult to identify may yield significant effects for ego-depletion.

**Study Two**

Study Two more directly tested the theory presented in this paper by seeking to implicate changes in construal level as the underlying mechanism connecting ego-depletion to failure to identify a self-control conflict. Moreover, in Study Two, I sought to link this low conflict awareness to actual behavior. Study Two used methods adapted from the Kleiman and Hassin’s (2011) study on self-control-conflict identification. As in their study, participants in Study Two engaged in a social-dilemma game that involved making decisions that pit individual greed against collective good. Specifically, participants took part in a simulated fishing community where they had to repeatedly choose between acting responsibly for others welfare (limit how many fish they take) or acting impulsively for personal short-term gain (take many fish, quickly).

Prior research has implicated ego-depletion in causing people to behave less pro-socially (more greedily) on a similar task (Osgood & Muraven, 2015b). While playing this game, the computer monitored a variety of behavioral indicators of conflict awareness as also measured by Kleiman and Hassin (2011). If when making decisions during the game, participants were highly aware and thinking about the conflict between acting greedily now and their values (to be a good person), goals (to maximize long term gains), and norms (to behave in a cooperative way) this would cause several behavioral effects. These include increased decisions making time, regretting choices, and behavioral variance. Unlike Kleiman and Hassin (2011), Study Two also manipulated ego-depletion and construal level. Furthermore, in Study Two I sought to demonstrate that markers of conflict-awareness mediated the difference in social-dilemma game choices observed between ego-depleted and non-depleted participants. This mediation should be
moderated by the construal manipulation. If ego-depletion decreases conflict awareness by causing lower level construal, then equalizing construal level between ego-depleted and non-depleted participants should eliminate the effect of ego-depletion on self-control conflict awareness (and thus diminish any mediation effect of indicators or conflict awareness on behavior).

Participants

273 participants (mean age: 36.07; 144 male) were recruited on Amazon Mechanical Turk (MTURK.COM) following the same guidelines as in Study One and the Pilot Study. Participants were paid $1 for participating in addition to up to $.50 in in-game bonuses.

Materials

Ego-depletion manipulation. The ego-depletion/control manipulations were the same as in Study One and the Pilot Study.

Manipulation Check Items. The manipulation check items were the same as in Study One (only ego-depletion manipulation check items were used in Study Two).

Construal-level manipulation. All participants were randomly assigned to one of three construal conditions: a high-level construal manipulation, a low-construal manipulation, or a dummy manipulation that should not impact construal level. Those participants randomly assigned to receive either the high- or low-construal manipulation completed a modified “Why/How” task (See Freitas, Trope, & Gollwitzer, 2004; Fujita & Carnevale, 2012). For this task, participants receiving the “high-construal” manipulation were asked to create four sentences in response to the following prompt: “Why would you want to eat a healthy diet?” They were instructed that each sentence they write must build off of the previous sentence by answering a “Why?” question. For example, if the first response sentence the participant wrote
was “So I can live longer.” The next sentence would therefore need to answer the question “Why do you want to live longer?” Thus, the second sentence the participant wrote might have been “To live to see my great-grandchildren” and after that “Because family is important to me” and so on. This manipulation encourages successively more abstract thinking and thus induces a higher level of mental construal (Freitas, Trope, & Gollwitzer, 2004). Participants in the low-construal condition created four sentences in response to the prompt “How do you stay healthy?” Again, participants were instructed that each sentence must build off of the previous sentence; in this case, such that each successive sentence explains how one might perform the task described in the previous sentence. For example, if in the first response sentence the participant wrote was “Only eat healthy food.” The next sentence would therefore need to answer the question “How do you only eat healthy food?” Thus, the second sentence the participant wrote might have been “only purchase healthy food” and after that “make a grocery shopping list with only healthy food on it” and so on. This manipulation encourages successively more concrete thinking and thus induces a lower level of mental construal (Freitas, Trope, & Gollwitzer, 2004). Those assigned to the dummy activity had to write four alternative ways of phrasing the sentence “A healthy diet is important.”

**Social Dilemma Game.** This interactive computer-simulation task was adapted from Kleiman and Hassin (2011) and took place entirely on an experimenter created webpage. Each participant was led to believe that he or she was one of two participants taking part in the experiment at the same time via computer. In reality, there was not actually another player. This deception was used to introduce the conflict of doing what is in one’s personal best interest and doing what is in the best interested of the other or both parties collectively. To facilitate this deception, before the start of the game, participants were subjected to a waiting screen, which
asked them to “Please be patient while the other participant gets ready.” The social dilemma game simulated a scenario where the participant is one of two fishermen catching fish on a small lake. On each round, participants were told that their character had “caught” a certain number of fish (randomly chosen from 3-7) and asked how many of those fish they would like to keep, and how many they would like to return to the lake. For each fish that was kept (added to that player’s fish “harvest”), the participant was told they would receive 1/4 cent in his or her account to be paid at the end of the study (in reality, all participants were paid $0.50, regardless of game play). Participants were not told the current amount of fish in the lake nor were they told anything about the “other players” fishing decisions. However, they were told, “If the fish population drops below a certain point, all of the fish will die and the simulation will end.” To increase believability, at five randomly chosen rounds, the participant received a warning that the “Fish population is getting dangerously low.” At the start of the game, there were five “practice” rounds. Participants were told that decisions made during those rounds would not affect the actual game or their payout. The actual game began after the practice trials. The game continued for 30 rounds, regardless of participants choices, with each round occurring immediately after the previously one (there was no time-delay between rounds). Although the fish “caught” during each round was randomized, the game was programmed such that all participants had the same cumulative number of fish caught by the end of the game, so all participants would have the same total number of opportunities to keep or release fish. Participants were told that he or she and the other player were fishing at the same time and continuously.

**Measures of Conflict Awareness.**

**Decision-making time.** Decisions made when an individual is aware of conflicting goals generally take longer than decisions made when the individual is not aware of such a conflict as
the participant must mentally weigh the merits of each option to make a decision, whereas if an individual has a clear preference (no conflict) the choice will be easier to make (Kleiman and Hassin, 2011). The computer tracked decision time on each round in milliseconds. Participant’s mean response time was used.

**Behavioral variance.** Goal conflicts occur because an individual is partially attracted to multiple choices that are mutually exclusive. If there were no conflict (only one choice the individual prefers) then he or she will behave similarly across many opportunities to make that choice (Kleiman and Hassin, 2011). However, if he or she is feeling conflicted, his or her behavior will sometimes be more influenced by one goal or the other, thus creating more variance across many opportunities to make a choice. Behavioral variance was measured by the participants’ standard deviation for the number of fish kept across the 30 rounds.

**Regret.** When a person is highly conflicted between two goals, he or she is more likely to experience cognitive dissonance and subsequent regret after making a choice (Oshikawa, 1969). For instance, consumers who make purchase decisions while experiencing a goal-conflict are more likely to experience post-purchase dissonance and return the purchased item (Schiffman & Wisenblit, 2014). Thus, people experiencing goal-conflicts would be more likely to take advantage of opportunities to “take-back” and change their choices after the fact. On the other hand, people not experiencing goal-conflict should have a clear preference for one choice and thus experience less dissonance and regret. To measure this, after each time the participant had decided how many (if any) fish to return to the lake at the end of each round, the computer prompted the participant with the question “Are you sure?” with the options of clicking “Yes” to continue or “No, go back” to return and change his or her choice. A higher frequency of clicking
“No, go back” was used as a measure of goal-conflict. The mean number of “No, go back.” clicks was recorded for each group in the experiment.

**Self-Report Items.** After the completion of the fishing game, participants also completed a series of self-report items meant to retrospectively test the extent to which they were experiencing a self-control conflict while playing the game (see Appendix B).

**Procedure**

Participants clicked on a link that brought them to the experiment webpage. Upon arriving at the experiment webpage, participants were provided with an informed consent screen and asked to agree to participate. Participants were then provided with an overview of the study’s procedure. Participants were told that they had been paired with another participant via the Internet. Participants were then randomly assigned to perform either the ego-depleting typing task or the non-depleting typing task and completed the manipulation check. After this, participants were randomly assigned to either one of the construal level manipulations (“Why/How” task) or dummy task. Once completed, participants once again had the rules of the fishing game explained to them, and they began playing the game. Upon completion of the game (30 rounds) participants completed the self-report items (see Appendix B). They were then presented with a debriefing statement, paid, and thanked for their participation.

**Results**

**Data Screening**

The data were screened following the same procedures as in Study One. I used Little’s MCAR test (Little, 1988) to confirm that there were no significant patterns of missing data, i.e., data were missing “completely at random”; this assumption was confirmed $\chi^2 (310) = 116.4, p > .999$. Of the 273 participants recruited, 20 did not complete the entire experiment, 15 did not
follow the manipulation instructions correctly, five were excluded as univariate outliers along at least one dependent variable, and three were excluded as multivariate outliers. In addition, any participant with a mean response time of under 600ms on the fishing game was excluded as this suggests they are responding too quickly to make a thoughtful decision and are simply trying to click through the study as quickly as possible. 19 participants were excluded using this criterion. Thus, data from 211 participants were used in subsequent analyses. Total harvest, and response variance were normally distributed without any transformations. Mean response time was positively skewed. This was corrected using a log 10 transformation. The regret variable (number of times the participant chose to go back and change their decision) was dropped from subsequent analyses as only 13 out of the 211 participants ever chose to go back and change their response even once. Given that the overwhelming majority (>90%) of participants never chose to change their choice, the use of “mean number of changed choices” per group seemed uninformative. When converted to a nominal variable (0 = no regrets, 1= at least one instance of regret), a chi-square test of independence revealed that no combination of conditions was a significant predictor of regret $\chi^2 (2, 200) = .346, p = .841$. In sum, given the rarity of participants who chose to go back and change a response and the lack of any association of this choice with any condition, this variable was deemed uninformative. Multicollinearity of the remaining three indicators of conflict awareness was assessed with bivariate correlations. No two variables reached the conventional threshold for multicollinearity ($r > .90$).

**Self-Reports and Manipulation Checks**

Participants who completed the depletion typing task reported greater effort on a seven-point Likert scale on the typing task ($M = 5.6, SD = 0.83$) than participants who completed the non-depletion version ($M = 4.6 SD = 0.85$), this difference was significant, $t (194) = -8.164$, $p <$.
0.01, \( d = 1.19 \). Similarly, participants who completed the depletion typing task reported working harder to control an impulse (M = 5.38, SD = 1.62) than participants who completed the non-depletion typing task (M = 2.63, SD = 1.85). This difference was statistically significant, \( t(194) = -10.875, p < .001, d = 1.58 \). Neither of these manipulation checks were significantly different for males versus females nor were either significantly correlated with participants’ age.

The self-reported awareness about a self-control conflict during the fishing game was calculated by summing the individual items in the scale (\( \alpha = .63 \); See Appendix B). Group means on this measure are on Table 4.

**Fishing Game and Conflict Awareness**

Means and standard deviations for overall fish harvest as well as each measure of conflict awareness are displayed on Table 4. There were no statistically significant differences between males and females on either overall fish harvest or any of the measures of conflict identification. Participants’ age was significantly correlated with mean response time, \( r(245) = .163, p = .010 \). Participants’ age was not significantly correlated with any other measure of conflict awareness or overall fish harvest. The amount participants reported inhibiting an impulse on the typing task was significantly correlated with mean response time, \( r(245) = .132, p = .039 \) and self-reported conflict awareness, \( r(245) = -.234, p < .001 \). The amount of effort participants reported using on the typing task was not significantly correlated with any measure of conflict awareness or overall fish harvest. Only one measure of conflict awareness (response standard deviation) was significantly correlated with overall fish harvest, \( r(251) = .408, p < .001 \).

A multivariate analysis of variance (MANOVA) was used to test for main effects and interactions of ego-depletion X construal manipulation on overall fish harvest (number of fish kept for self by the end the game) and for each measure of conflict awareness (response variance,
mean response time, and self-reported conflict awareness). The MANOVA did not yield a significant omnibus main effect (Pillai’s Trace) for construal condition, $F(8, 378) = 1.383, p = .202, \eta^2 = .028$, or depletion condition, $F(4, 188) = 1.703, p = .151, \eta^2 = .035$. The MANOVA also did not reveal a significant overall interaction of depletion condition and construal condition, $F(8, 378) = .941, p = .482, \eta^2 = .020$. Tests for univariate effects revealed only one significant effect: the effect of ego-depletion condition on self-reported conflict awareness was significant, $F(1, 191) = 4.978, p = .027, \eta^2 = .025$; ego-depleted participants reported experiencing a conflict less than non-depletion participants (see Table 4). There were no statistically significant interactions. A second MANOVA was conducted using only the data from the first five trials on mean response time and response standard deviation (choice variance) to test if effects may have occurred early in the game but then dissipated, as participants became bored. Mean and total fish kept during the first five trials was not analyzed as participants did not necessarily “catch” the same number of fish during these trials (see Social Dilemma Game in Methods section). This MANOVA did not yield a significant omnibus main effect (Pillai’s Trace) for construal condition, $F(4, 386) = 1.645, p = .162, \eta^2 = .017$, or depletion condition, $F(2, 192) = 1.230, p = .295, \eta^2 = .013$. The MANOVA also did not reveal a significant overall interaction of depletion condition and construal condition, $F(4, 386) = .658, p = .621, \eta^2 = .007$, nor were there any significant univariate effects.

Furthermore, a separate multiple moderated-mediation using PROCESS (Hayes, 2013) was conducted to test for an effect of ego-depletion on final fish harvest (overall number of fish kept across all 30 trials) as mediated by the each measure of conflict awareness and that these mediations were moderated by the construal manipulation. The moderated-mediation procedure computes an index of moderated mediation (IMM) for each mediator, which describes how much
the indirect effect of an IV on a DV through one or more mediators changes at different levels of a moderator. Confidence intervals can be computed for this index to determine statistical significance (if zero is in the interval, the effect is not significant). In this case, PROCESS did not reveal any such significant moderated-mediation for self-reported conflict awareness [IMM = 0.34, 95% C.I. = -0.94, 2.99], mean reaction time [IMM = -0.03, 95% C.I. = -1.17, 0.70], or response variance [IMM = 0.21, 95% C.I. = -5.67, 4.98] as moderated-mediators. Similarly, PROCESS did not uncover any statistically significant direct or indirect (mediated effects) of ego-depletion condition on overall fish harvest.

**Discussion**

I expected an interaction for each measure of conflict awareness such that ego-depleted participants who did not receive a construal manipulation would display less conflict awareness and keep more fish for themselves than non-depleted participants who did not receive a construal manipulation. However, *with* a construal manipulation, the difference between the ego-depleted and non-depleted participants would be eliminated. Without a construal manipulation, I predicted measures of conflict awareness would mediate the effect of ego-depletion on fish harvest, however, *with* a construal manipulation, the effect of ego-depletion on conflict awareness and fish decisions would be attenuated, thus the indirect effect (mediation) would also be weaker or absent.

None of these predictions were supported. Although ego-depleted participants did generally keep more fish for themselves than non-depleted participants, this difference was not statistically significant. Moreover, I did not find any of the predicted interactions or moderated-mediations. The only statistically significant effect was the effect of ego-depletion on self-reported conflict awareness. This finding was further supported by a significant correlation.
between self-reported use of self-control (controlling an impulse) during the typing task and self-reported awareness of a self-control conflict during the fishing game. Although this is consistent with the theory in this paper, it stands alone as the sole supportive evidence in these results. However, there are reasons to suspect that certain methodological changes may improve the chances of producing the predicted effects. First, the fishing game was lengthy and repetitive (30 rounds). It is possible that the game was cognitively exhausting or produced levels of boredom that overwhelmed any effects of the depletion and/or construal manipulations. A more interesting test of conflict awareness may produce better results. I attempted to test this possibility with the data from Study Two by conducting a second MANOVA analyzing data from only the first five trials (before intense boredom may have set in); however, those results were not statistically significant. Second, the fact that indicators of conflict awareness were not correlated with behavior suggests one of two possibilities. Either the measures of conflict awareness were problematic or conflict awareness had little influence on choices in this case. That these measures of conflict awareness have worked for other researchers in the past suggests the latter explanation. Perhaps a different dependent task would yield significant results. Alternatively, a manipulation to increase the importance of using self-control such as priming goals related to cooperation might have changed the outcome. Third, the conflict may have been too obvious. Participants were told at the start of the game that the game will end when the fish population “drops below a certain point” and were given fake warnings on several occasions throughout that “the fish population is getting dangerously low” to increase believability. The way the game was presented (and the fact it was a “game” in the first place) may have drawn extra attention to the self-control conflicts and negated any effect of ego-depletion on conflict awareness. Perhaps a dependent measures where the conflict is more subtle would yield different results. These results
contrast somewhat with an earlier study that found significant behavioral effects for ego-depletion on fish kept in similar fishing social dilemma game (Osgood & Muraven, 2015b). However, there are several important distinctions. First, Study Two used a different ego-depletion manipulation (typing task) than Osgood and Muraven (2015b) did (thought suppression). Second, the payout structure was set up differently. In the earlier study by Osgood and Muraven (2015b), participants were incentivized by the opportunity to earn points to skip a lengthy second part of the experiment (but still receive credit). Third, Osgood and Muraven (2015b) predicted, tested, and found an effect of ego-depletion on self-control implementation (not conflict awareness) on the fishing game. Finally, Study Two manipulated construal level, which the earlier study did not; this likely explains part of the difference in results.

Although not supported by behavioral effects, the significant effect of ego-depletion on self-reported awareness of a conflict is encouraging. Even if the conflict were appraised as unimportant and thus did not affect behavior, the self-reports should, in theory, still identify differences in how much one were thinking about the conflict, albeit a minor conflict. In this case, ego-depleted participants reported thinking about potential self-control conflicts less.

**General Discussion**

This paper proposed a theory that ego-depletion causes a low level of construal, which in turn decreases one’s ability to identify a self-control conflict. Although the ego-depletion manipulations were effectively administered in the online study format, neither the results from Study One nor the results from Study Two generally supported this theory. Given the non-supportive nature of the results, it is important to consider factors that may have contributed to the null effects. Indeed, absence of evidence does not necessarily indicate evidence of absence.
First, perhaps different results would have been found using a higher level of ego-depletion. Given that the tasks may have been experienced as very boring, the strength of the manipulation may have been insufficient relative to the cognitive and attention demands of the tasks. I was careful to verify that all participants included in analyses completed the manipulation correctly and manipulation checks confirmed that participants assigned to the ego-depletion manipulation did, indeed, exert much more self-control than those assigned to the non-depletion manipulations. Nevertheless, the strength of the depletion manipulation may have been disproportional to the dependent tasks. I attempted to test for this explanation in two ways. First, by testing for a relationship between amount of self-control exerted during the typing task (based on self-report manipulation checks) and conflict identification. Self-reported self-control exertion on the typing task did significantly (and negatively) predict self-reported conflict awareness on the fishing task in Study Two. However, no such relationship was found in Study One. Second, I conducted analyses separately on only the first five trials of the fishing game in Study Two in case gradual feelings of boredom had diminished between group effects over the course of the fishing game. However, this analysis did not yield any significant results. Thus, although there were some indicators that participants who exerted higher levels of self-control were less likely to notice a self-control conflict (self-reports), this was not consistent across all measures.

Second, the conflicts may have been too obvious for even the ego-depleted participants to miss, particularly, in Study Two. As described earlier, the instructions for Study Two may have made the conflict too salient. Perhaps in situations where conflicts are very difficult to identify, ego-depletion could make the difference. The studies reported here may not have created situations where the conflict was very difficult to see. Indeed, if ego-depletion does disrupt one’s ability to identify a self-control conflict, then this effect should be moderated by conflict.
salience. When a conflict is obvious, even someone suffering from ego-depletion should be able to notice it, similar to how almost any person can lift a 2.5lbs weight and such a weight test would not differentiate a strong person from a weak one. In other words, the studies here may have suffered from ceiling effects. However, when the conflict is more subtle, only individuals whose ability to identify a conflict is high (i.e., not suffering from any temporary handicaps) would be likely to identify it. Follow up studies should test for the effect of ego-depletion on conflict awareness by looking for an interaction between ego-depletion and conflict saliency on conflict identification.

One suggestion for future studies would be to test for an interaction between ego-depletion and factors known to moderate the accessibility of a self-control conflict. The Two Stage Model identifies several such factors such as width, consistency, and personal relevancy of conflicts. Another suggestion would be to test the role of ego-depletion on measures of conflict awareness in shorter tasks, such as a single play dictator game or prisoners dilemma. For instance, future researchers should test if people would be more likely to want to change their initial choice in such games when not depleted. A more straightforward measure may also be effective. For instance, positive results might be found from asking depleted and non-depleted participants to read hypothetical scenarios of imaginary actors considering a decision and ask participants to identify if the actors’ choice would be consistent or inconsistent with long term goals. Ego-depleted participants may take more time to decide or be less accurate. Finally, simply testing the effects of ego-depletion on conflict identification on tasks with more subtle conflicts may yield results. For example, perhaps ego-depleted participants would struggle more to identify if remarks or comments are offensive. Obviously offensive remarks (such as those involving slurs) would likely be easily identified by both depleted and non-depleted participants.
alike. Whereas, remarks with more subtle offensiveness may be more likely to be missed by depleted participants. Future research should also consider testing this theory with a different ego-depletion manipulation. The studies presented here all used the same typing task. It is possible that something about this manipulation fails to produce effects that disrupt self-control conflict identification. Indeed, the failure to find significant effects in the pilot call into question the effectiveness of this manipulation.

Notwithstanding the potential methodological shortcomings mentioned above, the research presented here included important safeguards to ensure a high quality test of the theory presented in this paper. For instance, these methods and analyses were pre-planned and great care was taken to screen the data and verify statistical assumptions. Thus, it is possible that ego-depletion simply does not disrupt conflict awareness. Osgood and Muraven (2015b) offered an alternative account for the effect of ego-depletion on reducing pro-social behavior (such as was tested in Study Two). According to that theory, ego-depletion decreases one’s motivation to act pro-socially, rather than one’s ability to identify a conflict.

Although these results do not support the idea that ego-depletion disrupts self-control conflict awareness, this is still valuable research with implications for theories of self-control and ego-depletion. First, although this paper was not directly testing the role of construal in self-control, no such effects were found. In other words, in Study Two, participants induced to experience different levels of mental construal did not display better self-control. Several theories of self-control view mental construal level as a strong influence on self-control (e.g., Fijuta, 2008; Schmeichel, Vohs, and Duke, 2011). Thus, the findings of Study Two are non-supportive of those theories. Second, the Two Stage Model of self-control emphasizes identifying a self-control conflict as essential to self-control. Although several factors have been
identified that influence such identification, prior to this paper, the role of ego-depletion in the conflict identification stage of the Two Stage Model (Stage One) has remained untested. In fact, two authors of the Two Stage Model have proposed the ego-depletion may disrupt self-control conflict identification (Myrseth & Wollbrant, 2015), but have thus far been unable to reference any research directly addressing the question. This study provides some insight, albeit non-supportive, on this idea.

This research also has several implications for ego-depletion theory and research. First, the general (albeit implicit) consensus in the field of ego-depletion research is that ego-depletion impairs one’s ability and/or motivation to use self-control. In other words, ego-depletion disrupts self-control implementation. This was the first paper to directly test if ego-depletion also disrupts self-control conflict identification. The negative results of the studies here are broadly consistent with the consensus that ego-depletion is related to implementation, not identification. However, that has not yet been shown conclusively. Even if ego-depletion does not affect identification, it could still affect another stage of the self-control process in addition to implementation. For instance, ego-depletion may disrupt one’s ability to select an effective self-regulatory strategy in order to move from the identification stage to the implementation stage. Indeed, even after identifying a conflict, one must decide how to resolve that conflict (select a self-control strategy) before implementing self-control. For instance, perhaps people choose less effective means of trying to control their behavior when they are ego-depleted. This has yet to be tested in ego-depletion, but the field of emotion regulation research provides a framework within which to do this. Emotion regulation researchers (see Gross, 1998) have identified several common emotion regulation strategies including some which are often ineffective (e.g., suppressing emotions) and some that are highly effective (e.g., rethinking negative events in non-emotional terms or
A second implication is that although this is the first paper to directly test for an ego-depletion effect on self-control conflict identification, several other studies have tested this indirectly (e.g., Friese, et al., 2013; Hedgcock, Vohs, & Rao, 2012; Inzlicht & Gutsell, 2007; Wang, Yang, & Wang, 2014) and reached inconsistent conclusions. Thus, the negative results of Study One and Study Two lend support to those arguing that ego-depletion does not disrupt the identification of self-control conflicts. Finally, the phenomenon of ego-depletion has come under scrutiny recently as being inconsistently replicable (e.g., Lurquin et al., 2016). This paper adds to that larger discussion. Although by no means challenging the basic phenomenon of ego-depletion, this paper does highlight that the specific way prior exertions of self-control may influence subsequent behavior are likely more nuanced than most of the field has generally treated it. Perhaps experiencing a strong exertion of self-control does causes changes in subsequent behavior, but different individuals react to the experience differently and their reactions may change based on numerous contextual factors. How people react to exerting self-control is probably highly moderated and not necessarily deleterious. This issue extends beyond the scope of the current paper, but nevertheless represents a small piece in a growing body of evidence challenging the fields existing notion of how ego-depletion works, and demanding theoretical overhauls.

Finally, in light of the inconclusive findings of these studies, it is important to consider potential modifications to the theory presented in this paper. First, previous research (e.g., Osgood & Muraven, 2015b) found a significant effect for ego-depletion on behavior in a similar fishing task as used in Study Two, but did not manipulate construal level. Thus, it is possible that
a direct relationship between ego-depletion and poor self-control conflict identification exists, but that it is not mediated by changes in construal level. Indeed, the attempt to manipulate construal level may have occluded a direct effect of ego-depletion. Alternatively, ego-depletion may moderate self-control conflict identification through a different mechanism such as motivation. The significant effect of ego-depletion on self-reported conflict awareness in Study Two also suggests another potential theoretical modification. It is possible that ego-depletion does not affect self-control conflict identification on an implicit level (goal conflicts are identified implicitly and thus still affect behavior), but people are less aware of the conflict at an explicit or conscious level. Indeed, this could explain why ego-depleted participants reported not being very aware or experiencing a self-control conflict in Study Two, but no significant effects were found in Study One, which only tested for implicit conflict awareness. Ego-depletion may also cause social-cognitive effects that disrupt one’s appraisal of self-control conflicts, although perhaps not the identification of them. Specifically, ego-depletion tasks in experiments are often more difficult than non-depleting tasks. This extra effort may cause participants to believe they deserve to act a little selfishly as a reward for their effort. Thus, they may not consider certain situations as self-control conflicts even if they are aware of conflicting goals or values (as they think their “earned” reward clearly justifies a selfish response to the conflict). In sum, although, as of yet, there is no conclusive evidence that strong exertions of self-control disrupt one’s subsequent ability to identify a self-control conflict, these results are by no means conclusive evidence of this. Indeed, as previously identified, there remain a myriad of theoretical and methodological considerations and adaptions to be tested first. The next step for researchers interested in this topic should be to search for a direct effect of ego-depletion on self-control conflict identification, then move forward testing for underlying mechanisms. Given the central
role of self-control in helping us accomplish our goals, follow our values, and maintain important societal standards, any reasonably potential fundamental disruption of self-control should be thoroughly investigated.
References


Inzlicht, M., & Al-Khindi, T. (2012). ERN and the placebo: A misattribution approach to studying the arousal properties of the error-related negativity. *Journal of Experimental...


Figure 1. Proposed Model.
Figure 2. Visualization of a trial. Each square above is a representative screenshot; please note that the information in parentheses was not presented to participants. At the start of each trial (a) participants were exposed to a sentence for 2,000 ms. The sentence was followed by a 1,000 ms waiting screen (b). Finally, the probe word appeared on the third screen and remained until the participant indicated whether or not the probe word had been present in the previous sentence. The next trial began immediately after the participant provided a response.
<table>
<thead>
<tr>
<th>Measure</th>
<th>Depletion Typing</th>
<th>Non-Depletion Typing</th>
<th>Mean Difference</th>
<th>df</th>
<th>t</th>
<th>p</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent congruent correct</td>
<td>95.33 (13.22)</td>
<td>94.08 (15.66)</td>
<td>1.25</td>
<td>113</td>
<td>.455</td>
<td>.650</td>
<td>.10</td>
</tr>
<tr>
<td>Percent incongruent correct</td>
<td>91.08 (12.08)</td>
<td>88.66 (16.70)</td>
<td>2.42</td>
<td>113</td>
<td>.872</td>
<td>.385</td>
<td>.16</td>
</tr>
<tr>
<td>Percent control correct</td>
<td>95.54 (10.88)</td>
<td>93.23 (16.74)</td>
<td>2.31</td>
<td>113</td>
<td>.854</td>
<td>.395</td>
<td>.16</td>
</tr>
<tr>
<td>Mean congruent response time (ms)</td>
<td>1018.09</td>
<td>977.57</td>
<td>40.52</td>
<td>113</td>
<td>.549</td>
<td>.584</td>
<td>.10</td>
</tr>
<tr>
<td>Mean incongruent response time (ms)</td>
<td>1165.09</td>
<td>1204.60</td>
<td>-39.51</td>
<td>113</td>
<td>-.477</td>
<td>.634</td>
<td>.09</td>
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<tr>
<td>Mean control response time (ms)</td>
<td>1011.49</td>
<td>1000.56</td>
<td>10.93</td>
<td>113</td>
<td>.149</td>
<td>.882</td>
<td>.02</td>
</tr>
<tr>
<td>Congruent minus incongruent response time (ms)</td>
<td>-146.99</td>
<td>-227.03</td>
<td>80.04</td>
<td>113</td>
<td>1.926</td>
<td>.057</td>
<td>.36</td>
</tr>
<tr>
<td>Control minus incongruent response time (ms)</td>
<td>-153.60</td>
<td>-204.30</td>
<td>50.70</td>
<td>113</td>
<td>1.093</td>
<td>.277</td>
<td>.21</td>
</tr>
</tbody>
</table>

*Note.* Numbers in parentheses are standard deviations.
Table 2.
*Probe Recognition Task Reaction Times and Standard Deviations (MS).*

<table>
<thead>
<tr>
<th></th>
<th>Depletion (SD)</th>
<th>Non-Depletion (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-critical trials</td>
<td>712.32 (222.88)</td>
<td>765.37 (213.63)</td>
</tr>
<tr>
<td>Critical trials</td>
<td>674.88 (232.95)</td>
<td>729.82 (217.11)</td>
</tr>
<tr>
<td>Non-Critical “no” trials</td>
<td>710.32 (256.45)</td>
<td>729.95 (251.59)</td>
</tr>
<tr>
<td>“Yes” trials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participant standard deviation across all trials (RTSD)</td>
<td>287.39 (370.67)</td>
<td>361.56 (396.83)</td>
</tr>
<tr>
<td>Change from non-critical “no” trials to critical trials (RTC)</td>
<td>-35.43 (182.74)</td>
<td>-0.13 (276.68)</td>
</tr>
</tbody>
</table>
Table 3.
*Study One ANCOVA of depletion and importance of looking groomed on RTC with and without RTSD as covariate*

<table>
<thead>
<tr>
<th></th>
<th>df</th>
<th>F</th>
<th>p</th>
<th>η2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>With RTSD as Covariate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depletion Condition</td>
<td>1.60</td>
<td>.078</td>
<td>.782</td>
<td>.001</td>
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<tr>
<td>RTSD</td>
<td>1.95</td>
<td>14.862</td>
<td>&lt;.001</td>
<td>.135</td>
</tr>
<tr>
<td>Importance of Looking Groomed Self-Report</td>
<td>6,15</td>
<td>.555</td>
<td>.760</td>
<td>.178</td>
</tr>
<tr>
<td>Depletion Condition X Importance of Looking Groomed*</td>
<td>5,95</td>
<td>.219</td>
<td>.953</td>
<td>.011</td>
</tr>
<tr>
<td><strong>Without RTSD as Covariate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depletion Importance of Looking Groomed Self-Report</td>
<td>1,57</td>
<td>.000</td>
<td>.984</td>
<td>.000</td>
</tr>
<tr>
<td>Importance of Looking Groomed Self-Report</td>
<td>6,14</td>
<td>.454</td>
<td>.831</td>
<td>.161</td>
</tr>
<tr>
<td>Depletion Condition X Importance of Looking Groomed*</td>
<td>5,96</td>
<td>.234</td>
<td>.947</td>
<td>.012</td>
</tr>
</tbody>
</table>

*Note.* Variables were transformed to satisfied normality assumptions (see data screening section). Importance of Looking Groomed was entered as a “random” factor.
Table 4. Means and standard deviations for Study Two.

<table>
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<tr>
<th>Depletion</th>
<th>Construal</th>
<th>Condition</th>
<th>Total Harvest</th>
<th>Choice Variance</th>
<th>Mean Response Time</th>
<th>Conflicted Self-Report</th>
<th>Time (MS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Low</td>
<td>Dummy</td>
<td>5.39</td>
<td>84.19</td>
<td>26.50</td>
<td>14.55</td>
<td>4.19</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>Low</td>
<td>1.35</td>
<td>1530.68</td>
<td>16.85</td>
<td>84.86</td>
<td>14.19</td>
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<tr>
<td></td>
<td>Low</td>
<td>Low</td>
<td>6.66</td>
<td>76.09</td>
<td>33.21</td>
<td>1316.19</td>
<td>18.59</td>
</tr>
<tr>
<td>High</td>
<td>Low</td>
<td>Dummy</td>
<td>5.39</td>
<td>84.19</td>
<td>26.50</td>
<td>17.66</td>
<td>6.19</td>
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<td></td>
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<td>Low</td>
<td>1.35</td>
<td>1530.68</td>
<td>16.85</td>
<td>84.86</td>
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<tr>
<td></td>
<td>Low</td>
<td>Low</td>
<td>6.66</td>
<td>76.09</td>
<td>33.21</td>
<td>1316.19</td>
<td>18.59</td>
</tr>
<tr>
<td>Depletion</td>
<td>Construal</td>
<td>Condition</td>
<td>Total Harvest</td>
<td>Choice Variance</td>
<td>Mean Response Time</td>
<td>Conflicted Self-Report</td>
<td>Time (MS)</td>
</tr>
<tr>
<td>No-Depletion</td>
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<td>Dummy</td>
<td>5.39</td>
<td>84.19</td>
<td>26.50</td>
<td>14.55</td>
<td>4.19</td>
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<tr>
<td></td>
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<td>Low</td>
<td>1.35</td>
<td>1530.68</td>
<td>16.85</td>
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<tr>
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<td>Low</td>
<td>Low</td>
<td>6.66</td>
<td>76.09</td>
<td>33.21</td>
<td>1316.19</td>
<td>18.59</td>
</tr>
</tbody>
</table>
Appendix A

The following are the sentence/probe word combinations that were used. These are based on Custers and Aarts (2007) research using this task to measure self-control conflict awareness. The first ten are practice trials and were presented to each participant in the same order. The following are real trials and appeared in a randomized order for each participant. The critical trials where the common goal to look well groomed is violated are marked with an asterisk (*).

1. The dog is brown…brown.
2. He ran a footrace…stagger
3. The ship is sailing north…ship
4. The quick brown fox jumps over the lazy dog…craft.
5. Your favorite coffee shop is closed…shop.
6. They speak Spanish in Mexico…physical
7. She asked for his telephone number…telephone
8. That is your book…charity
9. Your car is blue…car
10. It is time for lunch…geometry
11. The shoes are dirty…polish*
12. Your breath smells bad…mint*
13. Your hands are soiled…wash*
14. Your pants are falling down…belt*
15. You are starting to smell…shower*
16. You spilled your drink on yourself…change*
17. You have food between your teeth…floss*
18. Your hair is a mess…comb*
19. Your shirt is very wrinkled…iron*
20. You have a runny nose…tissue*
21. The dog is fast…water
22. The train left the station…less
23. She said something to him…create
24. You have an allergy to wheat…rock
25. You went shopping yesterday…laughter
26. Today is a nice day to visit the beach…after
27. The light switch is off…counter
28. Your friend is on vacation…brick
29. There are four seasons…hut
30. The comedian is funny…car
31. The doctor is not very nice…lamp
32. It is very windy outside today…computer
33. The dolphin leaped out of the water…soft
34. The accountant does not work for free…work
35. The farm had a good harvest this year…stair
36. The man kept blinking his eyes…kept
37. The audience applauded the speech…infant
38. The lawyer objected to the claim…the
39. You go to work at nine in the morning…nine
40. The newspaper was delivered on time…time
41. You remembered your brothers birthday…foundation
42. The snail moved along very slowly… along
43. The chef prepared your favorite meal…tell
44. The television show has a catchy song…has.
45. The rubber band snapped in your hand…reign
46. The store is closed on the weekends…closed
47. The apple does not fall far from the tree…brush
48. The police car is black and white…car
49. It is snowing on the mountain top…sect
50. The dealership near your house is having a big sale…house
51. Your library book is due back tomorrow…defining
52. Your favorite team won the championship…won
53. The printer is out of paper…out
54. Your desk it too tall…too
55. Your shoes have laces…desk
56. Your couch folds out into a bed…folds
57. The coffee maker is broken…broken
58. The grocery store is out of paper bags…paper
59. Daylight savings time is ending soon…soon
60. You were up all night studying for ran exam…you
61. The river water level is highest after it rains…river
62. The student abides the teachers instruction…student
63. The referendum vote is occurring tomorrow…vote
64. The campfire is starting to go out…out
65. Your parents are on vacation this week…on
66. You are driving through a work zone…work
67. The hardware store is closed today…closed
68. The comedian is not very funny…very
69. Your horse won the race…won
70. You have a doctors appointment today…today
Appendix B

All items were answered using a 7-point Likert scale where 1 = Do not at all agree and 7 = Very strongly agree. The order of these items were randomized for each participant.

1. I often felt conflicted between releasing fish back into the pond and keeping them for myself.
2. It was difficult for me to decide how many fish to return to the pond.
3. When deciding how many fish to release back into the pond, it was easy for me to think of both reasons to keep some fish and to release some fish.
4. I thought carefully about how many fish to release back into the pond.
5. I was often unsure as to how many fish I should release on each turn.