

Strengthening Self-Control by Practicing Inhibition and Initiation

by

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

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ABSTRACT

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Abstract

An abstract of a dissertation that examines the effect of practicing different forms of self-control, inhibition and initiation, on the occurrence of subsequent behaviors reflecting one or both types of self-control. Previous work based on the limited strength model of self-control has demonstrated that practicing small acts of self-control can improve self-control over time. However, past research involving self-control practice has operationalized self-control primarily as the inhibition of impulses. The current set of studies distinguishes between two forms of self-control: self-control by inhibition and self-control by initiation. This work also contributes to the self-control literature by treating self-control as an idiosyncratic process. Study 1 tested whether fluctuations in each form of self-control, aggregated at the daily level, would predict the degree to which people reported engaging in other self-control behaviors. Study 1 was a two-week experience sampling study in which 101 undergraduates reported several times daily on their self-control behaviors. The results of Study 1 support a distinction between self-control by inhibition and initiation. Moreover, the finding that participants actually studied more on days when they reported exerting more self-control by initiation seems to support a possible practice effect on self-control that may be specific to form. Study 2 introduced a practice manipulation, testing whether practicing one form of self-control (either inhibition or initiation) leads to improvement in only that type of self-control (but across domains), or across both forms. Study 2 was four weeks in total: two weeks of a practice manipulation (either inhibition, initiation, or a no-practice control) and two weeks of experience sampling. Analyses were carried out using multilevel modeling in SAS Proc Mixed and SAS Proc Glimmix. However, results indicated that there was no main effect of practice on subsequent self-control behaviors. Follow-up analyses revealed that the effect of practice varied across dependent variables and as a function of reported exertion of

inhibition and initiation. Several effects from Study 1, including the effect of within-person exertion of initiation on subsequent self-control behaviors, were replicated. Possible explanations for the unexpected findings, including the strength of the practice manipulation, are discussed. Ideas for future research, including tailoring self-control practice to specific demands on self-control, are presented. Implications for the effect of practice on future self-control pursuits and a distinction between inhibition and initiation are also discussed.

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Introduction

On a daily basis, people exert—or attempt to exert—self-control across varied domains, from health behaviors to interpersonal relationships, with varying degrees of success. Not surprisingly, self-control has been implicated in a wide range of both positive and negative outcomes. The ability to control the self has been linked with a number of adaptive outcomes, including more harmonious interpersonal relationships (Finkel & Campbell, 2001), enhanced intellectual performance (Schmeichel, Vohs, & Baumeister, 2003), and superior physical health (Crescioni et al., 2011). Self-control failures, meanwhile, have been implicated in a number of maladaptive outcomes for individuals and society, including overeating (Vohs & Heatherton, 2000), aggressive behavior (DeWall, Baumeister, Stillman, & Gailliot, 2007), substance dependence, financial problems, criminal offenses, and health problems including periodontal disease (Moffitt et al., 2011).

Despite this large body of research examining the impact of self-control across a variety of behaviors, there are several fundamental gaps in the literature that prevent research from being applied to everyday problems of self-control. The current favored experimental approach, a dual-task paradigm rooted in the limited resource model of self-control, is limiting in that it prevents researchers from examining how the exertion of self-control unfolds with respect to real-world behaviors. In addition, the selection of tasks and commonly used trait measure of self-control do not appear to be informed by a theoretical model of the construct. Similarly, a key component of the limited resource model—the effect of practice on subsequent self-control—has been understudied. Although initial demonstrations of this effect suggest that practicing self-control can improve self-control capacity, this research fails to explain why, despite the fact that many have regular practice at exercising self-control in their daily lives, people continually fail to exert self-control even when it is consequential to do so. Moreover, the competing influences of self-

control depletion and practice on subsequent self-control behaviors have not been examined. Finally, the current research on self-control implicitly assumes that self-control tasks are similarly taxing for most people (a few trait variables notwithstanding). In the current work, I offer a method of measuring exertion of self-control that accounts for the notion that different self-control behaviors affect people's capacity for self-control in different ways.

This dissertation is outlined as follows. First, I review relevant literature on the limited resource model of self-control and the effect of practice on self-control. Next, I review existing measurement techniques and definitions of self-control and offer preliminary evidence for making a distinction between two forms of self-control: self-control by inhibition and self-control by initiation. I then describe an experience sampling study that addresses the possibility of distinguishing between self-control by inhibition and self-control by initiation with respect to real-world self-control behaviors. Next, I report findings from a second study using an experience sampling approach to test the effect of practicing one form of self-control or the other on self-control behaviors in general. Finally, I explore possible explanations for unexpected findings, discuss ideas for future research, and address implications for the effect of practice on self-control pursuits and a conceptual distinction between inhibition and initiation.

The Limited Resource Model

An increasingly large body of research examining self-control is centered on what is referred to as the limited strength or limited resource model (Baumeister, Bratslavsky, Muraven, & Tice, 1998). The basic tenet of this model is that an individual's capacity to exercise self-control is limited in nature; engaging in behaviors that require self-control consumes this limited resource. When people exert self-control, this limited resource becomes temporarily depleted, and the capacity to engage in subsequent acts of self-control is thereby reduced. Within the self-

control literature, the reduced capacity for self-control following its use is referred to as ego depletion.

The majority of work testing the limited resource model of self-control has been completed in a laboratory setting. In a typical ego depletion study (e.g., Baumeister et al., 1998), participants are randomly assigned to first either complete an act of self-control, such as resisting the temptation to eat freshly-baked chocolate chip cookies, or to complete a control task that does not require self-control, such as resisting the temptation to eat radishes. Following this first act of self-control, all participants are then asked to complete a subsequent task, such as an unsolvable or difficult anagram task, on which performance or persistence is thought to be reflective of self-control capacity. This dual-task paradigm has been used successfully to demonstrate the ego depletion effect across tasks of different domains in a large number of studies. A recent meta-analysis of 83 published studies testing the limited resource model reported a medium-to-large average effect size across studies (Hagger, Wood, Stiff, & Chatzisarantis, 2010).

Despite its popularity within the field, most of the tasks used to examine the limited resource model of self-control via the dual-task paradigm have not changed in the 15 years since the model was first introduced. Although some (e.g., Baumeister, Vohs, & Tice, 2007; Hagger et al., 2010) have made attempts to classify the nature of the tasks used to test the limited resource model, there are several ongoing debates about what constitutes a self-control task. For example, some researchers dispute the notion that solving complex math problems requires self-control, because these problems can be solved using heuristics (Muraven, Tice, & Baumeister, 1998). Similarly, others have argued that persistence, particularly on unsolvable tasks, may not constitute evidence of self-control but, rather, an inability to adaptively self-regulate and disengage from tasks when appropriate (Barber, Grawitch, & Munz, 2012). However, despite these claims—and others—many researchers continue to use these disputed tasks as part of the

dual-task paradigm, both as the depleting task and as a dependent measure thought to tap self-control.

In addition to the aforementioned disputes on what constitutes a self-control task, other controversies have begun to appear within the literature on self-control inspired by the limited resource model. One such debate concerns the form of the resource—some researchers have posited that glucose may be the physiological resource underlying self-control (Gailliot et al., 2007); however, this account has been and continues to be challenged (e.g., Beedie & Lane, 2012; Kurzban, 2010; Molden et al., 2012). Another source of controversy is that, despite a large number of experiments supporting the limited resource model (e.g., Hagger et al., 2010), many questions remain regarding the mechanics of how depletion of self-control capacity works. Recent work has emphasized the need for accounts of the psychological processes underlying the ego depletion phenomenon. For example, Inzlicht and Schmeichel (2012) offer a process model of self-control that accounts for ego depletion via reduced motivation and shifts in attention away from the exertion of self-control. This process model could, theoretically, enable researchers to move beyond the metaphoric limited resource model and develop more precise accounts of how and why people fail to exercise self-control.

The Effect of Practice

The limited resource model of self-control makes use of a metaphor comparing one's capacity for self-control to a muscle; and, like a muscle, this self-control resource may be strengthened over time through practice (Muraven, Baumeister, & Tice, 1999). A limited number of studies have examined the effect of practicing self-control on the subsequent ability to exercise self-control. In a seminal study examining the degree to which practice impacts self-control, Muraven and colleagues (1999) found that participants who practiced self-control for two weeks by improving their posture daily demonstrated gains in self-control stamina as compared to those

in a no-exercise control group, as evidenced by performance on a laboratory handgrip task following a depleting thought suppression task.

In a subsequent set of studies, Oaten and Cheng (2006a, 2006b, 2007) randomly assigned participants to practice self-control daily for several weeks via various interventions (a study program, an exercise program, or a financial monitoring program). Across three studies, participants who practiced these self-control tasks evidenced subsequent improvements in self-control. The increase in self-regulatory stamina took two forms: first, participants who practiced self-control performed better on a visual tracking task following a depletion task, relative to controls. Participants who practiced self-control also reported improvements in general self-control behaviors (e.g., more healthy eating, less drug and alcohol use, less impulse spending, less procrastination) compared to both controls and to their own baseline reports of these behaviors.

Similar studies have replicated these findings across various self-control practice interventions and with respect to dependent measures involving the capacity for self-control. For example, Hui and colleagues (2009) found that participants who practiced behavioral restraint by swishing a high-alcohol-concentration mouthwash twice per day for two weeks evinced better self-control as measured by tolerance on a cold pressor task, performance on a mental concentration task, and health behaviors including flossing and brushing. In another sphere, self-control training implemented by asking participants to use their non-dominant hand in daily activities (e.g., eating) for two weeks decreased aggressive responses in a laboratory provocation paradigm among those high in trait aggression (Denson, Capper, Oaten, Friese, & Schofield, 2011). Still further, a set of longitudinal studies demonstrated that a two-week self-control practice program diminished the depleting effect of suppressing stereotypes, as measured by Stroop task and anagram performance following a stereotype suppression task, among those low in motivation to suppress stereotypes (Gailliot, Plant, Butz, & Baumeister, 2007). These studies

provide further evidence that practicing self-control over an extended period seems to strengthen one's capacity for self-control, and that this effect appears to be robust; a recent meta-analysis of nine of these studies reported a large effect size ($d = 1.07$; Hagger et al., 2010).

Taken together, these studies suggest that practicing self-control with some regularity serves to increase one's stamina for later self-control exertion, particularly following depletion. Across studies using several different forms of self-control practice manipulations, practicing small acts of self-control on a daily basis seemed to strengthen one's capacity for self-control over time. However, despite this convergence of findings, several questions about how practice serves to improve self-control capacity remain. One question left to be answered is whether different forms of self-control are equally effective for outcome behaviors in different domains of self-control. For example, Muraven (2010b) found that practicing inhibition improved inhibition as measured by smoking cessation. However, it is unclear whether practicing inhibition would also lead people to improve their capacity to initiate positive self-control behaviors (e.g., exercise). In addition, previous research has left the question of whether practice may be depleting at the outset unanswered. Although the limited resource model of self-control does account for the effect of practice, it is unclear how practice and depletion can be balanced within the context of real-world self-control behaviors.

Distinguishing Between Forms of Self-Control

One commonality in the research outlined in the previous two sections is the way in which the authors conceptualize and define self-control. Current definitions of self-control emphasize the degree to which people must override their impulses or bad habits, delay gratification, or otherwise inhibit thoughts, feelings, and behaviors that may be inconsistent with their goals. For example, in the practice literature reviewed above, authors offered the following definitions of self-control: "small acts of inhibiting moods, urges, thoughts, or feelings"

(Muraven, 2010a, p. 465); “to override, inhibit, or stop a thought, emotion, urge, or behavior” (Muraven, 2010b, p. 446); “behavioral restraint or inhibition” (Hui et al., 2009, p. 419). Although a small sample of the existing definitions of self-control, the emphasis on inhibition to the exclusion of other concepts is pervasive throughout the current body of literature on self-control, particularly with respect to the limited resource model.

In addition to extant definitions of self-control that seem to favor inhibition almost exclusively, it appears that the majority of existing measures of self-control used currently also tap inhibition. Within experimental research, most manipulations and dependent measures of self-control used in laboratory settings seem to address inhibition. For example, the Stroop task, used in many self-control studies as both a depleting task and a dependent measure ($k = 28$ in a recent meta-analysis; Hagger et al., 2010) is commonly acknowledged as a measure of inhibitory control (West & Alain, 2000). Similarly, the commonly used white bear thought suppression task (Wegner, Schneider, Carter, & White, 1987) and emotion-suppression video tasks (Baumeister et al., 1998) require participants to inhibit their thoughts and emotions, respectively. Finally, researchers often ask participants to inhibit the desire to consume tempting food as a depleting task (e.g., Baumeister et al., 1998) and also use over-consumption of tempting food as a dependent measure of self-control (Heatherton & Vohs, 2000).

As the previous examples illustrate, self-control studies in the laboratory often ask participants to engage in inhibition as either a task that should deplete their capacity for self-control or as evidence that their self-control has been depleted by a prior task. This observation that inhibition is often solely implicated in studies of self-control at the state level is, to some degree, mirrored in research involving trait self-control. Currently, the Trait Self-Control Scale and its brief version (Tangney, Baumeister, & Boone, 2004) are the self-report measure of choice for those studying self-control experimentally in social psychology. A review of this measure

reveals that most of the items refer primarily to inhibition (e.g., “I am good at resisting temptation” and “I do certain things that are bad for me, if they are fun”). In addition, very few items seem to tap a potential second facet of self-control, initiation ($n = 4$); most of those refer specifically to health behaviors (e.g., “I eat healthy foods” and “I engage in healthy practices”) and only one initiation-focused item (“I am able to work effectively toward long-term goals”) is included in the brief version of the scale that is used nearly exclusively in the self-control literature. Indeed, a recent examination of the factor structure of the Brief Self-Control Scale (Maloney, Grawitch, & Barber, 2012) revealed a two-factor structure consisting of restraint (“the tendency to resist temptation,” p.113) and impulsivity. Importantly, the sole item from the BSCS that could be considered to tap initiation (“I am able to work effectively toward long-term goals”) loaded on neither the restraint nor the impulsivity factor.

In sum, the vast majority of research examining self-control, particularly work stemming from the limited resource model, operationalizes self-control as tantamount with inhibition. However, in the current and proposed work, I advocate for a distinction between two different forms of self-control: self-control by inhibition and self-control by initiation. This distinction offers a definition of self-control that acknowledges that people may exercise self-control both by inhibiting and by initiating behavior. In this view, self-control, broadly speaking, is a conscious decision by an individual to move in a direction that differs from that dictated by prevailing forces in the person (e.g., impulses) or in the situation (e.g., norms, requests from other people). This broad definition allows for the possibility that self-control may be exercised in two ways. When dominant forces pull for thoughts, behaviors, or feelings that are inconsistent with goals, the self-control exercised in service of these goals is considered to be self-control by inhibition—consciously overriding the pull toward goal-inconsistent behavior. Put more simply, self-control by inhibition involves not behaving in undesired ways despite the predisposition to do so. Though

appealing or desirable initially, these behaviors may be counter to particular goal or to general successful functioning. One common example is inhibiting one's desire for unhealthy foods (e.g., chocolate or pizza). Although indulging in an ice cream sundae may be appealing at first blush, this behavior may be detrimental to short-term goals (e.g., to fit into a new pair of jeans), as well as long-term goals (e.g., to maintain a healthy weight) and even more distal goals (e.g., to avoid health problems like hypertension in old age).

By contrast, prevailing forces may pull for inaction when goal pursuit requires action; in this case, one must exercise self-control by initiation—the conscious production of goal-consistent action despite a pull toward inaction. Put differently, initiation can be thought of as a self-control process requiring a person to initiate or engage in behavior that may be unpleasant or otherwise undesired, but serves to draw a person closer to an active goal. Key to initiation is the idea that people must often engage in actions or behaviors that may seem unappealing in the short term, but that must be completed in order to achieve a broader or longer-term outcome. For example, exercise is a behavior that many people find to be unappealing in the short-term for reasons associated with the behavior itself (e.g., exercise can be physically uncomfortable) but also because exercising often means forgoing the desire to engage in other, more pleasant behaviors (e.g., watching television). Although inhibiting alternative behaviors is an important component of initiation, self-control pursuits of this nature require more than just the inhibition of inaction. In other words, inhibiting inaction or alternative behaviors is a necessary, but not sufficient, component of initiation.

To be clear, many behaviors that require self-control seem also to entail the use of inhibition. Even those behaviors that require an individual to exert self-control by initiation may also necessitate one to inhibit behaviors during the process of initiating others. For example, if Mary attempts to exert self-control by heading to the gym for a spin class, it is likely that she

must first inhibit the impulse to catch up on her DVR, organize her closet, or any other number of goal-inconsistent behaviors. However, forgoing these goal-inconsistent behaviors is not enough to ensure that the goal-consistent action is produced. The ability to inhibit is part of, but not the entire process of self-control.

Although the vast majority of research seems to over-emphasize—to the point of excluding alternatives—the role of inhibition in self-control, there are a few current perspectives that advocate for a more balanced approach to operationalizing self-control. For example, Fujita (2011) cautions against defining self-control solely as the effortful inhibition of impulses. In calling for a broader perspective in research on self-control, he defines self-control as “the general process by which people advance abstract, distal motives over concrete, proximal motives in judgments, decisions, and behavior” (p. 362). This broader conceptualization of self-control is instructive to the current and proposed research because it allows for the possibility that people can engage in self-control without the exertion of inhibition. Although this broad definition allows for the possibility of varied forms of self-control, Carver’s (2010) more specific definition of self-control as “the ability to override impulses to act as well as the ability to make oneself initiate or persist in boring, difficult, or disliked activity” (p. 766) appears to be closest to a conceptualization of self-control as both inhibiting desired, but goal-inconsistent, behaviors and initiating undesired, goal-consistent behaviors.

To explore further this proposed distinction between self-control by inhibition and self-control by initiation, we conducted a narrative study in which participants described their experiences with successful and unsuccessful self-control attempts (Davisson, Hoyle, & Gajewski, 2012). Self-control by inhibition was described as “a situation in which your impulse was to behave in a particular way, but you thought you should not” and self-control by initiation as “a situation in which your impulse was to not behave in a particular way, but you thought you

should.” Type of self-control and success were crossed such that each participant wrote about four situations: unsuccessful inhibition, successful inhibition, unsuccessful initiation, and successful initiation. All descriptions were rated by coders naïve to this conceptual distinction with reference to: (1) the extent to which the situation described involved self-control by inhibition, (2) the extent to which the situation described involved self-control by initiation, and (3) arousal and valence ratings of emotion words used in the description (using ANEW; Bradley & Lang, 1999).

Results from this study provide initial evidence for a conceptual distinction between self-control by inhibition and self-control by initiation. First, participants’ descriptions of experiences with self-control by inhibition were judged by naïve coders as involving significantly more inhibition than initiation. The reverse was true for descriptions of experiences with self-control by initiation; coders rated these narratives as involving significantly more initiation than inhibition. Finally, we also observed a significant main effect of self-control type on arousal and valence ratings, such that people used stronger and more positively valenced words to describe experiences with self-control by inhibition as compared with descriptions of self-control by initiation. In addition to the ratings of naïve coders, participants themselves were readily able to distinguish between self-control by inhibition and self-control by initiation in their descriptions of various experiences with self-control successes and failures. Taken together, these results substantiate a distinction between two forms of self-control.

Given the support in this narrative study for a distinction between self-control by inhibition and self-control by initiation, we next created a trait measure capturing these two forms of self-control. In order to assess discriminant and predictive validity, this measure was administered with a wide variety of other personality measures (e.g., the NEO-PI-R, Costa & McCrae, 1992), in addition to self-control behaviors (e.g., “I eat more than I should”) on which

separation between inhibition and initiation could be expected. Inhibition and initiation, as measured by the subscales on this trait scale, were differentially related to a number of other traits in ways that support a distinction between the two forms of self-control (Hoyle & Davisson, 2012). For example, the inhibition subscale was significantly more strongly related to impulsiveness, as measured by the NEO-PI Impulsiveness facet (Costa & McCrae, 1992) and by subscales of the UPPS Scale (Whiteside & Lynam, 2001), than was initiation. Turning to initiation, trait levels were more strongly associated with conscientiousness, as measured by facets of the NEO-PI Conscientiousness (Costa & McCrae, 1992) and the Behavioral Indicators of Conscientiousness (Jackson et al., 2010), than were trait levels of inhibition. In addition, inhibition scores were predictive of responses to behavioral questions, including “I eat more than I should” and “I drink too much alcohol,” above and beyond initiation scores. In sum, this study provided initial evidence for a distinction between self-control by inhibition and self-control by initiation at the trait level.

In addition to the results of a narrative study and descriptive work on a trait measure, some prior experimental work supports a distinction between self-control by inhibition and self-control by initiation. For example, in a laboratory study, inhibition, but not initiation, measured at the state level (i.e., If you were faced with a temptation right now, what is the likelihood you could resist it?) predicted performance on a Stroop task. Similarly, but in a different study, participants’ self-reported capacity to initiate behavior at the state level (i.e., If you needed to engage in a behavior that you make yourself do, what is the likelihood you could do it?) was predictive of willingness to forgive a romantic partner of a transgression; capacity for inhibition was unrelated to forgiveness (Davisson & Hoyle, 2013). This latter finding emphasizes the distinction between inhibition and initiation; although forgiveness requires one to inhibit negative thoughts and feelings toward the transgressor, the transformation of these negative associations

into more benevolent attitudes essential for forgiveness seems to involve more than just inhibition (Pronk, Karremans, Overbeek, Vermulst, & Wigboldus, 2010).

Taken together, results across a narrative study, correlational studies on a trait measure, and experimental work provide a widening body of evidence in support of a distinction between self-control by inhibition and self-control by initiation. As increasing numbers of researchers interested in self-control call for more precise definitions of self-control and more specific, process-oriented accounts of the nature of self-control, we offer a multi-dimensional view of self-control involving two key processes: inhibition and initiation. Key to the distinction is the idea that people can exercise self-control in two ways: by inhibiting or by initiating cognitions, emotions, and behaviors. Though some behaviors may require self-control of both forms, this representation offers a view of inhibition and initiation as related but distinct self-control processes.

Tailoring Self-Control Practice

Extending this conceptualization of inhibition and initiation as related, yet distinct self-control processes, practicing one type of self-control or the other should have different effects on subsequent self-control behaviors. However, a plausible counterargument is that any type of self-control practice—regardless of its form—builds non-specific capacities and skills that support and therefore improve self-control regardless of type. One possibility is that practicing self-control improves self-control behaviors via heightened monitoring of these behaviors. However, previous research by Muraven (2010a) has demonstrated that this is not likely to be the case; a control group of individuals, who monitored but did not alter their self-control behaviors, did not experience the same improvement in self-control as those who practiced a specific self-control behavior. Moreover, his results confirmed that the effect of practicing self-control on subsequent self-control behaviors could not be explained by an increased awareness of self-control,

expectations that practice would aid in future self-control attempts, or by reported effort expended on the practice task. Similarly, Oaten and Cheng (2006a, 2006b) found across two studies that differences in self-control behaviors between a self-control practice group and control participants could not be attributed to increased self-efficacy in the practice group. Collectively, these findings argue against the conclusion that self-control practice produces general, non-specific changes in capacities and skills that would not differ across our two types of self-control.

Given that evidence suggests that the effects of practice on self-control are not due simply to increased self-awareness, expectations, or general effort expenditures, what is practice changing? Potential answers to this question may be revealed through comparisons of the effects of different kinds of practice on different forms of self-control. Based on prior work, I propose that practicing self-control by initiation should lead to improvements in initiation, but should also facilitate inhibition because initiating goal-consistent behaviors often requires first the inhibition of goal-inconsistent behaviors. By contrast, practicing self-control by inhibition should facilitate inhibition, but not initiation, because inhibition is a necessary, but not sufficient, component of initiation. Why might this be the case? There are at least two possible explanations for why practicing a specific form of self-control should facilitate later attempts at self-control of that type, but not necessarily self-control more broadly.

One possibility is that the practice of inhibition or initiation creates or makes salient different goals and that this increased salience of inhibition or initiation goals is responsible for subsequent differential improvements in self-control. In other words, by asking participants to engage in a behavior that requires them to practice either initiation or inhibition, general goals to initiate or inhibit behaviors, respectively, may become more salient. Recent work examining the activation of action and inaction goals seems to support this argument. In one study, environmental cues for action goals led to increased exercise as compared to cues for inaction;

importantly, specific active behaviors also appeared to increase the salience of a more general goal for action (Hepler, Wang, & Albarracin, 2012). This was the case across the domain of the behavior, but not across the domain of the goal. Similar work examining the approach and avoidance of self-control-relevant concepts further indicates that priming general goals impacts multiple specific behaviors that fit into those broader goal categories (e.g., Fishbach & Shah, 2006). Although the distinctions made between action and inaction goals and approach and avoidance motivations, respectively, are broader than the outlined distinction between two self-control processes, these findings suggest a plausible increase in salience of general initiation and inhibition goals following practice of one form of self-control or the other. This increased salience may, in turn, affect the subsequent engagement in other self-control behaviors (i.e., across domains) of each type.

Another distinct possibility is that, through practicing inhibition or initiation, people may learn to utilize different strategies that are relevant for one type of self-control or the other. For example, past research (Mischel & Mischel, 1983) has shown that young children are able to learn and apply strategies for effective delay of gratification. More recent work (e.g., Myrseth & Fishbach, 2009) has posited that the implementation of effective self-control strategies is crucial for the successful exertion of self-control. In the realm of temptations that may derail self-control pursuit, prior research has demonstrated that people may manage self-control by devaluing available temptations (Myrseth, Fishbach, & Trope, 2009). This latter work refers to the collection of varied self-control strategies as restraint; however, as established earlier, restraining impulses represents a component of self-control but not the entirety of self-control or the collection of strategies necessary for its pursuit. Findings across these studies indicate that people are able to learn and implement strategies for the successful use of self-control; practicing small acts of self-control should be one way that people are able to learn said strategies. However,

because initiating behaviors requires more than just the inhibition of impulses, practicing inhibition alone should not be enough to gain strategies relevant for initiation. By contrast, the strategies learned through the practice of initiation should be mostly specific to initiation, but should also support the exertion of inhibition to some degree.

Self-Control as an Idiosyncratic Process

Previous research on self-control has assumed that, for the most part, depleting tasks affect all people in the same way. In laboratory studies, participants are asked to perform a task assumed to drain them of their self-control resources, and implicit in these studies is the assumption that the tasks are similarly taxing for all people. Between-person differences in the amount of self-control a task requires (not attributable to the experimental effect) are treated as random error and cannot be accommodated within the current dual-task paradigm. The assumption that a given behavior requires an equivalent exertion of self-control for all individuals, though untenable, has not been—perhaps could not be—explored in the dual task paradigm. For this reason, the paradigm likely misses important variability in self-control exertion and depletion in real-world contexts.

Incorporating the idiosyncrasies of self-control exertion into laboratory examinations of the limited resource model of self-control would be challenging, but field studies of the self-control process should allow for measurement of its individual nature. For example, a recent experience sampling study examining desire and its relation to self-control incorporated idiographic ratings of desire strength and goal conflict for a set of 76 possible desired behaviors thought to require self-control (Hofmann, Baumeister, Förster, & Vohs, 2012). Participants' ratings of conflict and desire predicted self-control and enactment of behaviors, respectively; however, this prediction could not have been tested without examining the idiographic nature of self-control behaviors. In two of our own studies (Davisson & Hoyle, 2013), participants rated the

degree to which a set of behaviors required them to exert self-control by inhibition and initiation. People's ratings of each of the behaviors as necessitating each form of self-control varied widely. Across both studies, participants' ratings of self-control behavior comprised the full range of responses (1-5) and demonstrated considerable variance (variance estimates ranged from 1.09 to 2.46). These findings provide evidence that, at least in people's self-reports of their own experience, the degree to which different behaviors require the use of self-control varies across people. Thus, an idiographic measure of self-control exertion (or depletion) is needed to represent more accurately the process of self-control as it unfolds with respect to real world behaviors.

Summary

To date, prior self-control research has operated under the implicit assumption that tasks thought to induce self-control depletion affect all people similarly. However, our prior research (Davisson & Hoyle, 2013) has demonstrated that people vary in the degree to which different behaviors require them to use self-control of one form or another. Indeed, some people find it easy to control their eating behavior but difficult to get to the gym, whereas others have the opposite struggle. In the present studies, depletion is measured via self-control exertion in a novel, idiographic way. First, participants rate a set of common, everyday behaviors on the degree to which each requires self-control by inhibition and self-control by initiation. During the course of the signaling phase of the study, participants report whether they have engaged in each of the behaviors. Using participants' ratings and their reports of behavior, an idiographic self-control exertion score can be created that captures the degree to which each participant has exerted self-control by inhibition and initiation during each day.

In addition to this novel method of measuring self-control exertion, the current research contributes to the literature on self-control by making a distinction between self-control by inhibition and self-control by initiation. To my knowledge, previous research has made no such

distinction. In Study 1, I first provide evidence for a distinction between these forms of self-control at both the trait and state (daily) level. The goal of this study was to examine whether expending self-control of one form impacts self-control behaviors of only that type, or both. Building on Study 1, a second study introduces a self-control practice manipulation of one type or the other. Study 2 tests whether practicing one form of self-control improves one's ability to use that type exclusively, or whether practicing a specific form of self-control improves the ability to exert self-control more generally.

Study 1

The purpose of Study 1 was two-fold. The study was designed first to examine whether fluctuations in self-control by inhibition and initiation could be observed using idiographic self-control exertion scores. In addition, Study 1 tested whether fluctuations in each form of self-control, aggregated at the daily level, would predict the degree to which people reported engaging in other self-control behaviors. In a two-week experience sampling study, undergraduate students reported several times daily on their self-control behaviors.

Method

Participants

The sample consisted of 102 undergraduates (72 females; 47% Caucasian, 18% African American, 24% Asian, 4% Hispanic or Latino, 7% other). The mean age was 20.14 ($SD = 1.24$); 24 participants were first-year students, 30 were sophomores, 18 were juniors, and 30 were seniors. Participants were recruited via an online participant recruitment site and flyers posted in common areas on the campus of a private university in the Southeast. Participants were paid \$12 for attending an intake session and up to \$33 for completing the experience sampling phase (\$2 per day of the experience sampling phase = \$28, plus a \$5 bonus for completing all signals). One participant completed the intake session but did not complete any signals; therefore, the final sample consisted of 101 participants.

Procedure Overview

Participants first attended an intake session at which they completed baseline, demographic, and individual difference measures and received instructions for the experience sampling phase of the study. The experience sampling phase was conducted via e-mail and text-message alerts sent through Qualtrics. For two weeks, participants received e-mail or text-

message alerts six times daily that asked them to report on their daily activities, including target self-control behaviors that were embedded in a larger set of behaviors.

Intake Session

The intake session was a one-hour group session held in the laboratory. In addition to receiving instructions for the experience sampling phase of the study and providing demographic information, participants completed a series of measures. Please refer to Appendix A for a complete copy of the intake session materials.

Intake Session Materials

Demographic data. Participants reported on demographic data including their age, sex, year in school, and ethnicity.

Ratings of behaviors. Participants were asked to rate a set of 27 behaviors in response to three questions addressing inhibition, initiation, and replenishment: (1) How much do you have to force yourself to do this behavior? (*initiation*), (2) How much do you have to resist the temptation to engage in this behavior? (*inhibition*), and (3) How much does this behavior replenish or recharge you? (*replenishment*). The five-point response scale for these items ranged from *not at all* to *a lot*.

Two additional questions tapped whether the behaviors listed were habitual in nature: (4) How often have you performed this behavior in the last month? (*habit by frequency*), and (5) When you perform this behavior, how often is it in the same physical location? (*habit by location*). Based on previous work (Wood, Quinn, & Kashy, 2002), participants responded using the following three-option response scales: for frequency, *monthly or less often*, *at least once a week*, *just about every day*; for location, *rarely*, *sometimes*, and *usually*. Responses to these two items were multiplied to create a single habit rating for each of the behaviors.

Individual difference measures. Participants completed additional individual difference measures, including the Two-Factor Self-Control Scale (assessing trait inhibition and initiation; Hoyle & Davisson, 2012), the UPPS Impulsive Behavior Scale (Whiteside & Lynam, 2001), the Marlowe-Crowne Social Desirability Scale (Reynolds, 1982), and the Self-Discipline, Deliberation, Order, Achievement-Striving, and Dutifulness facets of the NEO-PI-R Conscientiousness Scale (Costa & McCrae, 1992).

Experience Sampling Protocol

The experience sampling phase of the study involved two weeks of e-mail or text message alerts sent through Qualtrics six times per day. The alerts directed participants to a series of questions assessing their daily behaviors. Please refer to Appendix B for a complete list of items participants responded to during the experience sampling phase of the study.

First signal. The first signal (“AM signal”) was sent daily at 7am; participants were instructed to complete it upon waking. Participants were asked to report how many hours they had slept the previous night, how difficult it was for them to wake up, whether they were planning on dieting that day, and how many classes and assignments they had scheduled for the day.

Second through fifth signals. The second through fifth signals (“target signals”) were sent during blocks throughout the day based on the completion time of the first signal, at least one hour apart. Participants were asked to report their location and to select which behaviors from a set of 27 they had completed since the last signal (example behaviors include “Take a nap” and “Ate healthy foods;” see Appendix B for a list). In addition, participants responded to two additional state self-control items tapping inhibition and initiation, respectively: (1) Right now, how much willpower do you have to resist temptations? and (2) Right now, how much willpower do you have to get things done? (Scale for both questions: *none at all to a great deal.*)

Sixth signal. The sixth signal (“PM signal”) was sent daily at 10pm; participants were instructed to complete it before going to bed. Participants reported which behaviors they had engaged in throughout the day; target self-control behaviors included exercise (yes vs. no and duration), shopping (yes vs. no and amount spent), smoking (yes vs. no and quantity), television viewing (yes vs. no and duration), alcohol (yes vs. no and quantity), playing video games (yes vs. no and duration), drug use (yes vs. no and type), number of classes attended, and studying (duration). Finally, participants completed the same two state self-control items as before. Please refer to Appendix B for a complete list of items participants completed during this signal.

Results

Compliance

Across the sample and all signals, there was an overall completion rate of 92.3% ($N = 7830$ total completed signals out of a possible 8484). I calculated the completion rate separately for each of the three types of signals: AM signal (one per day), target signals (four per day), and PM signal (one per day). For the AM signals, the completion rate was 97.2% ($N = 1375$ out of a possible 1414 occasions). A completion rate of 91.5% was observed across all four target signals ($N = 5177$ out of a possible 5656 occasions). The completion rate was lowest for the PM signals, but still reached 90.4% ($N = 1278$ out of a possible 1414 occasions).

Inhibition and Initiation

At the trait level, mean inhibition and initiation scores, as measured by the TFSCS, were moderately positively correlated, $r(101) = .49, p < .001$. The reliability for each subscale was high (for inhibition: $\alpha = .88$; for initiation: $\alpha = .89$). In addition, these subscales were differentially related to a number of other personality measures, including conscientiousness and impulsiveness, providing further support for a distinction. As in our previous work, initiation was

more strongly correlated with measures of conscientiousness (r s ranged from .59 to .72), whereas inhibition was more strongly related to impulsiveness (r s ranged from -.34 to -.69).

Next, I examined the correlation between participants' ratings of each of the 27 behaviors as requiring self-control by inhibition and self-control by initiation. The correlations varied widely across each of the 27 behaviors, ranging from moderately negative ($r = -.23$, for "take a nap") to moderately positive ($r = .32$, for "take a break for lunch or dinner"). In addition, I examined the correlation between participants' ratings in response to two state self-control items tapping inhibition and initiation, respectively. (Participants completed these ratings four times daily on each of the 14 days of the study.) There was a strong positive correlation between self-reports of state self-control by inhibition and state self-control by initiation, $r(5149) = .63, p < .001$.

Creating Idiographic Self-Control Exertion Scores

Self-control exertion was operationalized by creating idiographic self-control exertion scores for each participant at the day-level by multiplying their ratings of each of the 27 behaviors as requiring inhibition, requiring initiation, replenishing, or habitual by whether they reported engaging in the behavior during a given signal (scored 0 if they did not engage in the behavior, 1 if they did). These scores were then aggregated over the day to create a daily self-control exertion score for each participant on inhibition, initiation, replenishment, and habit, respectively. Finally, daily self-control exertion scores were person-mean-centered to capture whether the day represented a day on which a given person exerted more or less self-control than on their average day.

Target DV: Hours Studied

As an initial test, I predicted the number of hours studied in a day from: between-person exertion of inhibition score, between-person exertion of initiation score, within-person exertion of inhibition score, within-person exertion of initiation score, the interaction between inhibition exertion and initiation exertion (all level 1 variables), and group-mean-centered trait inhibition and trait initiation (level 2 variables). Studying was included as a target dependent variable because it should require initiation; indeed, studying received one of the highest ratings on initiation during the intake session ($M = 3.29$, $SD = 1.23$) and, by comparison, relatively low ratings on inhibition ($M = 1.94$, $SD = 1.26$).

Between- vs. within-person effects of inhibition and initiation. I examined both the between- and within-person fixed effects of self-control by inhibition and initiation exertion on studying behavior. (The random effects of each were not significant.) In other words, I tested whether the effects of exerting inhibition and initiation, respectively, on studying behavior, were significant at the between-person level (i.e., on days when you exerted more self-control by inhibition and initiation than the average person in the study) and at the within-person level (i.e., on days when you exerted more self-control than your average day).

The between-person effect of exertion by initiation did not have a significant effect on hours studied, $B = .002$, $t(1138) = 0.14$, $p = .89$. Similarly, the between-person effect of exertion by inhibition on hours studied was not significant, $B = -.002$, $t(1138) = -0.16$, $p = .88$. Because these between-person effects were not significant, they were removed from the final model.

The within-person effect of inhibition on studying behavior also did not have a significant effect on hours studied, $B = .003$, $t(1136) = 0.26$, $p = .80$. In other words, a person's exertion of inhibition on a particular day, compared to their average daily exertion of inhibition, did not influence their duration of studying. However, the within-person exertion by initiation

predicted studying behavior, $B = .092$, $t(1136) = 8.11$, $p < .0001$. On days when people experienced more demands on their self-control by initiation, they studied significantly more.

Interaction between within-person effects of inhibition and initiation. The significant within-person effect of initiation on studying behavior was qualified by a significant interaction between the within-person effect of initiation and the within-person effect of inhibition; $B = -.0009$, $t(1136) = -2.54$, $p = .01$. This interaction revealed that the positive relationship between self-control by initiation and subsequent studying behavior was stronger for those who had experienced fewer-than-average daily demands on self-control by inhibition.

Level 2 effects. There was only one marginally significant level 2 effect on studying behavior: the effect of mean-centered trait initiation, as measured by the TFSCS. People who were higher in trait initiation reported studying more on a daily basis, $B = .42$, $t(1136) = 1.70$, $p = .09$. Importantly, trait inhibition was not significantly related to studying behavior, $B = -.18$, $t(1136) = -0.70$, $p = .48$. In addition, there were no significant cross-level interactions between level 1 and level 2 variables.

Discussion

Study 1 yielded initially surprising results; on days when participants experienced more demands on self-control by initiation they, on average, studied more. This finding cannot be explained by depletion; indeed, accounts of ego depletion would predict that, on days when participants experienced more demands on self-control, they should study less (if, in fact, studying requires self-control). However, I interpret these findings in two ways. First, the disparate effects of self-control exertion of inhibition and initiation on studying behavior seem to support a distinction between self-control by inhibition and initiation. If the two forms of self-control could not be distinguished, they should have had similar influence on our outcome behavior, studying—but they did not. Secondly, I (cautiously) interpret the finding that, on days

when participants exerted more self-control by initiation, they actually studied more as suggestive of a possible practice effect on self-control. In other words, on days when people practiced self-control by initiation more across various behaviors, they also exercised more self-control in a different domain (studying).

Study 2

Study 1 provided preliminary evidence that fluctuations in self-control by inhibition and initiation at the daily level can be captured using idiographic self-control exertion scores. In addition, the finding that participants studied more on days when they reported exerting more self-control by initiation suggests that practicing one form of self-control may help people subsequently exercise self-control on other tasks tapping that particular form. In other words, practice may help people exercise self-control across domains if the practice's form is the same across tasks. The purpose of Study 2 is to extend the findings from Study 1 by introducing a practice manipulation. Study 2 tests whether practicing one form of self-control (either inhibition or initiation) leads to improvements in only that type of self-control (but across domains), or across both types of self-control.

Hypotheses

In general, practicing initiation for a two-week period should improve self-control by initiation, such that the performance of behaviors requiring initiation (e.g., studying, exercise) should be less susceptible to the effects of depletion. Because practicing initiation necessarily requires that people practice inhibition, to some degree, practicing initiation should improve self-control by inhibition as well. However, because practicing inhibition does not necessarily require people to engage in self-control by initiation, engaging in a two-week practice of inhibition should improve self-control by inhibition, but not self-control by initiation.

Specifically, I hypothesize the following:

Hypothesis 1a: Practicing inhibition for a two-week period should lead to improvements in inhibition-related self-control behaviors (e.g., alcohol consumption, Stroop task), in the inhibition-practice group as compared to (a) controls, (b) their own pre-practice performance at

an intake session, and (c) with increasing amounts of practice, as measured by increasing self-control throughout and following the practice session.

Hypothesis 1b: Practicing inhibition for a two-week period should not lead to improvements in initiation-related self-control behaviors (e.g., studying, exercise), using the same comparisons as Hypothesis 1a.

Hypothesis 2a: Practicing initiation for a two-week period should lead to improvements in initiation-related self-control behaviors (e.g., studying, exercise) in the initiation-practice group as compared to (a) controls, (b) an inhibition-practice group, and (c) with increasing amounts or practice, as measured by increasing self-control throughout and following the practice session.

Hypothesis 2b: Practicing initiation for a two-week period should also lead to improvements in inhibition-related self-control behaviors (e.g., alcohol consumption, Stroop task). Because initiation often necessitates the use of inhibition as well (and particularly in our manipulation—e.g., eating an extra serving of vegetables at lunch involves forgoing the usual side of chips), participants who practice initiation should also evince improvements in inhibition.

Hypothesis 3: The effect of practice on subsequent self-control behaviors will be stronger at higher levels of depletion. In other words, the effect of practice should be particularly evident on days when participants experience more-than-usual demands on self-control.

Hypothesis 4: The effect of practice on self-control will vary as a function of dispositional levels of trait self-control. I do not have a specific directional prediction for this effect; it may be the case that participants who are higher in trait self-control will practice that form of self-control more effectively and thus experience a greater impact of practice on subsequent behavior. However, a competing, and equally plausible, hypothesis is that practice is especially useful for people who are lower in trait self-control.

Method

Participants

The sample was comprised of 114 undergraduates (81 females; 47% Caucasian, 11% African American, 29% Asian, 4% Hispanic or Latino, 8% other). The mean age was 20.22 ($SD = 1.80$); 36 participants were first-year students, 29 were sophomores, 21 were juniors, and 28 were seniors. Participants' grade point averages ranged from 2.46 to 4.0 ($M = 3.57$, $SD = 0.32$).

Participants were recruited via an online participant recruitment site and flyers posted in common areas on the campus of a private university in the Southeast. Participants were paid \$12 for attending the intake session and up to \$33 for completing the practice manipulation and experience sampling phases (\$1 per day of the practice manipulation and experience sampling phases completed = \$28, plus a \$5 bonus for completing all signals). In addition, participants who completed the online follow-up session ($N = 67$) were entered into a drawing for a \$100 gift card. Three participants did not complete the two-week experience sampling phase; therefore, the final sample (for analyses including experience sampling variables) consisted of 111 participants.

Procedure Overview

Participants first attended an intake session during which they completed baseline, demographic, individual difference measures, and a Stroop task. At this session, participants also received instructions for the practice manipulation and experience sampling phases of the study. The practice manipulation phase was a two-week phase in which participants were randomly assigned (for the entire two-week period) to either practice self-control by initiation, practice self-control by inhibition, or to complete control questions. On Days 1, 8, and 14 of the practice manipulation phase, all participants completed an evening report of their daily behaviors, which included target self-control behaviors embedded within a larger set of behaviors. Immediately following the practice manipulation phase (i.e., Days 15-28), all participants completed the

experience sampling phase. For two weeks, participants received e-mail or text-message alerts six times daily that instructed them to report on their daily activities, including target self-control behaviors embedded in a larger set of behaviors. Both the practice manipulation phase and the experience sampling phase were conducted via e-mail and text-message alerts sent through Qualtrics. Following the end of the experience sampling phase, participants were sent a link to an online follow-up session during which they completed the Stroop task a second time and re-rated the set of behaviors assessed during the intake session.

Intake Session

Participants attended a one-hour group intake session at which they completed baseline, demographic, and individual difference measures, and received information about the practice manipulation and experience sampling phases of the study. At this session, participants also completed a computerized Stroop task that served as a baseline measure of self-control. Please refer to Appendix C for a complete copy of materials used in the intake session.

Intake Session Materials

Demographic items. Participants reported on demographics including age, sex, year in school, academic major, ethnicity, and grade point average.

Ratings of behaviors. Participants rated a set of 33 behaviors in response to three questions addressing inhibition, initiation, and replenishment: (1) How much do you have to force yourself to do this behavior? (*initiation*), (2) How much do you have to resist the temptation to engage in this behavior? (*inhibition*), and (3) How much does this behavior replenish or recharge you? (*replenishment*). The response scale for these items was a 5-point scale ranging from *not at all* to *a lot*.

Two additional questions assessed whether the behaviors listed are habitual in nature: (4) How often have you performed this behavior in the last month? (*habit by frequency*), and (5) When you perform this behavior, how often is it in the same physical location? (*habit by location*). Based on previous work (Wood et al., 2002), participants responded using the following 3-option response scales: for frequency, *monthly or less often*, *at least once a week*, *just about every day*; for location, *rarely*, *sometimes*, and *usually*. Questions 4 and 5 were multiplied to create a single habit rating for each of the behaviors.

Individual difference measures. Participants completed additional individual difference measures, including the Two-Factor Self-Control Scale (assessing trait inhibition and initiation; Hoyle & Davison, 2012), the UPPS Impulsive Behavior Scale (Whiteside & Lynam, 2001), the Marlowe-Crowne Social Desirability Scale (Reynolds, 1982), and the Self-Discipline, Deliberation, Order, Achievement-Striving, and Dutifulness facets of the NEO-PI-R Conscientiousness Scale (Costa & McCrae, 1992).

Practice Manipulation

The practice manipulation consisted of two weeks of self-control exercise for members of the two self-control exercise (*self-control by inhibition* and *self-control by initiation*) groups. During this two week session, participants in the self-control by inhibition exercise group were asked to practice inhibition by resisting one “treat” food or beverage item (e.g., sweets, soda) each day. This form of self-control practice has been used successfully in previous work (Muraven, 2010a, 2010b) as a practice task that requires inhibiting a behavior. Specifically, participants were told the following:

Today, we would like you to eat the way you usually do, except that we would like you to take one opportunity to resist a "treat" that you would like to have or ordinarily indulge in. For example, you could resist a snack or soda from a vending machine, turn down a

baked good when offered, or decide not to eat pizza when it is ordered. It doesn't matter how to you decide to do it, but please resist one treat today.

Participants in the self-control by initiation exercise group were asked to practice initiation by eating one extra fruit or vegetable serving each day during the first two-week phase of the study. Specifically, participants were told the following:

Today, we would like you to eat the way you usually do, except that we would like you to add one more fruit or vegetable serving than you were planning on having or ordinarily have. For example, you may decide to add a piece of fruit to your typical breakfast, or avoid your typical side and order a side salad at lunch or dinner. It doesn't matter how you decide to do it, but please eat one additional fruit or vegetable serving today.

Participants in both practice conditions received two e-mail or text alerts on each of the first 14 days. The first alert was sent each morning to remind them to exercise inhibition or initiation as described above. The second alert was sent each evening to give participants the opportunity to report on their practice. Please refer to Appendix D for a complete copy of the questions participants answered during these two alerts.

Participants in the control group also received two e-mail or text alerts on each of the first 14 days; the first alert was sent in the morning and the second alert was sent each evening. Participants in this group were asked to complete a short math question during each of these signals. This type of control group has been used successfully in previous research to ensure that members of the control group maintain the same approximate amount of contact as participants receiving the practice manipulation; however, completing short math questions does not appear to require self-control (Muraven, 2010a).

Diary Component During Practice Manipulation

During the first two weeks of the study (i.e., the practice manipulation), participants in all three groups (both practice groups and the control group) also completed three days of evening reporting on their daily self-control behaviors. On Days 1, 8, and 14 of the practice manipulation, participants were asked to report which behaviors they had engaged in throughout the day; target self-control behaviors included exercise (yes vs. no and duration), shopping (yes vs. no and amount spent), smoking (yes vs. no and quantity), television viewing (yes vs. no and duration), alcohol (yes vs. no and quantity), playing video games (yes vs. no and duration), drug use (yes vs. no and type), number of classes attended, and studying (duration). These questions regarding self-control behaviors were embedded in a larger set of behaviors, some of which are unrelated to self-control. Participants also completed two additional questions tapping their current capacity for self-control. Please refer to Appendix D for a complete copy of the items that were included during this evening report.

Experience Sampling Phase

The experience sampling phase followed directly the two weeks of practice manipulation and consisted of two weeks of reporting on daily behaviors and self-control. This phase was also conducted via e-mail and text-message alerts sent through Qualtrics. For two weeks, participants received e-mail or text-message alerts six times daily that instructed them to report on their daily activities, including target self-control behaviors embedded in a larger set of behaviors. Please refer to Appendix E for a complete list of items used during the experience sampling phase.

First signal. The first signal (“AM signal”) was sent daily at 5am and participants were instructed to complete it upon waking. Participants reported how many hours they had slept the previous night, how difficult it was for them to wake up, whether they were planning on dieting that day, and how many classes and assignments they had scheduled for the day. In addition,

participants responded to two additional state self-control items tapping inhibition and initiation, respectively: (1) Right now, how much willpower do you have to resist temptations? and (2) Right now, how much willpower do you have to get things done? (Scale for both questions: *none at all to a great deal.*)

Second through fifth signals. The second through fifth signals (“target signals”) were sent during blocks throughout the day based on the completion time of the first signal, at least one hour apart. Participants reported their location and selected which behaviors from a set of 33 they have completed since the last signal (see Appendix E for a list). In addition, participants responded to two additional state self-control items tapping inhibition and initiation, respectively: (1) Right now, how much willpower do you have to resist temptations? and (2) Right now, how much willpower do you have to get things done? (Scale for both questions: *none at all to a great deal.*)

Sixth signal. The sixth signal (“PM signal”) was sent daily at 10pm; participants were instructed to complete it before going to bed. Participants reported which behaviors they had engaged in throughout the day; target self-control behaviors will include exercise (yes vs. no and duration), shopping (yes vs. no and amount spent), smoking (yes vs. no and quantity), television viewing (yes vs. no and duration), alcohol (yes vs. no and quantity), fast food consumption (yes vs. no), playing video games (yes vs. no and duration), drug use (yes vs. no and type), number of classes attended, flossing (yes vs. no), and studying (duration). Please refer to Appendix E for a full listing of items. Finally, participants completed the same two state self-control items as in the previous five signals.

Follow-up session. Following completion of the two-week practice manipulation and two-week experience sampling phase, participants received an email directing them to a 15-minute online follow-up session. In this session, participants were asked to complete the

computerized Stroop task a second time and to rate the set of behaviors as in the intake session. At this time, participants were also debriefed.

Results

Compliance

Across the sample and all signals, there was an overall completion rate of 91.8% ($N = 11487$ total completed signals out of a possible 12516 signals). Completion rates for each type of signal were also calculated separately for each type of signal. For the AM signal during the practice manipulation (one per day, 14 total), the completion rate was 96.4% ($N = 1538$ out of a possible 1596 signals). The completion rate for the PM signal during the practice manipulation without diary component (11 total) was 95.4% ($N = 1198$ out of a possible 1254 occasions). For the PM signal during the practice manipulation with diary component (three total), the completion rate was 93.9% ($N = 321$ out of a possible 342 signals).

The completion rate for the AM signal during the experience sampling phase (14 total) was 94.5% ($N = 1468$ out of a possible 1554 signals). For the target signals during the experience sampling phase (four per day, 56 total), the completion rate was 90.6% ($N = 5630$ out of a possible 6216 signals). The completion rate for the PM signals during the experience sampling phase was the lowest, but still reached 85.7% ($N = 1332$ out of a possible 1554 occasions).

Inhibition and Initiation

Trait inhibition and initiation, as measured by the TFSCS, were moderately positively correlated, $r(113) = .62, p < .001$. The reliability for each subscale was high (for inhibition: $\alpha = .88$; for initiation: $\alpha = .89$). As shown in Table 1, inhibition and initiation were differentially related to other individual difference measures, including conscientiousness and impulsiveness, as in Study 1.

Table 1: Study 2 Correlations Between TFSCS and Measures of Related Constructs

Measure of Related Construct	TFSCS Inhibition	TFSCS Initiation
NEO Conscientiousness – Achievement Striving	.48***	.63***
NEO Conscientiousness – Self-Discipline	.56***	.75***
NEO Conscientiousness – Deliberation	.38***	.26**
UPPS Impulsiveness – (Lack of) Premeditation	-.36***	-.20*
UPPS Impulsiveness – (Lack of) Perseverance	-.55***	-.66***
UPPS Impulsiveness - Urgency	-.74***	-.50***

Note. * $p < .05$, ** $p < .01$, *** $p < .001$, ^{ns} $p > .05$. $N = 114$.

In addition, initiation at the trait level was positively correlated with self-reports of GPA, $r(113) = .26, p < .01$. However, trait inhibition was not significantly correlated with GPA, $r(113) = .13, p > .05$.

At the state level, I examined the correlation between participants' ratings in response to two state self-control items tapping inhibition and initiation, respectively. Participants completed these ratings four times daily during each of the target signals they received during the experience sampling portion of the study (i.e., Days 15 through 28 of the study). There was a strong positive correlation between self-reports of state self-control by inhibition and state self-control by initiation, $r(5149) = .63, p < .001$.

Next, I examined the correlation between participants' ratings of each of the 33 behaviors as requiring self-control by inhibition and self-control by initiation. The correlations varied widely across each of the 33 behaviors, from moderately negative, to no correlation, to moderately positive. The correlations of ratings between inhibition and initiation for the full set of behaviors are presented in Table 2.

Table 2: Study 2 Correlations Between Ratings of Inhibition and Initiation

Behavior	Correlation Between Ratings of Inhibition and Initiation
Take a nap	-.23*
Eat junk food	-.35***
Spend time with friends	-.10 ^{ns}
Complete class assignments	-.22*
Eat healthy foods	-.11 ^{ns}
Use the internet/text during class	-.38***
Complete errands	.04 ^{ns}
Exercise	-.40***
Personal hygiene tasks	.02 ^{ns}
Go to class	.20*
Have a difficult conversation	-.07 ^{ns}
Go to work	.20*
Watch television or movies	-.30**
Read for pleasure	-.19*
Go shopping	-.29**
Play video/online games	-.29**
Skip class	-.33***
Study for a test or quiz	-.17 ^{ns}
Call friends or family	.07 ^{ns}
Take a break for lunch or dinner	.01 ^{ns}
Use the internet	-.20*
Complete chores	-.26**
Spend time with romantic partner	-.08 ^{ns}
Pay attention in class	-.02 ^{ns}
Work in a group/on a team	.13 ^{ns}
Attend a meeting	.04 ^{ns}
Participate in extracurricular activity	-.06 ^{ns}
Use social media	-.29**
Procrastinate	-.33***
Spend time with friends instead of studying	-.38***
Drink caffeinated beverages	-.15 ^{ns}

Note. * $p < .05$, ** $p < .01$, *** $p < .001$, ^{ns} $p > .05$. $N = 114$.

Manipulation Checks

Participants in the inhibition and initiation practice groups completed three manipulation checks daily on each day of the practice manipulation. Two of the manipulation checks—one each morning and one each evening—asked participants to list what their “daily assignment” was for that day. No participants in either of the practice groups failed this initial manipulation check. Participants in the inhibition group typically answered “resist a treat” or listed the specific treat they attempted to resist, whereas participants in the initiation group typically answered “eat extra fruit or vegetable serving” or listed the specific extra serving they had that day.

In addition, participants in both the inhibition and initiation practice groups completed a third manipulation check on each evening of the practice manipulation. Participants in the inhibition practice group were asked to list what treat they had resisted that day. Participants in the initiation practice group were asked to list the extra fruit or vegetable serving they had consumed that day. These responses were then coded by category (e.g., extra serving of fruit, extra serving of vegetables, extra serving of both). Results for the initiation practice group are presented below in Table 3.

Table 3: Initiation Group Coded Answers to Manipulation Check 3

Category	Proportion of Participants Answering in that Category
Extra serving of fruit	55.50%
Extra serving of vegetables	34.13%
Extra serving of fruit and vegetables	4.47%
Nothing/forgot/failed	5.90%

Coded responses for the third manipulation check for participants in the inhibition practice group are presented in Table 4.

Table 4: Inhibition Group Coded Answers to Manipulation Check 3

Category	Proportion of Participants Answering in that Category
Sweets (e.g., cookies, candy, ice cream)	50.23%
Other carbs (e.g., cereal, bagels, bread)	5.73%
Salty snacks (e.g., chips, popcorn)	4.83%
Savory foods (e.g., cheese, meat, pizza)	7.69%
Fried foods (e.g., French fries)	6.03%
Alcohol (e.g., beer, wine)	2.56%
Other beverages (e.g., soda, juice, iced tea)	9.05%
Other (e.g., “non-vegan food”)	4.37%
More than one treat	3.47%
Nothing/forgot/failed	5.43%

In summary, the manipulations appeared to be successful. No participant in either practice group failed an initial manipulation check asking them to report on their “daily assignment” (i.e., the manipulation they received). Participants in the initiation practice group reported eating extra servings of fruits or vegetables on the 14 days of the practice manipulation. Participants in the inhibition practice group reported resisting various treats throughout each day of the practice manipulation. In addition, participant compliance during the practice manipulation was high (completion rate = 96.4%); 95% of participants responded to the practice manipulation alert on 13 out of 14 days.

Creating Idiographic Self-Control Exertion Scores

As in Study 1, self-control exertion was operationalized by creating idiographic self-control exertion scores by participant at the day-level for the 14 days of the experience sampling portion of the study. These scores were created by multiplying participants’ ratings (from the intake session) of each of the 33 behaviors as requiring inhibition, requiring initiation, replenishing, or habitual by whether they reported engaging in the behavior during a given signal

occasion (scored as 0 if they did not report engaging in the behavior, 1 if they did report engaging in the behavior). These scores were then aggregated over the day to create a daily self-control exertion score for each participant on inhibition, initiation, replenishment, and habit, respectively. Daily self-control exertion scores were then person-mean-centered to capture whether the day represented a day on which a given person exerted more or less self-control than on their average day.

Correlations Among Dependent Variables

Before examining the dependent-variable-specific hypotheses, the correlations among the dependent variables were tested. The dependent variables included in this analysis were studying (hours studied), exercise (whether one exercised, minutes exercised), alcohol consumption (whether one consumed alcohol, quantity of consumed), eating junk food (reports of eating junk food over each day), eating healthy food (reports of eating healthy food over each day), and resisting junk food (reports of resisting junk food over each day).

The correlations among the dependent variables, both binary and continuous, are presented below in Table 5.

Table 5: Study 2 Correlations Among Dependent Variables

Dependent Variable	Hours studied	Binary exercise	Minutes exercised	Binary alcohol	Quantity of alcohol consumed	Ate junk food	Ate healthy food	Resisted junk food
Hours studied		-.03*	-.01 ^{ns}	-.12***	.02 ^{ns}	-.002 ^{ns}	.23***	.10***
Binary exercise			.33***	.01 ^{ns}	.16***	-.01 ^{ns}	.27***	.12***
Minutes exercised				-.04 [†]	.22***	.09***	.16***	.07**
Binary alcohol					.36***	.003 ^{ns}	.06***	.04**
Quantity of alcohol consumed						.20***	.21***	.09*
Ate junk food							.03**	.03**
Ate healthy food								.38***
Resisted junk food								

Note. * $p < .05$, ** $p < .01$, *** $p < .001$, [†] $p = .05-.099$, ^{ns} $p > .10$.

DV: Hours Studied

To test the hypothesis that practicing initiation for two weeks should improve initiation-dependent behaviors, the number of hours studied in a day was used as a dependent variable. I predicted the number of hours studied in a day from: between-person exertion of inhibition score, between-person exertion of initiation score, within-person exertion of inhibition score, within-person exertion of initiation score, the interaction between inhibition exertion and initiation exertion (all level 1 variables), and condition, time as measured by days since the last day of practice (centered on the last day of practice, Day 14), group-mean-centered trait inhibition and trait initiation (level 2 variables). Studying was included as a target dependent variable for this

hypothesis because it should require initiation. Indeed, studying received one of the highest ratings on initiation during the intake session ($M = 2.82$, $SD = 1.35$) and, by comparison, relatively low ratings on inhibition ($M = 2.00$, $SD = 1.28$).

As the most stringent test of the hypothesis, hours studied on the last day of practice (Day 14) and during the entire experience sampling session (Days 15-28) were first tested as a dependent measure. To follow up, analyses were conducted examining the effects at two other intervals following practice: the last day of practice and the week following (i.e., Days 14-21); the last day of practice and two days following (i.e., Days 14-16). The aim of these analyses was to attempt to capture at what point in time any effect of practice could be detected.

Days 14-28

Effects of time and practice. There was a marginal main effect of time on hours studied, $B = -.02$, $t(1297) = -1.64$, $p = .10$, suggesting that, as time since the practice manipulation elapsed, people studied less. However, there was no main effect of practice, $B = .16$, $t(1297) = 0.42$, $p = .67$. This lack of a main effect of practice indicates that there was no overall effect of practice manipulation on hours studied on the last day of practice or in the two weeks following practice. Similarly, the interaction between time and practice condition was also non-significant, $B = .47$, $t(1297) = 0.47$, $p = .64$.

Between- vs. within-person effects of inhibition and initiation. Next, I examined both the between- and within-person fixed effects of self-control by inhibition and initiation exertion on studying behavior. The random effects of each were not significant. In other words, I tested whether the effects of exerting inhibition and initiation, respectively, on studying behavior, were significant at the between-person level (i.e., on days when you exerted more self-control by inhibition and initiation than the average person in the study) and at the within-person level (i.e., on days when you exerted more self-control than your average day).

The between-person effect of exertion by initiation had a marginally significant effect on hours studied, $B = .02$, $t(1185) = 1.71$, $p = .09$. However, the between-person effect of exertion by inhibition on hours studied was not significant, $B = -.01$, $t(1185) = -0.44$, $p = .67$. Because these between-person effects were not significant, they were removed from the final model.

The within-person effect of inhibition also had no significant effect on hours studied, $B = .00$, $t(1185) = 0.05$, $p = .96$. In other words, a person's level of self-control exertion by inhibition on a particular day, compared to their average daily exertion of inhibition, did not influence the amount they studied that day. However, replicating the pattern observed in Study 1, the within-person effect of exertion by initiation significantly predicted studying behavior, $B = .04$, $t(1185) = 4.98$, $p < .001$. On days when people experienced more demands on their self-control via initiation, as measured by reports of behaviors they had engaged in throughout the day, they studied more. This main effect was not qualified by a significant interaction between within-person exertion of inhibition and within-person exertion of initiation, $B = -.01$, $t(1184) = -0.85$, $p = .39$.

Individual difference (level 2) effects. There were no significant main effects of the key individual difference variables, including trait inhibition, trait initiation, and GPA. Mean-centered trait inhibition did not significantly predict hours studied, $B = .13$, $t(1173) = 0.46$, $p = .65$. Similarly, there was no main effect of mean-centered trait initiation on studying, $B = .10$, $t(1173) = 0.37$, $p = .71$. Mean-centered GPA also did not significantly predict hours studied, although the effect was close to marginal, $B = .66$, $t(1173) = 1.56$, $p = .12$.

In addition, there were no significant interaction effects involving practice and the key individual difference variables. The hypothesized interaction between practice and trait initiation failed to reach significance, $B = .56$, $t(1173) = 1.24$, $p = .22$. Similarly, the interaction between practice and mean-centered GPA was not significant, $B = .55$, $t(1173) = 0.63$, $p = .53$.

Cross-level interactions. The key cross-level interactions examined whether the effect of practice varied as a function of within-person exertion of self-control by inhibition or initiation at the day level. However, none of these interactions emerged as significant. There was no interaction between practice and within-person exertion of initiation, $B = -.01$, $t(1184) = -0.26$, $p = .79$. Similarly, the interaction between practice and within-person exertion of inhibition failed to reach significance, $B = .01$, $t(1184) = 0.76$, $p = .45$.

Days 14-21

Effects of time and practice. There was a marginal main effect of time on hours studied, $B = .05$, $t(663) = 1.71$, $p = .09$, suggesting that, as time since the practice manipulation elapsed, people studied more. However, there was no main effect of practice, $B = .20$, $t(663) = 0.42$, $p = .68$. The absence of a main effect of practice indicates that there was no overall effect of practice manipulation on hours studied on the last day of practice or in the week following practice. Similarly, the interaction between time and practice condition was also non-significant, $B = -.08$, $t(662) = -1.23$, $p = .22$.

Between- vs. within-person effects of inhibition and initiation. In the next step, I tested the between- and within-person fixed effects of self-control by inhibition and initiation exertion on studying behavior. This test examined whether the effects of exerting inhibition and initiation, respectively, on studying behavior were significant at both the between-person and the within-person level.

The between-person effect of exertion by initiation had a marginally significant effect on hours studied, $B = .02$, $t(556) = 1.95$, $p = .06$. However, the between-person effect of exertion by inhibition on hours studied was not significant, $B = -.01$, $t(556) = -0.61$, $p = .54$. Because these between-person effects were not significant, they were not included in the final model.

The within-person effect of inhibition on studying behavior also had no significant effect on hours studied, $B = .01, t(556) = 1.37, p = .17$. This finding demonstrates that a person's level of self-control exertion by inhibition on a particular day, as compared to their average daily exertion of inhibition, did not influence their studying duration. However, replicating the pattern observed in Study 1 and with Days 14 through 28 in Study 2, within-person exertion by initiation significantly predicted studying behavior, $B = .03, t(556) = 2.48, p = .01$. On days when people exerted more self-control by initiation, they also spent more time studying. This main effect was not qualified by a significant interaction between within-person exertion of inhibition and within-person exertion of initiation, $B = -.01, t(555) = -0.52, p = .60$.

Individual difference (level 2) effects. There were no significant main effects of the key individual difference variables, including trait inhibition, trait initiation, and GPA. Mean-centered trait inhibition did not significantly predict duration of studying, $B = .13, t(551) = 0.45, p = .66$. There was also no main effect of mean-centered trait initiation on reports of hours studied, $B = .09, t(551) = 0.30, p = .76$. Mean-centered GPA also did not significantly predict studying behavior, $B = .65, t(551) = 1.38, p = .17$.

In addition, there were no significant interaction effects involving practice and the key individual difference variables. The hypothesized interaction between practice and trait initiation failed to reach significance, $B = .47, t(551) = 0.95, p = .34$. Similarly, the interaction between practice and mean-centered GPA was not significant, $B = 1.31, t(551) = 1.37, p = .17$.

Cross-level interactions. The key cross-level interactions examined whether the effect of practice varied as a function of within-person exertion of self-control by inhibition or initiation at the day level. However, none of these interactions emerged as significant. There was no interaction between practice and within-person exertion of initiation, $B = .01, t(555) = 0.08, p =$

.93. Similarly, the interaction between practice and within-person exertion of inhibition failed to reach significance, $B = .01, t(1184) = 0.45, p = .65$.

Days 14-16

Effects of time and practice. The main effect of time on hours studied approached marginal significance, $B = -0.20, t(192) = -1.54, p = .12$, suggesting that, as time since the practice manipulation elapsed, people studied less. However, there was no main effect of practice, $B = 0.59, t(193) = 1.03, p = .30$. The absence of a practice main effect suggests that there was no overall effect of practice manipulation on hours studied on the last day of practice or in the two days immediately following the practice manipulation. However, there was a significant interaction between time and practice, $B = 0.51, t(191) = 2.00, p < .05$. On the last day of practice (i.e., Day 14), there was no difference in studying between the initiation practice group, inhibition practice group, and control group. However, as displayed in Figure 1 below, by Day 16 (i.e., two days after practice had ended), the initiation group was studying significantly more hours than both the inhibition practice group and the control group.

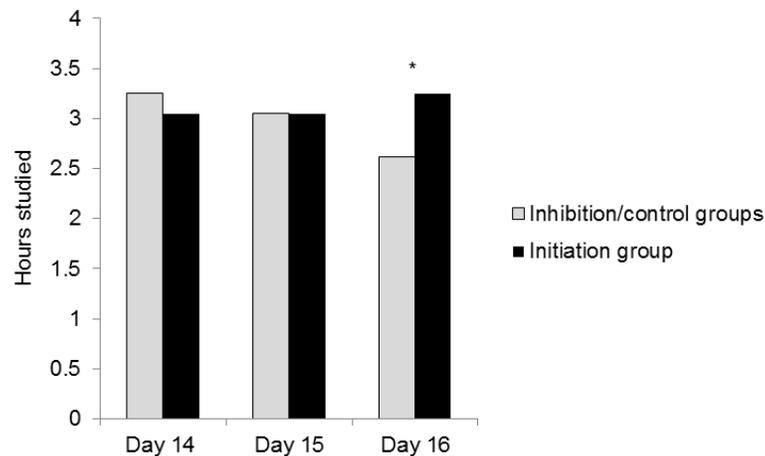


Figure 1: Interaction between day and practice on hours studied.

Next, I examined the between- and within-person fixed effects of inhibition and initiation exertion on studying behavior. This test examined whether the effects of exerting inhibition and initiation, respectively, on hours studied, were significant at the between-person level and at the within-person level. The between-person effect of exertion by initiation had a marginally significant effect on hours studied, $B = .02$, $t(556) = 1.95$, $p = .06$. However, the between-person effect of exertion by inhibition on hours studied was not significant, $B = -.01$, $t(556) = -0.61$, $p = .54$. Because these between-person effects were not significant, they were not included in the final model.

The within-person effect of inhibition also had no significant effect on hours studied, $B = .01$, $t(556) = 1.37$, $p = .17$. This result indicates that a person's current daily level of self-control exertion by inhibition, as compared to their average daily exertion of inhibition, did not influence the degree to which they studied on that day. However, replicating the pattern observed in Study 1 and on Days 14 through 28 in Study 2, within-person exertion of self-control via initiation significantly predicted hours studied, $B = .03$, $t(556) = 2.48$, $p = .01$. On days when participants exerted more self-control by initiation, they also studied more. The interaction between within-person exertion of inhibition and within-person exertion of initiation again failed to reach significance, $B = -.01$, $t(87) = -0.54$, $p = .59$.

Individual difference (level 2) effects. There were no significant main effects of the key individual difference variables, including trait inhibition, trait initiation, and GPA. Mean-centered trait inhibition did not have a significant effect on studying behavior, $B = 0.48$, $t(88) = 1.10$, $p = .27$. Similarly, mean-centered trait initiation did not significantly predict hours studied, $B = -0.36$, $t(88) = -0.87$, $p = .39$. Mean-centered GPA also had no significant effect on reports of studying behavior, $B = 0.48$, $t(88) = 1.10$, $p = .27$.

In addition, there were again no significant interaction effects involving practice and the key individual difference variables. The hypothesized interaction between practice and trait initiation was not significant, $B = -.06$, $t(88) = -0.09$, $p = .93$. The interaction between practice and mean-centered GPA also failed to reach significance, $B = 2.05$, $t(88) = 1.48$, $p = .14$.

Cross-level interactions. The key cross-level interactions examined whether the effect of practice varied as a function of within-person exertion of self-control by inhibition or initiation at the day level. However, none of these interactions emerged as significant. There was no interaction between practice and within-person exertion of initiation, $B = .04$, $t(87) = 0.97$, $p = .34$. Similarly, the interaction between practice and within-person exertion of inhibition again failed to reach significance, $B = -.01$, $t(87) = -0.07$, $p = .94$.

Studying: Summary of Findings

Across the two larger intervals analyzed (Days 14 through 28, Days 14 through 21), there was no main effect of practice condition on studying. Furthermore, practice condition was not involved in any significant interaction effects. These results indicate that self-control practice, whether by inhibition or initiation, appeared not to have an effect over these 14-day and eight-day periods. However, the pattern from Study 1 in which within-person exertion of initiation positively predicted studying behavior was evident in both intervals. On days when people experienced more demands on their self-control via initiation than on an average day, they studied more. None of the other effects tested reached significance.

Using a smaller interval of the last day of the practice manipulation and the two days immediately following practice, I observed a significant interaction between time and practice condition. Simple slopes analyses indicated no difference in studying behavior between the initiation practice group, the inhibition practice group, and control group on the last day of practice or one day following the practice manipulation. However, two days after the practice

manipulation had ended, participants in the initiation practice group were studying more than participants in either of the other two groups. Beyond this significant interaction, the remaining findings from the two longer intervals were evident.

DV: Exercise

To test the hypothesis that practicing initiation for two weeks should improve initiation-dependent behaviors, exercise was used as a dependent variable with two dependent measures: likelihood of exercise (binary outcome) and, if one exercised, minutes spent exercising (continuous outcome). Analyses for binary outcomes were conducted using SAS Proc Glimmix; analyses for continuous outcomes were carried out with SAS Proc Mixed. Both dependent measures of exercise were predicted from: between-person exertion of inhibition score, between-person exertion of initiation score, within-person exertion of inhibition score, within-person exertion of initiation score, the interaction between inhibition exertion and initiation exertion (all level 1 variables), and condition, time as measure by days since the last day of practice (centered on the last day of practice, Day 14), group-mean-centered trait inhibition and trait initiation (level 2 variables). Exercise was included as a target dependent variable for this hypothesis because it should require initiation; in fact, exercise received one of the highest ratings on initiation during the intake session ($M = 3.13$, $SD = 1.43$) and, by comparison, relatively low ratings on inhibition ($M = 2.30$, $SD = 1.39$).

As with studying, the most stringent test of the hypothesis involved using exercise as a binary outcome and duration of exercise on the last day of practice (Day 14) and during the entire experience sampling session (Days 15-28) as dependent measures. Next, analyses were conducted examining the effects at two other intervals following practice: the last day of practice and the week following (i.e., Days 14-21) and the last day of practice and two days following (i.e., Days

14-16). The aim of these analyses was to attempt to capture at what point the effect of practice on exercise behavior was evident.

Days 14-28

Effects of time and practice. There was no main effect of time on duration of exercise, $B = -.13, t(487) = -0.35, p = .73$. The main effect of practice on duration of exercise was also not significant, $B = 1.41, t(487) = 0.15, p = .89$. This lack of main effect of practice indicates that there was no overall effect of practice manipulation on duration of exercise on the last day of practice or in the two weeks following practice. Similarly, the interaction between time and practice condition also failed to reach significance, $B = .42, t(486) = 0.64, p = .52$.

There was a significant main effect of time on likelihood of exercise, $B_{\log} = -0.02, t(1530) = -2.42, p = .02$. Each day elapsed since the practice manipulation corresponded to a 1% decrease in probability of exercise. The main effect of practice on probability of exercise, however, failed to reach significance, $B_{\log} = -0.16, t(1531) = -0.40, p = .69$. As with exercise duration, the effect of the interaction between time and practice condition on likelihood of exercise was not significant, $B_{\log} = -0.08, t(1528) = -0.33, p = .74$.

Between- vs. within-person effects of inhibition and initiation. Next, I examined both the between- and within-person fixed effects of self-control by inhibition and initiation exertion on duration of exercise and likelihood of exercise. These tests examined whether the effects of exerting inhibition and initiation, respectively, on exercise duration and probability of exercise, were significant at the between-person level and at the within-person level.

The between-person effect of self-control exertion by initiation did not have a significant effect on duration of exercise, $B = -0.40, t(430) = -1.55, p = .12$. Similarly, the between-person effect of exertion by inhibition on exercise duration failed to reach significance, $B = 0.34, t(430)$

= 1.51, $p = .13$. Because these between-person effects were not significant, they were not included in further model tests.

The within-person effect of inhibition on exercise duration was significant, $B = -0.34$, $t(429) = -2.20$, $p < .05$. On days when people exerted more self-control by inhibition than an average day, they exercised for less time. However, contrary to the hypotheses and to the findings on studying, within-person exertion by initiation did not significantly predict exercise duration, $B = .12$, $t(429) = 0.68$, $p = .49$. These effects were qualified by a significant interaction between within-person exertion of inhibition and within-person exertion of initiation, $B = .02$, $t(429) = 3.18$, $p < .01$. Simple slopes analyses revealed that, on days when people exerted less self-control by inhibition than their usual day, there was no effect of within-person exertion of initiation on exercise duration, $B = -.036$, $p = .85$. Similarly, at average levels of within-person exertion of inhibition, there was no effect of within-person exertion of initiation on duration of exertion, $B = .10$, $p = .57$. However, on days when people exerted more self-control by inhibition than on their usual day, there was a positive effect of within-person exertion of initiation, such that participants exercised for longer durations. This effect was marginally significant, $B = .25$, $p = .09$. The results of this analysis are displayed below in Figure 2.

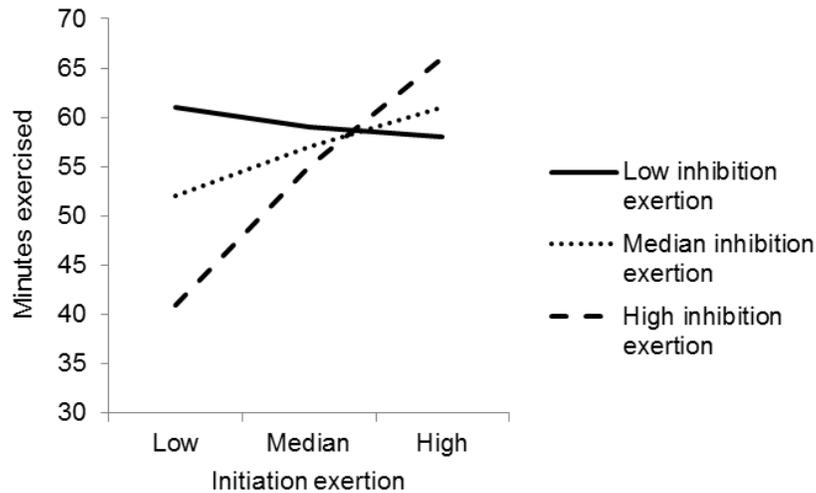


Figure 2: Interaction between inhibition and initiation exertion on exercise.

Using likelihood of exercise as the dependent measure, the between-person main effect of initiation was marginally significant, $B_{\log} = 0.02$, $t(1205) = 1.87$, $p = .06$. Participants were 2% more likely to exercise on days when they exerted more self-control by initiation, as compared to the average person in the study. However, as with exercise duration, the between-person effect of self-control exertion by inhibition was non-significant, $B_{\log} = -0.01$, $t(1205) = -0.97$, $p = .33$.

Contrary to the exercise duration findings, the within-person effect of inhibition on exercise likelihood failed to reach significance, $B_{\log} = 0.01$, $t(1205) = 0.57$, $p = .57$. However, the within-person effect of initiation was marginally significant, $B_{\log} = 1.85$, $t(1205) = 1.85$, $p = .06$, in the same direction as the between-person effect of initiation. Participants were also 2% more likely to exercise on days when they exerted more initiation than their own typical day. However, the interaction between within-person initiation and within-person inhibition was not significant, $B_{\log} = 0.00$, $t(1205) = -0.31$, $p = .76$.

Individual difference (level 2) effects. Next, I tested the effects of trait self-control by initiation and trait self-control by inhibition on exercise duration. Mean-centered trait inhibition

did not significantly predict duration of exercise, $B = 2.01$, $t(431) = 0.33$, $p = .74$. However, the main effect of mean-centered trait initiation on exercise duration was marginally significant, $B = 10.19$, $t(431) = 1.94$, $p = .07$. When participants who were higher on trait initiation exercised, they did so for longer durations.

As with exercise duration, mean-centered trait inhibition did not significantly predict likelihood of exercise, $B_{\log} = 0.08$, $t(1201) = 0.21$, $p = .84$. Similarly, the effect of mean-centered trait initiation on probability of exercise failed to reach significance, $B_{\log} = 0.24$, $t(1201) = 0.74$, $p = .46$.

In addition, there were no significant interaction effects involving practice and any individual difference variables on exercise duration. Of particular note, the hypothesized interaction effect between practice and trait initiation on exercise duration failed to reach significance, $B = -2.72$, $t(431) = -0.25$, $p = .80$. Similarly, the interaction effect between practice and trait initiation on likelihood of exercise was non-significant, $B_{\log} = -0.58$, $t(1201) = -0.94$, $p = .35$.

Cross-level interactions. The target cross-level interactions examined whether the effect of practice on duration of exercise varied as a function of within-person exertion of inhibition or initiation at the day level. However, neither of these interactions emerged as significant. There was no interaction between practice and within-person exertion of initiation, $B = 0.30$, $t(428) = 0.99$, $p = .32$. Similarly, the interaction between practice and within-person exertion of inhibition failed to reach significance, $B = -.09$, $t(428) = -0.40$, $p = .69$.

However, using probability of exercise as the dependent measure, the interaction effect between practice and within-person exertion of initiation at the day level was marginally significant, $B_{\log} = 0.03$, $t(1202) = 1.71$, $p = .09$. The effect of practice on likelihood of exercise varied as a function of exertion of initiation. Participants in the initiation practice group, relative

to those in the inhibition practice group and control group, were 34% more likely to exercise on days when they exerted more initiation than usual. There was no difference in the impact of practice at lower levels of exertion by initiation. Similarly, the interaction between practice and within-person exertion of inhibition was significant, $B_{\log} = -0.04$, $t(1202) = -2.52$, $p = .01$. However, this effect was not in the predicted direction: participants in the inhibition group had a 33% increase in the likelihood of exercise on days when they exerted more inhibition than usual, relative to those in the initiation practice group and in the control group. Again, the effect of practice was not significant at lower levels of exertion by inhibition.

Days 14-21

Effects of time and practice. The main effect of time on duration of exercise was not significant, $B = -0.38$, $t(243) = -0.46$, $p = .65$. There was also no main effect of practice on duration of exercise, $B = -2.80$, $t(243) = -0.26$, $p = .80$. The absence of a practice main effect indicates that there was no general effect of practice manipulation on duration of exercise on the last day of practice or in the week following practice. In addition, the interaction between time and practice condition also failed to reach significance, $B = .26$, $t(243) = 0.19$, $p = .85$.

The main effect of time on likelihood of exercise was not significant, $B_{\log} = -0.05$, $t(676) = -1.30$, $p = .19$. However, the main effect of practice on likelihood of exercise was marginally significant, $B_{\log} = 0.86$, $t(676) = 1.90$, $p = .06$. Participants in the initiation practice group were 51% more likely to exercise than participants in the inhibition practice group and control participants. As with exercise duration, the effect of the interaction between time and practice condition on likelihood of exercise was not significant, $B_{\log} = 0.08$, $t(674) = 0.69$, $p = .49$.

Between- vs. within-person effects of inhibition and initiation. Next, I examined both the between- and within-person fixed effects of exertion of inhibition and initiation on duration of exercise. These tests examined whether the effects of exerting inhibition and initiation,

respectively, on exercise duration, were significant at the between-person level and at the within-person level. The between-person effect of exertion by initiation did not have a significant effect on duration of exercise, $B = -0.19$, $t(190) = -0.95$, $p = .35$. Similarly, the between-person effect of exertion by inhibition on exercise duration was not significant, $B = 0.29$, $t(190) = 1.16$, $p = .25$. Because these between-person effects were not significant, they were removed from the model.

The within-person effect of inhibition on exercise duration was not significant, $B = -0.16$, $t(190) = -0.83$, $p = .41$. In contrast to the hypotheses and to the findings on studying, within-person exertion by initiation also did not significantly predict exercise duration, $B = .13$, $t(190) = 0.61$, $p = .55$. Similarly, the interaction between within-person exertion of inhibition and within-person exertion of initiation failed to reach significance, $B = .01$, $t(189) = 0.68$, $p = .50$.

Using likelihood of exercise as the dependent measure, the between-person main effect of initiation failed to reach significance, $B_{\log} = 0.02$, $t(567) = 1.17$, $p = .24$. In addition, as with exercise duration, the between-person effect of self-control exertion by inhibition was non-significant, $B_{\log} = -0.01$, $t(567) = -0.92$, $p = .36$.

The within-person effect of inhibition on likelihood of exercise also failed to reach significance, $B_{\log} = -0.01$, $t(567) = -0.36$, $p = .72$. In contrast to the hypotheses and to the findings on studying, within-person exertion by initiation also did not significantly predict the probability of exercising, $B_{\log} = 0.02$, $t(567) = 1.27$, $p = .20$. Similarly, the interaction between within-person exertion of inhibition and within-person exertion of initiation failed to reach significance, $B_{\log} = .00$, $t(567) = 0.12$, $p = .90$.

Individual difference (level 2) effects. Next, I tested the effects of trait self-control by initiation and trait self-control by inhibition on duration of exercise. Mean-centered trait inhibition did not significantly predict exercise duration, $B = 0.19$, $t(191) = 0.03$, $p = .98$. Similarly, the main effect of mean-centered trait initiation on exercise duration was not

significant, $B = -7.69$, $t(191) = -1.23$, $p = .22$. In addition, there were no significant interaction effects involving practice and any individual difference variables. In particular, the hypothesized interaction between practice and trait initiation failed to reach significance, $B = 0.07$, $t(191) = 0.01$, $p = .99$.

Using likelihood of exercise as a dependent measure, the main effect of mean-centered trait inhibition was not significant, $B_{\log} = 0.03$, $t(566) = 0.09$, $p = .93$. Similarly, the main effect of mean-centered trait initiation on the probability of exercise failed to reach significance, $B_{\log} = 0.02$, $t(566) = 0.04$, $p = .97$. As with exercise duration, the predicted interaction between trait initiation and practice condition was not significant, $B_{\log} = -0.04$, $t(565) = -0.05$, $p = .96$.

Cross-level interactions. The key cross-level interactions examined whether the effect of practice on duration of exercise varied as a function of within-person exertion of inhibition or initiation at the day level. However, none of these interactions emerged as significant. There was no interaction between practice and within-person exertion of initiation, $B = -0.25$, $t(189) = -0.70$, $p = .48$. Similarly, the interaction between practice and within-person exertion of inhibition failed to reach significance, $B = .22$, $t(189) = 0.77$, $p = .44$.

Similarly, using the likelihood of exercise as a dependent measure, the cross-level interaction between practice and within-person exertion of initiation failed to reach significance, $B_{\log} = .04$, $t(565) = 1.56$, $p = .12$. However, the interaction between practice and within-person exertion of inhibition at the daily level was significant, $B_{\log} = -0.04$, $t(565) = -1.96$, $p = .05$. This effect took the same form as in the longer interval: participants in the inhibition group were 25% more likely to exercise on days when they exerted more inhibition than usual, relative to those in the initiation practice group and in the control group. Again, the effect of practice was not significant at lower levels of exertion by inhibition.

Days 14-16

Effects of time and practice. The main effect of time on exercise duration was not significant, $B = 0.21$, $t(62) = 0.07$, $p = .94$. Time elapsed since the practice manipulation did not significantly predict duration of exercise. There was also no main effect of practice on duration of exercise, $B = -14.12$, $t(62) = -1.24$, $p = .22$. The absence of a practice main effect indicates that there was no general effect of practice manipulation on duration of exercise on the last day of practice or in the two subsequent days. In addition, the interaction between time and practice condition also failed to reach significance, $B = -2.89$, $t(61) = -0.45$, $p = .65$.

As with exercise duration, the main effect of time on likelihood of exercise was not significant, $B_{\log} = -0.21$, $t(196) = -1.45$, $p = .15$. The main effect of practice on probability of exercise also failed to reach significance, $B_{\log} = 0.70$, $t(196) = 1.64$, $p = .10$. As with exercise duration, the effect of the interaction between time and practice condition on likelihood of exercise was not significant, $B_{\log} = 0.24$, $t(194) = 0.52$, $p = .60$.

Between- vs. within-person effects of inhibition and initiation. Next, I examined the between- and within-person fixed effects of exertion of inhibition and initiation on duration of exercise. These tests examined whether the effects of exerting self-control by inhibition and initiation, respectively, on exercise duration, were significant at the between-person level and at the within-person level. The between-person effect of exertion by initiation did not have a significant effect on duration of exercise, $B = -0.37$, $t(21) = -0.89$, $p = .38$. The between-person effect of exertion by inhibition on exercise duration also failed to reach significance, $B = 0.15$, $t(21) = 0.43$, $p = .69$. Because these between-person effects were not significant, they were removed from the model.

The within-person effect of inhibition on duration of exercise was also not significant, $B = -0.29$, $t(21) = -0.72$, $p = .48$. Contrary to the hypotheses and to the findings on studying,

within-person exertion by initiation also did not significantly predict exercise duration, $B = .37$, $t(21) = 0.69$, $p = .50$. The interaction between within-person exertion of inhibition and within-person exertion of initiation also failed to reach significance, $B = -.01$, $t(21) = -0.82$, $p = .42$.

Using likelihood of exercise as the dependent measure, the between-person main effect of initiation again failed to reach significance, $B_{\log} = 0.02$, $t(90) = 0.81$, $p = .42$. In addition, as with exercise duration, the between-person effect of self-control exertion by inhibition was non-significant, $B_{\log} = -0.01$, $t(90) = -0.58$, $p = .56$.

The within-person effect of inhibition on likelihood of exercise also failed to reach significance, $B_{\log} = 0.01$, $t(90) = 0.32$, $p = .75$. In contrast to the hypotheses and to the findings on studying, within-person exertion by initiation also did not significantly predict the probability of exercising, $B_{\log} = 0.01$, $t(90) = 0.20$, $p = .84$. Similarly, the interaction between within-person exertion of inhibition and within-person exertion of initiation failed to reach significance, $B_{\log} = .01$, $t(89) = 1.56$, $p = .13$.

Individual difference (level 2) effects. Next, I tested the effects of trait self-control by initiation and trait self-control by inhibition on duration of exercise. Mean-centered trait inhibition did not significantly predict exercise duration, $B = 1.79$, $t(23) = 0.21$, $p = .84$. In addition, the effect of mean-centered trait initiation on exercise duration was not significant, $B = -11.63$, $t(23) = -1.33$, $p = .20$.

In addition to the absence of individual difference main effects, none of the interaction effects involving practice and individual difference variables reached significance. In particular, the hypothesized interaction between practice and trait initiation had no significant effect on exercise duration, $B = 12.23$, $t(23) = 0.76$, $p = .45$.

Using likelihood of exercise as a dependent measure, the main effect of mean-centered trait inhibition again failed to reach significance, $B_{\log} = -0.18$, $t(88) = -0.46$, $p = .65$. Similarly,

the main effect of mean-centered trait initiation on the probability of exercise failed to reach significance, $B_{\log} = 0.35$, $t(88) = 0.72$, $p = .47$. As with exercise duration, the interaction between trait initiation and practice was not significant, $B_{\log} = 0.36$, $t(88) = 0.46$, $p = .65$.

Cross-level interactions. The key cross-level interactions examined whether the effect of practice on duration of exercise varied as a function of within-person exertion of inhibition or initiation at the day level. However, none of these interactions emerged as significant. There was no interaction between practice and within-person exertion of initiation, $B = -0.94$, $t(21) = -0.94$, $p = .36$. Similarly, the interaction between practice and within-person exertion of inhibition failed to reach significance, $B = .91$, $t(21) = 1.20$, $p = .24$.

Similarly, using the likelihood of exercise as a dependent measure, the cross-level interaction between practice and within-person exertion of initiation failed to reach significance, $B_{\log} = -0.02$, $t(88) = -0.43$, $p = .67$. The interaction between practice and within-person exertion of inhibition at the daily level was also non-significant, $B_{\log} = 0.02$, $t(88) = 0.42$, $p = .67$.

Exercise: Summary of Findings

Using duration of exercise as the dependent measure of exercise, across all three intervals (Days 14 through 16, Days 14 through 21, Days 14 through 28), there was no main effect of practice condition. Furthermore, practice condition was not involved in any significant interaction effects. These results indicate that self-control practice, whether by inhibition or initiation, appeared not to impact participants' exercise behavior with respect to duration of exercise. Contrary to the predicted hypotheses, practice was also not involved in any significant interaction effects. In the longest interval, there was a significant interaction between within-person exertion of initiation and within-person exertion of inhibition. Interestingly, the form of this interaction revealed that participants who were experiencing greater-than-usual demands on self-control by inhibition, unexpectedly, appeared to be buffered by greater levels of exertion via initiation.

However, this finding was not replicated in the smaller intervals examining exercise duration. No other consistent significant effects emerged for exercise duration.

The effects for likelihood of exercise, a binary outcome, varied slightly from those using the continuous duration outcome. Across the three intervals, there was a marginal or significant effect of practice, such that participants in the initiation practice condition had an increased probability of exercise, compared to those in the inhibition practice group and in the control group. As with exercise duration, none of the expected main or interaction effects involving trait self-control emerged as significant. However, unlike exercise duration, the interactions between practice condition and within-person exertion of initiation and inhibition, respectively, were marginal or significant in the two longer intervals. These effects revealed that the influence of practice depended on the level of exertion of each form of self-control. At higher levels of exertion by initiation, participants in the initiation practice group experienced increased odds of exercise than participants in the inhibition and control groups. However, at greater-than-usual levels of exertion by inhibition, it was participants in the inhibition practice group (not the initiation group, as expected) that evidenced increased likelihood of exercising.

DV: Alcohol Consumption

To test the hypotheses that practicing inhibition for two weeks should improve inhibition-dependent behaviors, and that practicing initiation for two weeks should also improve inhibition-dependent behaviors, alcohol consumption was used as a dependent variable with two dependent measures: likelihood of alcohol use (binary outcome) and, if one drank, number of drinks consumed (continuous outcome). Both dependent measures of alcohol use were predicted from: between-person exertion of inhibition score, between-person exertion of initiation score, within-person exertion of inhibition score, within-person exertion of initiation score, the interaction between inhibition exertion and initiation exertion (all level 1 variables), and condition, time as

measured by days since the last day of practice (centered on the last day of practice, Day 14), group-mean-centered trait inhibition and trait initiation (level 2 variables).

As with studying and exercise, the most stringent test of the hypothesis involved using alcohol consumption as a binary outcome and number of drinks consumed on the last day of practice (Day 14) and during the entire experience sampling session (Days 15-28) as dependent measures. Next, analyses were conducted examining the effects at others interval following practice: the last day of practice and the week following (i.e., Days 14-21) and the last day of practice and two days following (i.e., Days 14-16). The aim of these analyses was to attempt to capture at what point the effect of practice on drinking behavior became evident. For the smaller intervals, Days 14-21 and Days 14-16, the continuous outcome of quantity of alcohol consumption could not be analyzed because the small number of reports of drinking behavior led to a lack of model convergence for the models tested in the larger interval. Similarly, due to very few reports of drinking behavior ($n = 43$ out of 331 total reports) over the three-day interval of Days 14 through 16, analysis of the binary outcome of alcohol consumption was constrained due to minimal variance in occurrence of the behavior, leading to a lack of model convergence for models tested over this interval.

Days 14-28

Effects of time and practice. The main effect of time on number of drinks consumed failed to reach significance, $B = 0.04$, $t(112) = 1.15$, $p = .25$. The main effect of practice on quantity of alcohol consumption was significant for both the inhibition practice group, $B = 1.37$, $t(112) = 2.17$, $p = .03$, and for the initiation practice group, $B = 1.58$, $t(112) = 2.37$, $p = .02$, as compared to the control group. However, the effect was in the opposite direction predicted: participants in the practice group consumed more alcohol over the two weeks following the

practice manipulation than participants in the control group. The interaction between time and practice condition also failed to reach significance, $B = .04$, $t(110) = -0.31$, $p = .76$.

As with quantity of alcohol consumption, the main effect of time on likelihood of alcohol consumption failed to reach significance, $B_{\log} = 0.01$, $t(1302) = 0.32$, $p = .75$. However, contrary to the findings on quantity of alcohol consumption, the main effect of practice condition on likelihood of alcohol use was not significant, $B_{\log} = 0.57$, $t(1302) = 1.39$, $p = .17$. The interaction between time and practice condition was, again, not significant, $B_{\log} = 0.01$, $t(1302) = 0.18$, $p = .86$.

Between- vs. within-person effects of inhibition and initiation. Next, I examined both the between- and within-person fixed effects of self-control by inhibition and initiation exertion on alcohol consumption. These tests examined whether the effects of exerting inhibition and initiation, respectively, on alcohol consumption, were significant at the between-person level and at the within-person level.

The between-person effect of self-control exertion by initiation did not have a significant effect on quantity of alcohol consumed, $B = -0.01$, $t(98) = -0.32$, $p = .75$. Similarly, the between-person effect of exertion by inhibition on quantity of alcohol consumption failed to reach significance, $B = 0.01$, $t(98) = 0.19$, $p = .85$. Using likelihood of alcohol consumption as the dependent measure, the between-person effect of initiation was not significant, $B_{\log} = 0.01$, $t(1186) = 0.68$, $p = .50$. Similarly, the between-person effect of inhibition on likelihood of alcohol use failed to reach significance, $B_{\log} = 0.00$, $t(1186) = -0.06$, $p = .95$. Because none of these between-person effects were significant, they were not included in subsequent models.

The within-person effect of inhibition on quantity of alcohol consumption was significant, $B = 0.04$, $t(98) = 1.98$, $p = .05$. On days when people exerted more self-control by inhibition than an average day, they consumed more alcohol. Within-person exertion by initiation

marginally significantly predicted quantity of alcohol consumed, $B = -0.04$, $t(98) = -1.90$, $p = .06$. As predicted and as shown with the studying dependent variable, on days when people exerted more self-control by initiation than their average day, they drank less alcohol. However, unlike the previous findings with exercise, the interaction between within-person exertion of inhibition and within-person exertion of initiation failed to reach significance, $B = .01$, $t(97) = 1.23$, $p = .22$.

Using likelihood of alcohol consumption as a dependent measure, the within-person effect of inhibition was again significant, $B_{\log} = -0.03$, $t(1186) = -2.00$, $p < .05$, but in the predicted direction. On days when people exerted less self-control by inhibition than on an average day, they were 5% less likely to consume alcohol. However, within-person exertion of initiation did not significantly predict likelihood of alcohol consumption, $B_{\log} = -0.002$, $t(1186) = -0.09$, $p = .93$. As with quantity of alcohol consumption, the interaction between within-person inhibition and within-person initiation failed to reach significance, $B_{\log} = 0.0003$, $t(1186) = 0.71$, $p = .48$.

Individual difference (level 2) effects. Next, I tested the effects of trait self-control by initiation and trait self-control by inhibition on alcohol consumption. Mean-centered trait inhibition did not significantly predict quantity of alcohol consumption, $B = -0.34$, $t(98) = -0.79$, $p = .43$. The effect of mean-centered trait initiation on quantity of alcohol consumption also failed to reach significance, $B = 0.36$, $t(98) = 0.95$, $p = .34$. In addition, there were no significant interaction effects involving practice and any individual difference variables. The interaction between practice and trait initiation failed to reach significance, $B = 1.15$, $t(98) = 0.95$, $p = .34$, as did the interaction between practice and trait inhibition, $B = -0.49$, $t(98) = -0.25$, $p = .81$.

As with quantity consumed, the main effect of mean-centered trait inhibition on likelihood of consumption failed to reach significance, $B_{\log} = 0.51$, $t(1188) = 1.18$, $p = .24$.

Similarly, there was no effect of mean-centered trait initiation on likelihood of alcohol consumption, $B_{\log} = -0.55$, $t(1188) = -1.28$, $p = .20$. However, the hypothesized interaction effects involving practice and trait self-control were both significant. There was a significant interaction between practice condition and trait initiation on likelihood of alcohol consumption, $B_{\log} = 1.11$, $t(1188) = 1.99$, $p < .05$. This interaction revealed that participants in the inhibition practice group who were high in trait initiation were 39% more likely to consume alcohol, relative to those in the initiation practice group and the control group and to those in the inhibition practice group lower on trait initiation. The interaction between practice condition and trait inhibition also significantly predicted likelihood of alcohol consumption, $B_{\log} = -1.23$, $t(1188) = -2.05$, $p = .04$. However, this interaction was in the expected direction: participants who practiced inhibition and were high in trait inhibition were 54% less likely to consume alcohol, relative to participants in the initiation and control groups and those in the inhibition practice group who were lower on trait inhibition.

Cross-level interactions. The target cross-level interactions examined whether the effect of practice on alcohol consumption varied as a function of within-person exertion of inhibition or initiation at the day level. However, neither of these interactions emerged as significant. There was no interaction observed between practice and within-person exertion of self-control by initiation, $B = -0.04$, $t(95) = -0.79$, $p = .43$. Similarly, the interaction between practice and within-person exertion of inhibition failed to reach significance, $B = 0.03$, $t(98) = 1.34$, $p = .18$.

Similarly, using likelihood of alcohol consumption as a dependent measure, none of the target cross-level interactions reached significance. In particular, the interaction between practice and within-person exertion of initiation was not significant, $B_{\log} = 0.003$, $t(1185) = 0.11$, $p = .91$. The interaction between practice and within-person exertion of inhibition also failed to significantly predict likelihood of alcohol use, $B_{\log} = 0.02$, $t(1185) = 0.77$, $p = .44$.

Days 14-21

Effects of time and practice. The main effect of time on likelihood of alcohol consumption failed to reach significance, $B_{\log} = -0.07$, $t(665) = -1.40$, $p = .16$. In addition, the main effect of practice condition on likelihood of alcohol use was not significant, $B_{\log} = 0.46$, $t(665) = 1.02$, $p = .31$. The interaction between time and practice condition was, again, not significant, $B_{\log} = -0.06$, $t(663) = -0.32$, $p = .75$.

Between- vs. within-person effects of inhibition and initiation. Next, I examined both the between- and within-person fixed effects of self-control by inhibition and initiation exertion on likelihood of alcohol consumption. These tests examined whether the effects of exerting inhibition and initiation, respectively, on the likelihood of alcohol consumption, were significant at the between-person level and at the within-person level.

None of the between- or within-person effects of inhibition or initiation significantly predicted likelihood of alcohol consumption during the last day and week following the practice manipulation. The between-person effect of inhibition on likelihood of alcohol consumption was not significant, $B_{\log} = -0.01$, $t(556) = -0.26$, $p = .80$. Similarly, the between-person exertion of initiation did not significantly predict likelihood of alcohol consumption, $B_{\log} = 0.02$, $t(556) = 1.30$, $p = .20$. The within-person effect of inhibition also failed to reach significance, $B_{\log} = -0.02$, $t(556) = -1.28$, $p = .20$. Within-person exertion of initiation similarly did not significantly predict likelihood of alcohol consumption, $B_{\log} = -0.001$, $t(556) = -0.04$, $p = .97$. Finally, the interaction between within-person inhibition and within-person initiation also failed to reach significance, $B_{\log} = 0.0004$, $t(556) = 0.77$, $p = .44$.

Individual difference (level 2) effects. Next, I tested the effects of trait self-control by initiation and trait self-control by inhibition on alcohol consumption. Mean-centered trait inhibition did not significantly predict likelihood of alcohol consumption, $B_{\log} = 0.63$, $t(558) =$

1.42, $p = .16$. Similarly, there was no effect of mean-centered trait initiation on likelihood of alcohol consumption, $B_{\log} = -0.53$, $t(558) = -1.16$, $p = .25$. However, the hypothesized interaction effects involving practice and trait self-control were both significant. There was a significant interaction between practice condition and trait initiation on likelihood of alcohol consumption, $B_{\log} = 1.53$, $t(558) = 2.56$, $p = .01$. This interaction revealed that participants in the inhibition practice group who were high in trait initiation were 53% more likely to consume alcohol, relative to those in the initiation practice group and the control group and to those in the inhibition practice group lower on trait initiation. The interaction between practice condition and trait initiation also significantly predicted likelihood of alcohol consumption, $B_{\log} = -1.73$, $t(558) = -2.72$, $p < .01$. However, this interaction was in the expected direction: participants who practiced inhibition and were high in trait inhibition were 42% less likely to drink alcohol, relative to participants in the initiation and control groups and those in the inhibition practice group who were lower on trait inhibition.

Cross-level interactions. The target cross-level interactions examined whether the effect of practice on the likelihood of alcohol consumption varied as a function of within-person exertion of inhibition or initiation at the day level. However, neither of these interactions emerged as significant. There was no interaction observed between practice and within-person exertion of self-control by initiation, $B_{\log} = -0.02$, $t(553) = -0.43$, $p = .67$. Similarly, the interaction between practice and within-person exertion of inhibition failed to reach significance, $B_{\log} = 0.04$, $t(553) = 1.00$, $p = .32$.

Alcohol Consumption: Summary of Findings

Using quantity of alcohol consumption as a dependent measure, the hypothesized main effect of practice was significant. This effect was in the opposite direction from the predicted hypotheses—participants in both the inhibition and initiation practice groups drank more over

both intervals than participants in the control group. However, the main effect of within-person inhibition on quantity consumed was significant and in the predicted direction—when participants experienced greater-than-usual demands on self-control by inhibition, they drank more. Similarly, the predicted main effect of within-person initiation was marginally significant; participants drank marginally significantly less alcohol on days they exerted more-than-usual initiation. However, none of the predicted interactions or trait-level effects significantly predicted quantity of alcohol consumption.

The main effect of practice did not, however, significantly predict likelihood of alcohol consumption. Across both intervals (Days 14 through 28, Days 14 through 21), the key finding was an interaction between practice and trait self-control. This interaction revealed that participants in the inhibition practice condition who were higher in trait initiation experienced a heightened likelihood of alcohol consumption; this pattern was reversed for those higher-than-average in trait inhibition, who were less likely to drink alcohol when they practiced inhibition.

DV: Healthy Eating

To test the hypothesis that practicing initiation for two weeks should improve initiation-relevant behaviors, the number of reports of healthy eating per day was used as a dependent variable. I predicted reports of healthy eating behavior from: between-person exertion of inhibition score, between-person exertion of initiation score, within-person exertion of inhibition score, within-person exertion of initiation score, the interaction between inhibition exertion and initiation exertion (all level 1 variables), and condition, time as measured by days since the last day of practice (centered on the last day of practice, Day 14), group-mean-centered trait inhibition and trait initiation (level 2 variables). Healthy eating was included as a target dependent variable for this hypothesis because it should require initiation—as such, it was used as the manipulation of initiation during the practice session. Indeed, eating healthy received one of the highest ratings

on initiation during the intake session ($M = 3.51$, $SD = 1.35$) and, by comparison, relatively low ratings on inhibition ($M = 1.95$, $SD = 1.19$).

As the most stringent test of the hypothesis, reports of healthy eating on the last day of practice (Day 14) and during the entire experience sampling session (Days 15-28) were first tested as a dependent measure. To follow up, analyses were conducted examining the effects at two other intervals following practice: the last day of practice and the week following (i.e., Days 14-21); the last day of practice and two days following (i.e., Days 14-16). The aim of these analyses was to attempt to capture at what point in time the effect of practice became apparent.

Days 14-28

Effects of time and practice. There was a significant main effect of time on healthy eating, $B = -.02$, $t(1370) = -3.06$, $p < .01$, suggesting that, as time since the practice manipulation elapsed, people reported fewer instances of healthy eating. The main effect of practice on healthy eating was also significant, $B = .46$, $t(1370) = 2.29$, $p = .02$. This significant effect revealed that participants in the initiation practice group reported more healthy eating over the last day of practice and the two weeks following the practice manipulation, as compared to participants in the inhibition group and participants in the control group. However, the interaction between time and practice condition failed to reach significance, $B = .003$, $t(1368) = 0.16$, $p = .87$.

Between- vs. within-person effects of inhibition and initiation. Next, I examined both the between- and within-person fixed effects of self-control by inhibition and initiation exertion on reports of healthy eating. The between-person effect of exertion by initiation on healthy eating failed to reach significance, $B = .001$, $t(1368) = 1.14$, $p = .25$. Similarly, the between-person effect of exertion by inhibition on healthy eating was not significant, $B = .004$, $t(1368) = 1.34$, $p = .19$. Because these between-person effects were not significant, they were removed from the final model.

The within-person effect of inhibition on healthy eating also failed to reach significance, $B = .003, t(1368) = 1.32, p = .19$. In other words, a person's level of self-control exertion by inhibition on a particular day, compared to their average daily exertion of inhibition, did not influence their reports of healthy eating that day. However, replicating the pattern observed in Study 1 with studying, the within-person effect of exertion by initiation significantly predicted reports of healthy eating, $B = .01, t(1368) = 3.96, p < .001$. On days when people experienced more self-control demands by initiation, as measured by reports of behaviors they had engaged in throughout the day, they reported more healthy eating. This main effect was qualified by a marginally significant interaction between within-person exertion of inhibition and within-person exertion of initiation, $B = -.0002, t(1368) = -1.77, p = .08$. Probing this interaction revealed that, at lower levels of exertion of initiation, participants who exerted more-than-usual inhibition also reported more healthy eating. This pattern was reversed at higher levels of exertion by initiation, whereby participants who exerted less inhibition than usual evinced more reports of healthy eating.

Individual difference (level 2) effects. There were no significant main effects of the key individual difference variables, including trait inhibition and trait initiation. Mean-centered trait inhibition did not significantly predict reports of healthy eating, $B = -.03, t(1368) = -0.20, p = .84$. Similarly, there was no main effect of mean-centered trait initiation on healthy eating, $B = .03, t(1368) = 0.24, p = .81$. In addition, there were no significant interaction effects involving practice and the key individual difference variables. The hypothesized interaction between practice and trait initiation failed to reach significance, $B = -.37, t(1368) = -0.94, p = .35$. Similarly, the interaction between practice and mean-centered trait inhibition was not significant, $B = .003, t(1368) = 0.01, p = .99$.

Cross-level interactions. The key cross-level interactions examined whether the effect of practice varied as a function of within-person exertion of self-control by inhibition or initiation at the day level. The interaction between practice and within-person exertion of inhibition failed to reach significance, $B = .004$, $t(1367) = 1.15$, $p = .25$, suggesting that the effect of practice on healthy eating did not vary as a function of within-person exertion of inhibition. The interaction between practice and within-person exertion of initiation was marginally significant, $B = -.01$, $t(1367) = -1.79$, $p = .07$. This effect revealed that participants in the initiation practice condition who exerted higher-than-usual levels of initiation reported eating healthier than participants in the inhibition practice condition, participants in the control condition, and participants who exerted less-than-average initiation.

Days 14-21

Effects of time and practice. The main effect of time on healthy eating failed to reach significance, $B = -.02$, $t(646) = -1.26$, $p = .20$. However, the main effect of practice on healthy eating was again significant, $B = .40$, $t(647) = 2.00$, $p < .05$. Participants in the initiation practice group had more reports of healthy eating over the last day of practice and the week following the practice manipulation than participants in the inhibition group and participants in the control group. As in the longer interval, the interaction between time and practice condition was not significant, $B = .003$, $t(644) = 0.77$, $p = .44$.

Between- vs. within-person effects of inhibition and initiation. Next, I examined both the between- and within-person fixed effects of self-control by inhibition and initiation exertion on reports of healthy eating. The between-person effect of exertion by initiation on healthy eating failed to reach significance, $B = .004$, $t(644) = 0.61$, $p = .54$. Similarly, the between-person effect of exertion by inhibition on healthy eating was not significant, $B = .001$, $t(644) = 0.46$, $p = .67$.

The within-person effect of inhibition on healthy eating was not significant, $B = -.0009$, $t(644) = -0.28$, $p = .78$. This non-significant effect suggests that people's level of self-control exertion by inhibition on a particular day, compared to their average daily exertion of inhibition, did not influence their reports of healthy eating that day. However, again replicating the pattern observed in Study 1 with studying, the within-person effect of exertion by initiation significantly predicted reports of healthy eating, $B = .02$, $t(644) = 3.85$, $p < .001$. On days when people experienced more demands on self-control via initiation, they also reported more healthy eating. However, the interaction between within-person exertion of inhibition and within-person exertion of initiation failed to reach significance, $B = -.0002$, $t(643) = -1.49$, $p = .14$.

Individual difference (level 2) effects. Mean-centered trait inhibition did not significantly predict reports of healthy eating, $B = -.005$, $t(644) = -0.04$, $p = .97$. Similarly, there was no main effect of mean-centered trait initiation on healthy eating, $B = .03$, $t(644) = 0.20$, $p = .84$. In addition, there were no significant interaction effects involving practice and trait inhibition or trait initiation. The interaction between practice and trait initiation was not significant, $B = -.53$, $t(644) = -1.33$, $p = .18$, indicating that the effect of practice did not vary as a function of trait levels of initiation. The interaction between practice and mean-centered trait inhibition also failed to reach significance, $B = .17$, $t(644) = 0.35$, $p = .73$.

Cross-level interactions. The key cross-level interactions examined whether the effect of practice varied as a function of within-person exertion of self-control by inhibition or initiation at the day level. The interaction between practice and within-person exertion of inhibition was not significant, $B = -.005$, $t(643) = -1.06$, $p = .29$. Similarly, the interaction between practice and within-person exertion of initiation failed to reach significance, $B = .003$, $t(643) = 0.40$, $p = .69$. The absence of both interaction effects suggests that, at this interval, the effect of practice on healthy eating did not vary as a function of within-person exertion of self-control of either type.

Days 14-16

Effects of time and practice. The main effect of time on healthy eating was significant, $B = -.21$, $t(107) = -2.32$, $p = .02$. Participants reported eating less healthy foods as days since the practice manipulation elapsed. In addition, the main effect of practice on healthy eating was again significant, although marginally so, $B = .50$, $t(107) = 1.93$, $p = .06$. Participants in the initiation practice group had more reports of healthy eating over the last day of practice and the two days immediately following the practice manipulation than participants in the inhibition group and participants in the control group. As in the longer two intervals, the interaction between time and practice condition was not significant, $B = .12$, $t(105) = 0.47$, $p = .64$.

Between- vs. within-person effects of inhibition and initiation. Next, I examined both the between- and within-person fixed effects of self-control by inhibition and initiation exertion on reports of healthy eating. The between-person effect of exertion by initiation on healthy eating was not significant, $B = .003$, $t(105) = 0.42$, $p = .68$. Similarly, the between-person effect of exertion by inhibition on healthy eating was also non-significant, $B = .008$, $t(105) = 1.24$, $p = .22$. These effects were not included in subsequent models.

The within-person effect of inhibition on reports of healthy eating was not significant, $B = -.006$, $t(105) = -0.86$, $p = .39$. However, again replicating the pattern observed in Study 1 with studying and throughout the other dependent variables in Study 2, the within-person effect of exertion by initiation significantly predicted reports of healthy eating, $B = .02$, $t(105) = 1.94$, $p = .05$. When people exerted more self-control by initiation than usual, they also reported more healthy eating. However, the interaction between within-person exertion of inhibition and within-person exertion of initiation failed to reach significance, $B = -.0002$, $t(104) = -0.72$, $p = .47$.

Individual difference (level 2) effects. Mean-centered trait inhibition did not significantly predict reports of healthy eating, $B = -0.11$, $t(105) = -0.61$, $p = .54$. The main effect of mean-

centered trait initiation on healthy eating also failed to reach significance, $B = .15$, $t(105) = 0.91$, $p = .36$. In addition, there were no significant interaction effects involving practice and trait inhibition or trait initiation. The interaction between practice and trait initiation was not significant, $B = -.40$, $t(105) = -0.77$, $p = .44$. The interaction between practice and mean-centered trait inhibition also failed to reach significance, $B = -.02$, $t(105) = -0.04$, $p = .97$. The absence of these interaction effects indicates that the effect of practice on healthy eating did not vary as a function of trait self-control.

Cross-level interactions. The key cross-level interactions examined whether the effect of practice on healthy eating varied as a function of within-person exertion of self-control by inhibition or initiation at the day level. The interaction between practice and within-person exertion of inhibition was not significant, $B = -.01$, $t(104) = -0.94$, $p = .35$. Similarly, the interaction between practice and within-person exertion of initiation failed to reach significance, $B = .02$, $t(104) = 1.28$, $p = .20$. The absence of both interaction effects indicates that, at this interval, the effect of practice on healthy eating did not vary as a function of within-person exertion of self-control of either type.

Healthy Eating: Summary of Findings

Across all three intervals, the main effect of practice on healthy eating was significant, such that participants in the initiation practice condition evinced more reports of healthy eating than participants in both the inhibition practice condition and in the control group. In addition, the main effect of within-person exertion of initiation was significant and in the predicted direction—participants reported more healthy eating on days when they exerted more self-control by initiation than usual. This finding replicates the pattern observed for studying in Studies 1 and 2; when participants experienced more demands on self-control via initiation, they also reported more instances of healthy eating. Importantly, the within-person effect of exertion by inhibition

was not significant, suggesting that the extent to which participants exerted self-control using inhibition throughout the day did not influence their reports of healthy eating, an initiation behavior. Although inconsistent across the three intervals, there was some evidence for the predicted interaction between practice and within-person exertion of self-control. When observed (i.e., over the interval including Days 14-28), this pattern revealed that participants who practiced initiation reported more healthy eating when they experienced greater-than-usual demands on self-control via initiation. However, as observed with exercise and studying, the predicted interactions with trait self-control were not significant.

DV: Unhealthy Eating

To test the hypotheses that practicing inhibition for two weeks should improve inhibition-dependent behaviors, and that practicing initiation for two weeks should also improve inhibition-dependent behaviors, the number of reports of unhealthy eating per day was used as a dependent variable. I predicted reports of unhealthy eating from: between-person exertion of inhibition score, between-person exertion of initiation score, within-person exertion of inhibition score, within-person exertion of initiation score, the interaction between inhibition exertion and initiation exertion (all level 1 variables), and condition, time as measured by days since the last day of practice (centered on the last day of practice, Day 14), group-mean-centered trait inhibition and trait initiation (level 2 variables). Unhealthy eating was included as a target dependent variable for this hypothesis because it should reflect inhibition—or lack thereof. Indeed, eating junk food received one of the highest ratings on inhibition during the intake session ($M = 3.12$, $SD = 1.43$) and, by comparison, relatively low ratings on initiation ($M = 2.08$, $SD = 1.37$).

As the most stringent test of the hypothesis, reports of unhealthy eating on the last day of practice (Day 14) and during the entire experience sampling session (Days 15-28) were first tested. To follow up, analyses were conducted examining the effects at two other intervals

following practice: the last day of practice and the week following (i.e., Days 14-21); the last day of practice and two days following (i.e., Days 14-16). These analyses aimed to capture at what point in time the effect of practice became apparent.

Days 14-28

Effects of time and practice. The main effect of time on reports of unhealthy eating was not significant, $B = 0.0007$, $t(1370) = 0.15$, $p = .88$. In addition, the predicted main effect of practice was not significant for either the inhibition practice group, $B = -0.08$, $t(1370) = -0.50$, $p = .62$, or for the initiation practice group, $B = -0.21$, $t(1370) = -1.31$, $p = .19$. However, the interaction between time and practice condition was significant for both the inhibition practice group, $B = -.05$, $t(1368) = -3.57$, $p < .01$, and for the initiation practice group, $B = -.05$, $t(1368) = -3.58$, $p < .01$. The interaction took the same form for participants in the initiation practice group and participants in the inhibition practice group, as compared to control participants. As displayed in Figure 3, there were no significant differences in reports of unhealthy eating on the last day of practice; however, as time since the practice manipulation elapsed, control participants reported more instances of unhealthy eating than participants in both practice conditions.

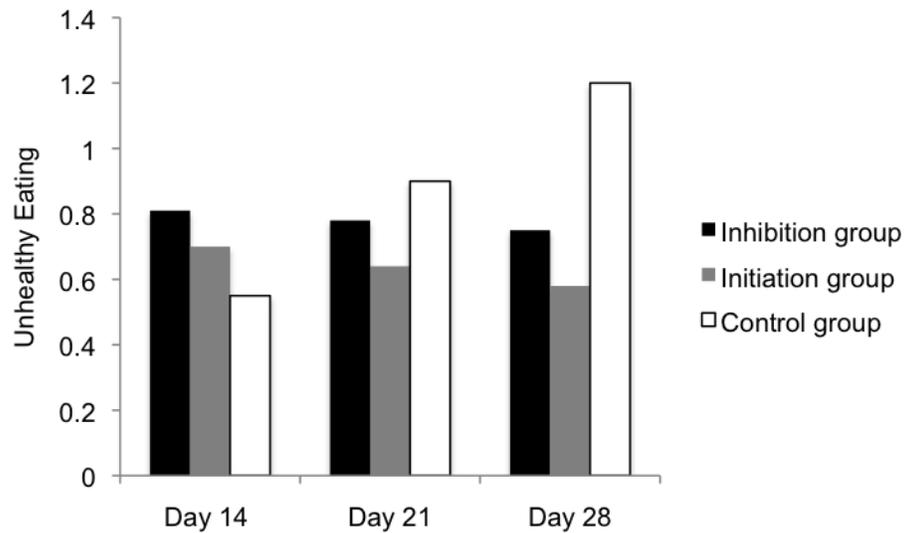


Figure 3: Interaction between time and practice condition on unhealthy eating.

Between- vs. within-person effects of inhibition and initiation. Next, I examined both the between- and within-person fixed effects of self-control exertion of inhibition and initiation on reports of unhealthy eating. The random effects of each were not significant. The between-person effect of exertion by initiation on unhealthy eating failed to reach significance, $B = .004$, $t(1368) = 0.86$, $p = .39$. Similarly, the between-person effect of exertion by inhibition on unhealthy eating was not significant, $B = .005$, $t(1368) = 1.19$, $p = .23$. Because these between-person effects were not significant, they were removed from the final model.

The within-person effect of inhibition on unhealthy eating was significant, $B = .008$, $t(1368) = 3.76$, $p < .001$. This effect indicated that, when participants experienced more-than-usual demands on self-control via inhibition, they also reported more instances of unhealthy eating. However, the within-person effect of exertion by initiation on reports of unhealthy eating was significant and negative, $B = -.008$, $t(1368) = -2.87$, $p < .01$. On days when people experienced more self-control demands by initiation, as measured by reports of behaviors they had engaged in throughout the day, they evidenced fewer reports of unhealthy eating. However, the interaction

between within-person inhibition and within-person initiation failed to reach significance, $B = -.0001$, $t(1367) = -0.85$, $p = .39$.

Individual difference (level 2) effects. There were no significant main effects of the key individual difference variables, including trait inhibition and trait initiation. Mean-centered trait inhibition did not significantly predict reports of unhealthy eating, $B = -.03$, $t(1368) = 0.23$, $p = .81$. Similarly, there was no main effect of mean-centered trait initiation on unhealthy eating, $B = .03$, $t(1368) = 0.23$, $p = .81$. The interaction between practice by initiation and trait initiation was significant, $B = -.63$, $t(1368) = -1.95$, $p = .05$. Probing this interaction revealed that there were no significant differences between the practice groups and control group in reports of unhealthy eating at low levels of trait initiation. However, at high levels of trait initiation, participants in the initiation practice group reported significantly fewer instances of unhealthy eating than participants in the control and inhibition practice groups (see Figure 4 below).

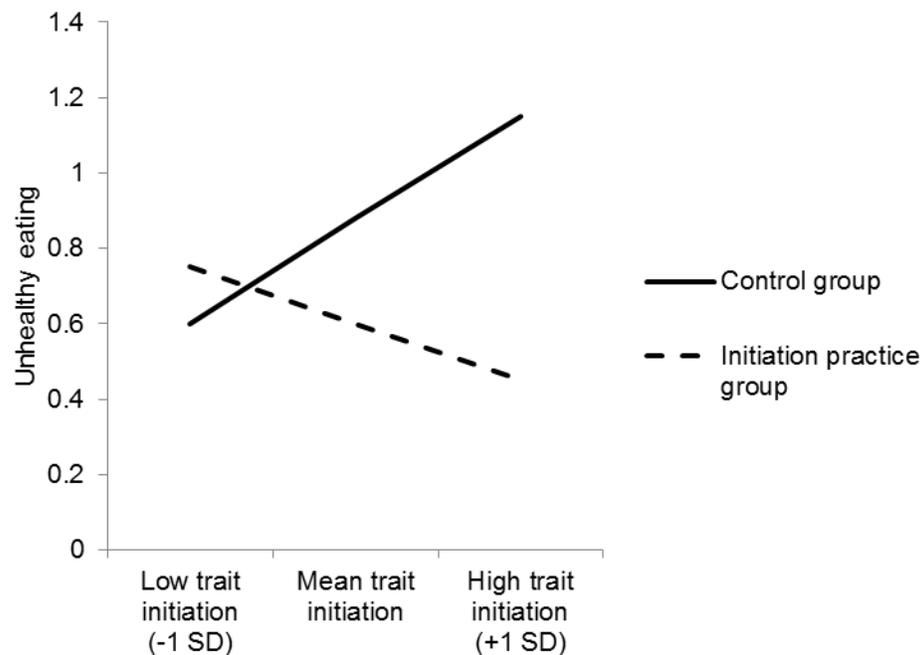


Figure 4: Interaction between practice and trait initiation on unhealthy eating.

In addition, the other interactions between practice and trait self-control failed to reach significance: practice by initiation and trait inhibition, $B = .56, t(1368) = 1.46, p = .14$; practice by inhibition and trait initiation, $B = -.40, t(1368) = -1.38, p = .17$; practice by inhibition and trait inhibition, $B = .52, t(1368) = 1.35, p = .18$.

Cross-level interactions. The key cross-level interactions examined whether the effect of practice varied as a function of within-person exertion of self-control by inhibition or initiation at the day level. I first examined the interactions between practice by initiation and within-person exertion of self-control. The interaction between practice by initiation and within-person exertion of initiation failed to reach significance, $B = -.008, t(1365) = -1.36, p = .17$. However, the interaction between practice by initiation and within-person exertion of inhibition was significant, $B = .009, t(1365) = 2.80, p < .01$. Follow-up analyses revealed that participants in the initiation practice group reported fewer instances of unhealthy eating than participants in the control group; this effect was significant at lower levels of within-person exertion of inhibition, $B = -.30, p = .03$, and marginally significant at median levels of within-person exertion of inhibition, $B = -.23, p = .09$, but not significant at high levels of within-person exertion of inhibition, $B = -.16, p = .25$.

Finally, I examined the interactions between practice by inhibition and within-person exertion of self-control. The interaction between practice by inhibition and within-person exertion of inhibition was significant, $B = .008, t(1365) = 2.30, p = .02$. As with the initiation practice group, this interaction revealed that participants who practiced inhibition reported less unhealthy eating than participants in the control group. This effect was again magnified at lower levels of within-person exertion of inhibition. In addition, the interaction between practice via inhibition and within-person exertion of initiation was significant, $B = -.002, t(1365) = -2.46, p = .01$. This interaction took the opposite form as those involving within-person inhibition. Specifically, there was no effect of practice on unhealthy eating at lower levels of within-person initiation; however,

as shown in Figure 5, those who practiced inhibition demonstrated fewer instances of unhealthy eating at high levels of within-person initiation.

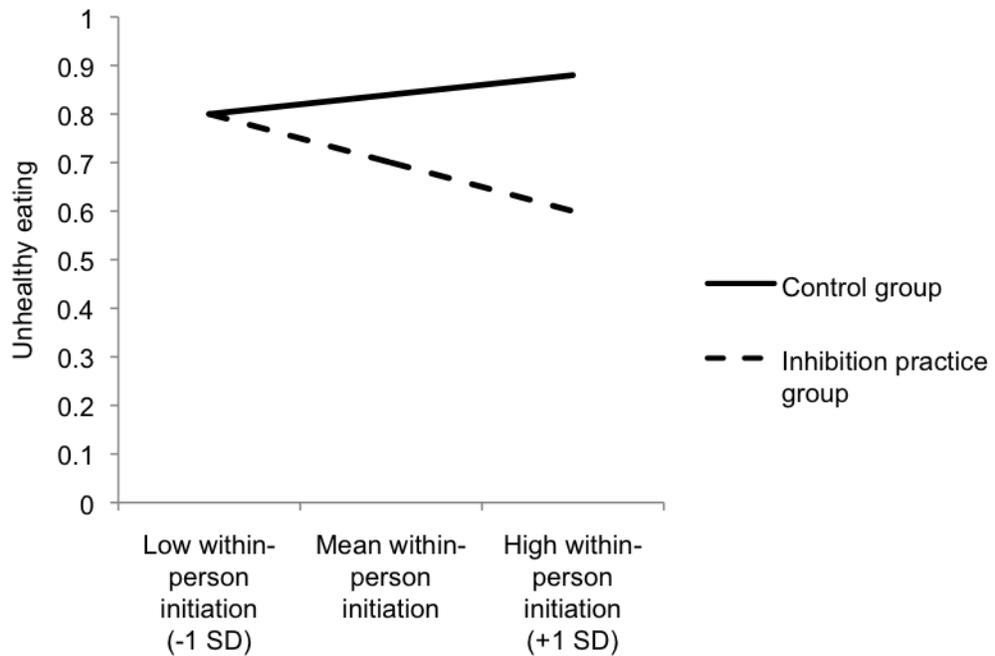


Figure 5: Interaction between practice by inhibition and exertion of initiation.

Days 14-21

Effects of time and practice. The main effect of time on unhealthy eating was not significant, $B = .005$, $t(646) = 0.12$, $p = .73$. In addition, the predicted main effect of practice was not significant for either the inhibition practice group, $B = 0.05$, $t(647) = 0.32$, $p = .75$, or for the initiation practice group, $B = -0.07$, $t(647) = -0.44$, $p = .66$, as compared to the control group. As in the longer interval, the interaction between time and practice condition was significant for the inhibition practice group, $B = -.10$, $t(644) = -2.48$, $p = .01$, as compared to the control group. The form of this interaction replicated the pattern from the longer interval: There were no significant differences in reports of unhealthy eating on the last day of practice; however, as time since the practice manipulation elapsed, control participants reported more unhealthy eating than

participants in the inhibition practice group. The interaction between time and practice condition failed to reach significance for the initiation practice group, $B = -.06$, $t(644) = -1.54$, $p = .12$, as compared to control participants.

Between- vs. within-person effects of inhibition and initiation. Next, I examined both the between- and within-person fixed effects of self-control by inhibition and initiation exertion on reports of unhealthy eating. These tests examined whether the effects of exerting inhibition and initiation, respectively, on unhealthy eating, were significant at the between-person level and at the within-person level. The random effects of each were not significant.

The between-person effect of exertion by initiation on unhealthy eating failed to reach significance, $B = .006$, $t(644) = 1.28$, $p = .20$. Similarly, the between-person effect of exertion by inhibition on unhealthy eating was not significant, $B = .003$, $t(644) = 0.79$, $p = .43$. However, unlike the results from the longer interval, neither of the within-person effects significantly predicted reports of unhealthy eating behavior. The within-person effect of inhibition on unhealthy eating was not significant, $B = .005$, $t(644) = 1.52$, $p = .13$. Similarly, the within-person effect of initiation did not significantly predict reports of unhealthy eating, $B = -.004$, $t(644) = -1.14$, $p = .26$. Furthermore, the interaction between within-person exertion of inhibition and within-person exertion of initiation was not significant, $B = .00002$, $t(643) = 0.16$, $p = .87$.

Individual difference (level 2) effects. Mean-centered trait inhibition did not have a significant main effect on unhealthy eating, $B = .03$, $t(644) = 0.29$, $p = .77$. The main effect of mean-centered trait initiation also failed to reach significance, $B = .01$, $t(644) = 0.10$, $p = .92$. As in the longer interval, the interaction between practice by initiation and trait initiation was significant, $B = -.70$, $t(644) = -2.16$, $p = .03$. Probing this interaction again revealed that there were no significant differences between the practice groups and control group in reports of unhealthy eating at low levels of trait initiation. However, at high levels of trait initiation,

participants in the initiation practice group reported significantly fewer instances of unhealthy eating than participants in the control and inhibition practice groups.

In addition, and again replicating the findings using the longer interval, the other interactions between practice and trait self-control failed to reach significance: practice by initiation and trait inhibition, $B = .59$, $t(644) = 1.51$, $p = .13$; practice by inhibition and trait initiation, $B = -.42$, $t(644) = -1.42$, $p = .16$; and practice by inhibition and trait inhibition, $B = .43$, $t(644) = 1.11$, $p = .27$.

Cross-level interactions. The key cross-level interactions examined whether the effect of practice on unhealthy eating varied as a function of within-person exertion of self-control by inhibition or initiation at the day level. The interaction between practice by initiation and within-person exertion of inhibition was not significant, $B = .003$, $t(641) = 0.62$, $p = .54$. Similarly, the interaction between practice by initiation and within-person exertion of initiation failed to reach significance, $B = -.004$, $t(641) = -0.46$, $p = .65$. In addition, the interaction between practice via inhibition and within-person exertion of inhibition was not significant, $B = .006$, $t(641) = 1.22$, $p = .22$. However, the interaction between practice by inhibition and within-person exertion of initiation was marginally significant, $B = -.02$, $t(641) = -1.86$, $p = .06$. This interaction replicated the pattern from the longer interval, demonstrating that there was no effect of practice on unhealthy eating at lower or average levels of within-person initiation. However, participants who practiced inhibition demonstrated fewer instances of unhealthy eating when their exertion via initiation was greater-than-average.

Days 14-16

Effects of time and practice. The main effect of time on unhealthy eating was not significant, $B = .07$, $t(107) = 0.82$, $p = .42$. In addition, the predicted main effect of practice was not significant for either the inhibition practice group, $B = 0.29$, $t(107) = 1.47$, $p = .15$, or for the

initiation practice group, $B = 0.07$, $t(107) = 0.34$, $p = .64$, as compared to the control group. The interaction between time and practice condition failed to reach to significance for both the inhibition practice group, $B = 0.38$, $t(105) = 1.11$, $p = .27$, and the initiation practice group, $B = 0.02$, $t(105) = 0.09$, $p = .93$.

Between- vs. within-person effects of inhibition and initiation. Next, I examined both the between- and within-person fixed effects of self-control by inhibition and initiation exertion on reports of unhealthy eating. The between-person effect of exertion by initiation on unhealthy eating failed to reach significance, $B = .004$, $t(105) = 0.62$, $p = .54$. Similarly, the between-person effect of exertion by inhibition on unhealthy eating was not significant, $B = .003$, $t(105) = 0.55$, $p = .58$. In addition, neither of the within-person effects significantly predicted reports of unhealthy eating. The within-person effect of inhibition on unhealthy eating was not significant, $B = .006$, $t(105) = 0.99$, $p = .32$. Similarly, the within-person effect of initiation did not significantly predict reports of unhealthy eating, $B = -.004$, $t(105) = -0.61$, $p = .54$. Furthermore, the interaction between within-person exertion of inhibition and within-person exertion of initiation failed to reach significance, $B = .0001$, $t(104) = 0.55$, $p = .58$.

Individual difference (level 2) effects. Mean-centered trait inhibition did not have a significant main effect on unhealthy eating, $B = -.03$, $t(105) = -0.24$, $p = .81$. The main effect of mean-centered trait initiation also failed to reach significance, $B = .02$, $t(105) = 0.12$, $p = .90$. In addition, there were no significant interaction effects involving practice and trait inhibition or trait initiation. Again replicating the findings using the longer interval, three of the interactions between practice and trait self-control were not significant: practice by initiation and trait inhibition, $B = .16$, $t(105) = 0.35$, $p = .73$; practice by inhibition and trait initiation, $B = -.26$, $t(105) = -0.71$, $p = .48$; and practice by inhibition and trait inhibition, $B = .28$, $t(105) = 0.61$, $p = .55$. However, the interaction between practice by initiation and trait initiation observed over the

longer intervals also failed to reach significance over this shorter interval, $B = -.49$, $t(105) = -1.23$, $p = .22$.

Cross-level interactions. The key cross-level interactions examined whether the effect of practice on unhealthy eating varied as a function of within-person exertion of self-control by inhibition or initiation at the day level. As in the longer intervals, the interaction between practice by initiation and within-person exertion of inhibition was not significant, $B = -.004$, $t(102) = -0.38$, $p = .70$. Similarly, the interaction between practice by initiation and within-person exertion of initiation failed to reach significance, $B = -.0005$, $t(102) = -0.03$, $p = .98$. In addition, the interaction between practice via inhibition and within-person exertion of inhibition was not significant, $B = .005$, $t(102) = 0.57$, $p = .22$. Furthermore, the interaction between practice via inhibition and within-person exertion of initiation observed over the longer intervals failed to reach significance using this shorter interval, $B = -.02$, $t(102) = -1.64$, $p = .10$.

Unhealthy Eating: Summary of Findings

Across all three intervals, the main effect of practice on unhealthy eating was not significant. However, using the two longer intervals (Days 14-21 and Days 14-28), there was a significant interaction between time and condition, such that participants in the control group reported significantly more instances of unhealthy eating over time, whereas participants in both of the practice conditions evidenced no change. In only the longest interval (Days 14-28), the within-person effects of exertion by inhibition and initiation were both significant, albeit in different directions. These effects revealed that participants reported more instances of unhealthy eating on days when they experienced more demands on self-control by inhibition than usual, and less unhealthy eating when they exerted more-than-usual self-control via initiation. These patterns involving within-person effects of self-control exertion paralleled those observed using alcohol consumption as a dependent variable.

In addition to the main effects of within-person exertion of self-control, there were also several significant interactions between practice and within-person exertion of self-control over the longest interval (Days 14-28). Specifically, the same pattern was observed for participants in both the inhibition practice group and the initiation practice group, such that practice was associated with significantly fewer reports of unhealthy eating only at low levels of within-person exertion of inhibition. In other words, practicing either inhibition or initiation led to fewer reports of unhealthy inhibition when participants experienced fewer-than-usual demands on self-control by inhibition. Interestingly, this pattern was reversed when examining within-person initiation, although it was only significant for participants who practiced inhibition. When participants who practiced inhibition exerted greater-than-average levels of initiation, they reported fewer instances of unhealthy eating. In addition, there was a significant interaction between practice and trait initiation, such that participants who practiced initiation and were high in trait initiation reported less unhealthy eating. Interestingly, the form of this effect was opposite from that observed for likelihood of alcohol consumption, whereby participants who practiced initiation and were high in trait initiation were more likely to drink.

DV: Resisting Junk Food

To test the hypothesis that practicing inhibition for two weeks should improve inhibition-relevant behaviors, the number of reports of resisting junk food per day was used as a dependent variable. I predicted reports of resisting junk food from: between-person exertion of inhibition score, between-person exertion of initiation score, within-person exertion of inhibition score, within-person exertion of initiation score, the interaction between inhibition exertion and initiation exertion (all level 1 variables), and condition, time as measured by days since the last day of practice (centered on the last day of practice, Day 14), group-mean-centered trait inhibition and trait initiation (level 2 variables). Resisting junk food was included as a target dependent

variable for this hypothesis because it should require inhibition. As such, it was used as the manipulation of inhibition during the practice session.

As the most stringent test of the hypothesis, reports of resisting junk food on the last day of practice (Day 14) and during the entire experience sampling session (Days 15-28) were first tested as a dependent measure. To follow up, analyses were conducted examining the effects at two other intervals following practice: the last day of practice and the week following (i.e., Days 14-21); the last day of practice and two days following (i.e., Days 14-16). The aim of these analyses was to attempt to capture at what point in time the effect of practice became evident.

Days 14-28

Effects of time and practice. There was a marginally significant main effect of time on reports of resisting junk food, $B = -.007$, $t(1370) = -1.84$, $p = .07$, suggesting that, as time since the practice manipulation elapsed, people reported fewer instances of resisting junk food. The predicted main effect of practice was not significant for either the inhibition practice group, $B = .13$, $t(1370) = 1.08$, $p = .28$, or for the initiation practice group, $B = -0.03$, $t(1370) = -0.18$, $p = .85$. In addition, the interaction between time and practice condition failed to reach significance for both the inhibition practice group, $B = -.01$, $t(1368) = -1.25$, $p = .21$, and for the initiation practice group, $B = .009$, $t(1368) = 0.83$, $p = .41$.

Between- vs. within-person effects of inhibition and initiation. Next, I examined both the between- and within-person fixed effects of self-control by inhibition and initiation exertion on reports of resisting junk food. These tests examined whether the effects of exerting inhibition and initiation, respectively, on resisting junk food, were significant at the between-person level and at the within-person level. The random effects of each were not significant.

The between-person effect of exertion by initiation on resisting junk food was marginally significant, $B = .006$, $t(1368) = 1.81$, $p = .07$. Similarly, the between-person effect of exertion by

inhibition was marginally significant, $B = .005$, $t(1368) = 1.73$, $p = .08$. In both cases, participants who exerted more self-control than the average person in the study evidenced marginally more reports of resisting junk food. However, the between-person effects were not involved in any significant interactions.

The within-person effect of inhibition on resisting junk food failed to reach significance, $B = .001$, $t(1368) = 0.63$, $p = .53$. In other words, a person's level of self-control exertion by inhibition on a particular day, compared to their average daily exertion of inhibition, did not influence their reports of resisting junk food that day. However, the within-person effect of exertion by initiation significantly predicted reports of resisting junk food, $B = .007$, $t(1368) = 3.28$, $p = .001$. On days when people experienced more self-control demands by initiation, as measured by reports of behaviors they had engaged in throughout the day, they reported resisting more junk food. However, the interaction between within-person initiation and within-person inhibition failed to reach significance, $B = -.00004$, $t(1367) = -0.55$, $p = .58$.

Individual difference (level 2) effects. Mean-centered trait inhibition did not significantly predict reports of resisting junk food, $B = -.11$, $t(1368) = -0.42$, $p = .67$. However, mean-centered trait initiation significantly predicted resisting junk food, $B = .39$, $t(1368) = 2.06$, $p = .04$, such that participants higher on trait initiation evidenced more reports of resisting junk food. In addition, the interaction between practice and trait initiation was significant for participants in the inhibition practice condition, $B = -.46$, $t(1368) = -2.14$, $p < .05$, as compared to control participants. Simple slopes analyses revealed that the effect of practicing inhibition was strongest for participants low in trait initiation, $B = .44$, $p = .02$, as compared to those high in trait initiation, $B = -.16$, $p = .38$. Importantly, participants low in trait initiation who practiced inhibition evidenced significantly more reports of resisting junk food than participants low in trait initiation in the control group.

The interaction between practice and trait initiation was also significant for participants in the initiation practice condition, $B = -.54$, $t(1368) = -2.28$, $p < .05$, as compared to the control condition. Simple slopes analyses revealed a marginally significant positive effect of practicing initiation for participants low in trait initiation, $B = .35$, $p = .08$, such that participants low in trait initiation who practiced initiation reported more instances of resisting junk food. Interestingly, and mirroring the effects observed with alcohol consumption, these analyses also revealed a marginally significant negative effect of practicing initiation for participants high in trait initiation, $B = -.36$, $p = .06$. This effect demonstrated that participants who were high in trait initiation who practiced initiation for two weeks actually reported fewer instances of resisting junk food.

Cross-level interactions. The key cross-level interactions examined whether the effect of practice varied as a function of within-person exertion of self-control by inhibition or initiation at the day level. However, none of these interactions reached significance, suggesting that the effect of practice on reports of resisting junk food did not depend on the degree to which people exerted self-control throughout the day. Specifically, the interaction between practice by inhibition and within-person exertion of inhibition was not significant, $B = -.0002$, $t(1365) = -0.07$, $p = .94$, nor was the interaction between practice via inhibition and within-person exertion of initiation, $B = .0007$, $t(1365) = 0.14$, $p = .89$. Similarly, the interaction between practice via initiation and within-person exertion of inhibition failed to reach significance, $B = .002$, $t(1365) = 0.72$, $p = .47$, as did the interaction between practice by initiation and within-person exertion of initiation, $B = -.002$, $t(1365) = -0.50$, $p = .62$.

Days 14-21

Effects of time and practice. There was a marginally significant main effect of time on reports of resisting junk food, $B = -.02$, $t(646) = -1.92$, $p = .06$, suggesting that, as time since the

practice manipulation elapsed, people reported fewer instances of resisting junk food. The predicted main effect of practice was not significant for either the inhibition practice group, $B = .20, t(646) = 1.57, p = .12$, or for the initiation practice group, $B = -0.04, t(646) = -0.34, p = .74$. In addition, the interaction between time and practice condition failed to reach significance for both the inhibition practice group, $B = .03, t(644) = 1.17, p = .24$, and for the initiation practice group, $B = .05, t(644) = 1.57, p = .12$.

Between- vs. within-person effects of inhibition and initiation. Next, I examined both the between- and within-person fixed effects of self-control by inhibition and initiation exertion on reports of resisting junk food. The between-person effect of exertion by initiation on resisting junk food was not significant, $B = .003, t(644) = 0.85, p = .40$. However, the between-person effect of exertion by inhibition was marginally significant, $B = .007, t(644) = 2.59, p = .01$. Participants who exerted more self-control via inhibition than the average person in the study reported more instances of resisting junk food. However, as in the longer interval, the between-person effects were not involved in any significant interactions.

The within-person effect of inhibition on resisting junk food failed to reach significance, $B = .001, t(644) = 0.53, p = .60$. In other words, a person's level of self-control exertion by inhibition on a particular day, compared to their average daily exertion of inhibition, did not influence their reports of resisting junk food that day. However, the within-person effect of exertion by initiation significantly predicted reports of resisting junk food, $B = .007, t(644) = 2.64, p = .001$. When people experienced more-than-usual demands on initiation, they also reported resisting more junk food. However, the interaction between within-person initiation and within-person inhibition failed to reach significance, $B = -.0001, t(643) = -1.35, p = .18$.

Individual difference (level 2) effects. Mean-centered trait inhibition did not significantly predict reports of resisting junk food, $B = .03, t(644) = 0.31, p = .76$. Although the main effect of

mean-centered trait initiation failed to reach significance, $B = .29$, $t(644) = 1.51$, $p = .13$, it was in the same direction as over the longer interval. In addition, the interaction between practice and trait initiation was marginally significant for participants in the inhibition practice condition, $B = -.46$, $t(644) = -1.74$, $p = .08$, as compared to control participants. Simple slopes analyses revealed that the effect of practicing inhibition was strongest for participants low in trait initiation, $B = .45$, $p = .02$, as compared to those high in trait initiation, $B = -.06$, $p = .76$. As in the longer interval, participants low in trait initiation who practiced inhibition evidenced significantly more reports of resisting junk food than participants low in trait initiation in the control group.

The interaction between practice and trait initiation was also marginally significant for participants in the initiation practice condition, $B = -.43$, $t(644) = -1.74$, $p = .08$, as compared to the control condition. Simple slopes analyses revealed a non-significant positive effect of practicing initiation for participants low in trait initiation, $B = .26$, $p = .21$. These analyses also revealed a non-significant negative effect of practicing initiation for participants high in trait initiation, $B = -.30$, $p = .13$. Although neither of these simple slopes reached significance, they were in the same direction as those observed using the longer interval, whereby participants who were low in trait initiation had more reports of resisting junk food when they practiced initiation. Furthermore, participants high in trait initiation reported less resisting of junk food when they practiced initiation.

Cross-level interactions. The key cross-level interactions examined whether the effect of practice varied as a function of within-person exertion of self-control by inhibition or initiation at the day level. However, none of these interactions was significant, suggesting that the effect of practice on reports of resisting junk food did not vary as a function of daily exertion of self-control. Specifically, the interaction between practice by inhibition and within-person exertion of inhibition was not significant, $B = -.004$, $t(641) = -1.23$, $p = .22$, nor was the interaction between

practice via inhibition and within-person exertion of initiation, $B = .009$, $t(641) = 1.42$, $p = .16$. Similarly, the interaction between practice via initiation and within-person exertion of inhibition failed to reach significance, $B = .003$, $t(641) = 0.94$, $p = .35$, as did the interaction between practice by initiation and within-person exertion of initiation, $B = -.001$, $t(641) = -0.24$, $p = .81$.

Days 14-16

Effects of time and practice. The main effect of time on reports of resisting junk food was not significant, $B = -.02$, $t(107) = -0.23$, $p = .82$. The predicted main effect of practice again was not significant for either the inhibition practice group, $B = .16$, $t(107) = 1.06$, $p = .29$, or for the initiation practice group, $B = -.10$, $t(107) = -0.68$, $p = .50$. In addition, the interaction between time and practice condition failed to reach significance for both the inhibition practice group, $B = -.36$, $t(105) = -1.42$, $p = .16$, and for the initiation practice group, $B = -.24$, $t(105) = -0.94$, $p = .25$.

Between- vs. within-person effects of inhibition and initiation. Next, I examined both the between- and within-person fixed effects of self-control by inhibition and initiation exertion on reports of resisting junk food. The random effects of each were not significant. The between-person effect of exertion by initiation on resisting junk food was not significant, $B = .002$, $t(105) = 0.43$, $p = .67$. In addition, the between-person effect of exertion by inhibition also failed to reach significance, $B = .005$, $t(105) = 0.93$, $p = .35$. The between-person effects again were not involved in any significant interactions.

The within-person effect of inhibition on resisting junk food failed to reach significance, $B = .005$, $t(105) = 0.77$, $p = .45$. However, the within-person effect of exertion by initiation significantly predicted reports of resisting junk food, $B = .01$, $t(105) = 1.98$, $p < .05$. When people experienced more-than-usual demands on initiation, they also reported resisting more junk

food. However, the interaction between within-person initiation and within-person inhibition again failed to reach significance, $B = .00004$, $t(104) = 0.18$, $p = .86$.

Individual difference (level 2) effects. Mean-centered trait inhibition did not significantly predict reports of resisting junk food, $B = -.01$, $t(105) = -0.11$, $p = .91$. The main effect of mean-centered trait initiation was marginally significant, $B = .42$, $t(105) = 1.77$, $p = .08$, suggesting that participants who were higher in trait initiation reported more instances of resisting junk food. In addition, the interaction between practice and trait initiation was significant for participants in the inhibition practice condition, $B = -.66$, $t(105) = -2.43$, $p = .02$, as compared to control participants. Simple slopes analyses revealed that the effect of practicing inhibition was strongest for participants low in trait initiation, $B = .59$, $p = .01$, as compared to those high in trait initiation, $B = -.26$, $p = .26$. As in the two other intervals, participants low in trait initiation who practiced inhibition reported significantly more instances of resisting junk food than participants low in trait initiation in the control group.

The interaction between practice and trait initiation was marginally significant for participants in the initiation practice condition, $B = -.50$, $t(105) = -1.71$, $p = .09$, as compared to the control condition. Simple slopes analyses revealed a non-significant positive effect of practicing initiation for participants low in trait initiation, $B = .22$, $p = .36$. These analyses also revealed a marginally significant negative effect of practicing initiation for participants high in trait initiation, $B = -.43$, $p = .08$. Although neither of these simple slopes reached conventional levels of significance, they were in the same direction as those observed over the two other intervals, whereby participants who were low in trait initiation had more reports of resisting junk food when they practiced initiation. Furthermore, participants high in trait initiation reported less resisting of junk food when they practiced initiation.

Cross-level interactions. The key cross-level interactions examined whether the effect of practice varied as a function of within-person exertion of self-control by inhibition or initiation at the day level. However, none of these interactions were significant, suggesting that the effect of practice on reports of resisting junk food did not vary as a function of daily exertion of self-control. Specifically, the interaction between practice by inhibition and within-person exertion of inhibition was not significant, $B = -.004$, $t(102) = -0.47$, $p = .64$, nor was the interaction between practice via inhibition and within-person exertion of initiation, $B = .009$, $t(102) = 1.21$, $p = .23$. Similarly, the interaction between practice via initiation and within-person exertion of inhibition failed to reach significance, $B = .01$, $t(102) = 1.57$, $p = .12$, as did the interaction between practice by initiation and within-person exertion of initiation, $B = -.02$, $t(102) = -1.61$, $p = .11$.

Resisting Junk Food: Summary of Findings

Across all three intervals, there was no main effect of practice on reports of resisting junk food. Although, as predicted, there was not a significant difference in reports of resisting junk food between the initiation and inhibition practice groups, neither group differed significantly from controls. However, the main effects of between-person and within-person exertion of self-control were, on the whole, significant and in the predicted direction. Participants evidenced more reports of resisting junk food on days when they exerted more self-control by initiation than usual, replicating the pattern observed for both studying and healthy eating behaviors. In addition, a reasonably consistent effect for between-person exertion was observed, suggesting that participants who exerted more self-control by either inhibition or initiation than the average person in the study resisted more junk food. There were no significant interactions between practice and exertion of either form of self-control.

Interestingly, across all three intervals, I observed a consistent interaction between practice of both forms and trait self-control initiation. This interaction revealed that participants

low in trait initiation who practiced self-control either by inhibition or initiation reported more instances of resisting junk food than participants low in trait initiation who did not practice self-control. However, mirroring the effects observed for alcohol consumption, participants who were high in trait initiation actually evidenced fewer reports of resisting junk food when they practiced self-control.

DVs: Repeated Measures from Follow-Up Session

Stroop Task

To test the hypothesis that participants in the inhibition practice group and the initiation practice group should evidence improvements in inhibition-relevant outcomes as compared to participants in the control group, the Stroop test was used as a dependent variable. Participants completed a computerized Stroop task during both the intake session and during the online follow-up session. More specifically, participants in the inhibition and initiation practice groups should have improved their Stroop performance relative to those in the control group and as compared to their own pre-practice performance (i.e., performance during the intake session).

There were no significant differences in the number of incorrect responses to Stroop items based on condition, $F(1, 63) = 1.77, p = .19$. Participants in the inhibition condition did not have significantly fewer incorrect responses to Stroop items in the follow-up Stroop task ($M = 3.86, SD = 3.33$), as compared to participants in the initiation condition ($M = 4.91, SD = 5.12$) or in the control condition ($M = 2.00, SD = 2.50$), controlling for baseline Stroop performance. Similarly, there were no significant differences in total reaction time to incongruent trials based on condition, controlling for baseline Stroop performance, $F(1, 63) = 1.46, p = .24$. Participants in the inhibition condition did not significantly improve their total reaction time to incongruent trials ($M = 18.83 s, SD = 5.86$), relative to participants in the initiation condition ($M = 19.29 s, SD = 4.17$), or participants in the control condition ($M = 17.71 s, SD = 4.77$).

Ratings of Behavior

An alternative function of practicing self-control for two weeks is that practice may serve to change people's beliefs about various behaviors as requiring self-control. Previous work on self-control has demonstrated that beliefs about self-control can moderate the effects of self-control depletion (Job, Dweck, & Walton, 2010). Therefore, it is possible that repeated, targeted practice at self-control may serve to modify people's beliefs about the degree to which particular behaviors require self-control, as reflected in their subjective ratings of behaviors on self-control.

During the intake session, all participants rated the set of 33 behaviors on the degree to which they required self-control by inhibition, self-control by initiation, and were replenishing. During the online follow-up session, participants completed these ratings for a second time. If engaging in a two-week practice of self-control via inhibition and initiation did alter participants' views of different self-control behaviors, these changes could be reflected in the ratings from the follow-up session. Further, it is possible that, in line with the other predictions regarding the differential impact of practicing initiation and inhibition, practicing one form or the other would have a different influence on changes in ratings of behaviors as requiring each form. More specifically, practicing initiation should lead to changes of ratings of behaviors on both inhibition and initiation, because I expect that practice at initiation should generalize to both forms of self-control. However, practicing inhibition should impact participants' ratings of behaviors on inhibition, but not initiation.

There were no significant differences in ratings of behaviors on inhibition, $F(1,64) = 0.44, p = .51$. Participants in the inhibition condition did not differ in their post-practice ratings of behaviors on inhibition ($M = 2.55, SD = 0.50$), as compared to participants in the initiation condition ($M = 2.42, SD = 0.53$) or in the control condition ($M = 2.46, SD = 0.37$), controlling for baseline ratings. Similarly, there were no significant differences in ratings of behaviors on

initiation, $F(1,63) = 1.01, p = .32$. Participants in the inhibition condition did differ in their post-practice ratings of behaviors on initiation ($M = 2.45, SD = 0.42$), as compared to participants in the initiation condition ($M = 2.54, SD = 0.43$) or in the control condition ($M = 2.68, SD = 0.56$), controlling for baseline ratings. Similarly, differences in ratings of the top ten highest-rated behaviors on both initiation and inhibition did not vary according to practice condition, controlling for baseline ratings of these behaviors.

Repeated Measures: Summary of Findings

None of the expected findings for the repeated measures variables reached significance. For both Stroop task performance and ratings of behaviors on inhibition and initiation as measured during the follow-up session, no differences were observed based on condition and controlling for baseline performance. There are several possible reasons for the absence of these effects due to the nature of the online follow-up session. This session was optional and thus only 67 participants completed the session. Furthermore, participation in the follow-up session was not even across the practice conditions (inhibition group: $n = 35$; initiation group: $n = 22$; control group: $n = 10$). In addition, because a large group of participants finished the experience sampling portion of the study on the final day before Spring Break, many of those participants either failed to complete the follow-up session or completed it during or following Spring Break, leading to larger-than-expected variability in the time elapsed between the conclusion of the practice manipulation and completion of the follow-up study. Finally, as noted previously, it is possible that the manipulations were not strong enough to produce the effects predicted for the changes in Stroop performance and ratings of behaviors.

Discussion

The purpose of Study 2 was to examine whether practicing self-control, either by inhibition or by initiation, would lead to improvements in only the form of self-control practiced (but across domains), or across both types of self-control. This overarching research question was tested by randomly assigning participants to resist one treat daily for two weeks (*inhibition practice group*), to eat an extra serving of fruits or vegetables daily for two weeks (*initiation practice group*), or to complete math problems twice daily for two weeks (*control group*). After completing two weeks of the practice manipulation, participants then reported on their daily behaviors, including a set of target self-control outcomes, in the context of a two-week experience sampling protocol.

Study 2 yielded a mixture of both expected and surprising results. Across the set of dependent variables, some evidence emerged for a general practice effect on self-control behaviors. For studying, the binary exercise outcome, and reports of healthy eating—all behaviors that require one to exercise self-control by initiation—there was a main effect of practice by initiation: Participants who practiced initiation studied more, reported more instances of healthy eating, and were more likely to exercise than participants in the inhibition and control groups. Although these findings support the hypothesis that practicing initiation, but not inhibition, should improve self-control on initiation-relevant outcomes, it should be noted that, for studying and exercise, this effect was observed only using the smaller intervals (i.e., Days 14-16, Days 14-21), suggesting that the practice effect achieved using this specific practice manipulation may be short-lived. However, the more consistent effect of practice on the healthy eating outcome observed across all intervals indicates that practice may transfer most effectively to outcomes in the same domain of behavior (e.g., Salomon & Perkins, 1989). Finally, it should be noted that for one behavior—alcohol consumption—practice actually had a negative impact:

participants in both practice groups reported consuming more alcohol than participants in the control group. Among the plausible explanations for this unexpected negative effect of practice are psychological reactance (Bensley & Wu, 1991) and unintended depletion of self-control resources via practice (Baumeister et al., 2007). These alternative explanations are addressed further in the general discussion.

An additional hypothesis tested in Study 2 was whether the effect of practice would vary as a function of self-control depletion, conceptualized in this study as exertion of inhibition and initiation and measured using idiographic self-control exertion scores. I expected that the effect of practice would be amplified at higher levels of exertion of self-control, such that practice would be particularly useful for participants when they experienced more demands on self-control of either form. However, support for this hypothesis was quite mixed across the set of dependent variables; significant interactions between practice and self-control exertion were observed only for the exercise and unhealthy eating outcomes. When it came to unhealthy eating, practicing inhibition yielded the hypothesized effect for people experiencing high demands on initiation: practice reduced unhealthy eating, but only at high levels of exertion via initiation. Unexpectedly, this effect was reversed when considering exertion via inhibition—the effect of both forms of practice was only significant for those at *low* levels of self-control exertion by inhibition. These disparate effects suggest the possibility that depletion may be experienced differently depending on which form of self-control has been exerted and, as such, provide additional support for a distinction between self-control by inhibition and initiation.

For exercise, the effect of practice did vary as a function of self-control exertion, but which form of practice influenced the likelihood of exercise varied depending on which demands on self-control were high. Practicing inhibition resulted in an increased likelihood of exercising on days when demands on self-control by inhibition were greater-than-average. Similarly,

practicing initiation resulted in a greater likelihood of exercising when demands on initiation were higher than usual. These varying effects suggest that the effectiveness of practicing one form of self-control or the other may depend on which form of self-control demands one encounters; further implications of this effect are considered in the general discussion.

In addition, I expected that the effect of practice on subsequent self-control outcomes would vary as a function of trait self-control, though I did not predict which direction this effect would take. Despite this agnostic view, the results with interactions involving practice and trait self-control were, on the whole, both mixed and surprising. Using resisting junk food as an outcome tapping self-control by inhibition, I observed some evidence to suggest that practice was particularly effective for participants low in trait self-control. Specifically, participants low in trait levels of self-control by initiation reported resisting more junk food when they practiced self-control by inhibition or self-control by initiation. This finding also provides support for the hypothesis that both forms of practice should yield improvements in outcome behaviors that require self-control by inhibition.

However, when it came to alcohol consumption, participants with high levels of trait inhibition who practiced inhibition reported drinking less. This finding suggests that practicing inhibition via resisting treats was particularly effective for those who were already high in trait inhibition, but did not provide much benefit for participants who were lower in trait levels of self-control by inhibition. Moreover, participants with high levels of trait initiation actually reported drinking *more* when they practiced inhibition. This finding points toward a possible “work hard, play hard” effect (Parker & Williams, 2003), whereby participants who are high in trait levels of self-control by initiation may find *failing* to inhibit behavior (e.g., drinking too much, eating unhealthy foods, sleeping too little) particularly replenishing of their self-control more generally. In addition, this result was replicated when it came to resisting junk food, such that participants

who practiced initiation and were also high on trait levels of initiation reported resisting less junk food. Again, this effect may point to the possibility of a “work hard, play hard” pattern, whereby people who are high in trait levels of initiation may, by eschewing inhibition, free up resources to be used in the pursuit of initiation. This possibility and other plausible explanations for these seemingly disparate findings regarding trait self-control are addressed further in the general discussion.

The most consistent pattern observed across the set of dependent variables replicated a key finding from Study 1: participants reported better self-control outcomes on days when they experienced more demands on self-control via initiation. When participants reported engaging in more behaviors throughout the day that required them to exert initiation (as measured by idiographic self-control exertion scores), they also (1) studied more, (2) were more likely to exercise, (3) reported eating more healthy foods, (4) reported eating fewer unhealthy foods, (5) resisted more junk food, and (6) drank less alcohol. These improved outcomes, importantly, were across behaviors requiring both inhibition and initiation, providing further support for the idea that positive effects resulting from engaging in initiation may generalize across both forms of self-control.

This finding, though consistent across the pair of studies, is counterintuitive from a depletion standpoint, which would posit that people should find their self-control resources depleted due to repeated use throughout the day and, thus, unavailable for subsequent self-control pursuits (Muraven et al., 1998). Moreover, across the set of dependent variables, I found little evidence for a depletion effect. One plausible reason for the lack of support for a depletion effect stems from the operationalization of self-control in the current studies as involving both inhibition and initiation. In the current work, the only main effects of within-person exertion by inhibition on self-control outcomes were in the direction of a depletion effect—when participants

experienced more demands on self-control by inhibition, they drank more alcohol, reported more instances of unhealthy eating, and exercised for shorter durations. As noted previously, the majority of empirical evidence regarding the depletion effect (e.g., Hagger et al., 2010) conceptualizes self-control primarily as the inhibition of impulses, urges, or temptations. Because most previous work examining the limited resource model has not examined behaviors that require initiation as opposed to inhibition, the possibility exists that the widely-replicated depletion effect may not necessarily apply to self-control via initiation. In addition, one of the only depletion effects observed was found for reports of resisting junk food using self-control exertion at the between-person level, whereby participants who were higher in self-control exertion relative to the average person in the study displayed evidence of a depletion effect via less resisting of junk food. This finding reinforces the importance of using idiographic self-control exertion scores to capture fluctuations in self-control and highlights the differences in interpretation that result when, as in most ego-depletion research, within-person differences in self-control are treated as error variance.

In sum, Study 2 provided mixed evidence for an effect of practicing one form of self-control or another on subsequent self-control pursuits. For studying, exercise, and healthy eating, there was evidence to support the hypothesis that practicing self-control by initiation—but not inhibition—would lead to improvements in self-control outcomes tapping initiation. Tests of moderators of this practice effect provided mixed results—for some behaviors, practice was more advantageous for people high in self-control, either at the trait or state level; for others, practice benefited those with lower levels of trait or state self-control. Plausible explanations for these disparate findings are discussed in further detail in the general discussion. In addition, there was a consistent effect of exertion of initiation across the set of self-control outcomes that replicated Study 1, indicating that, when people exerted more self-control by initiation throughout the day,

they displayed more behaviors reflecting good self-control. This counterintuitive effect argues against a general depletion effect, particularly when it comes to initiating behaviors, and prompts further questions about the influence of initiation on subsequent self-control attempts.

General Discussion

Key Findings

The purpose of this pair of studies was three-fold: first, to demonstrate that fluctuations in self-control by inhibition and initiation can be captured using idiographic self-control exertion scores; second, to provide additional evidence for a conceptual distinction between self-control by inhibition and self-control by initiation; and third, to test whether practicing one form of self-control or the other yields improvements in other behaviors tapping the particular form of self-control, or across both types of self-control. Previous research (e.g., Muraven, 2010a; Oaten & Cheng, 2006b) has demonstrated that practicing small acts of self-control on a daily basis serves to strengthen people's capacity for self-control over time and on subsequent, often unrelated self-control behavioral outcomes. However, prior work has conceptualized self-control primarily as the inhibition of temptations, urges, and impulses (e.g., Hagger et al., 2010). Given our preliminary findings in support of a distinction between self-control by inhibition and self-control by initiation (Davisson & Hoyle, 2013; Davisson, Hoyle, & Gajewski, 2012), I hypothesized that practicing one form of self-control, either inhibition or initiation, should lead to increased self-control of that form, but not necessarily the other, as measured by behavioral outcomes tapping initiation and inhibition, respectively.

Both studies provided evidence that fluctuations in self-control by inhibition and self-control by initiation can be captured using idiographic self-control exertion scores. Participants were able to rate a set of behaviors on the degree to which they required self-control by inhibition and self-control by initiation. Patterns of correlations among these ratings were generally stable across both studies, indicating that participants can reliably distinguish between the forms of self-control for the same behaviors. There was a considerable degree of variance present across

ratings in both studies, indicating that people did differ substantially in the degree to which they considered behaviors to require self-control by inhibition and initiation. In addition, Study 1 provided evidence that the idiographic exertion scores created using these ratings of behavior predicted the degree to which participants reported studying over a 14-day period.

Study 1 provided additional evidence for a distinction between self-control by inhibition and self-control by initiation. In Study 1, trait inhibition and trait initiation, as measured by the TFSCS (Hoyle & Davison, 2012) were moderately positively correlated. Additionally, the initiation and inhibition subscales were differentially correlated with measures of conscientiousness and impulsivity, demonstrating further support for a distinction. As mentioned previously, correlations between ratings of behaviors on inhibition and initiation ranged from negative to positive, indicating that participants could reliably distinguish between the forms of self-control for different behaviors. These findings were replicated in Study 2—at the trait level, inhibition and initiation were moderately positively correlated with each other and differentially correlated with measures of conscientiousness and impulsivity. Similarly, correlations of ratings of inhibition and initiation for a larger set of behaviors again ranged from moderately negative to moderately positive in Study 2. Finally, expanding on the evidence for a distinction between self-control by inhibition and initiation presented in Study 1 and its replication, Study 2 demonstrated that inhibition and initiation at the trait level were differentially associated with (and differentially predicted) grade point average.

Evidence for a practice effect specific to inhibition or initiation was mixed. Specifically, I hypothesized that practicing initiation for a two-week period would lead to improvements in both initiation- and inhibition-relevant self-control behaviors, because initiation should require one to both inhibit a prepotent response and initiate a desired behavior (e.g., eat extra servings of vegetables). However, I expected that practicing inhibition should not necessarily require one to

also engage in initiation—one can avoid a vending machine treat, for example, without initiating a healthy behavior in its place. Study 1 provided preliminary evidence for a possible practice effect by demonstrating that participants who exerted more self-control by initiation on a given day also reported in engaging in more studying, a self-control behavior in a different domain that requires one to exert initiation. However, the evidence from the experimental practice manipulation in support of this hypothesis was mixed.

In Study 2, the overall effect of practice on self-control outcome behaviors and interaction effects with other key variables varied greatly across the dependent variables. This variability in the effects observed was not surprising given the overall weak correlations observed between dependent variables. There was a main effect of practice on reports of healthy eating, indicating that participants who practiced initiation via eating an extra serving of fruit or vegetables had more reports of healthy eating in the two weeks following the practice manipulation than participants who practiced inhibition or control participants. This effect supports the hypothesis that practicing initiation, but not inhibition, should result in increased self-control on other behaviors tapping initiation, albeit perhaps only in the domain practiced (i.e., eating). In addition, there was a short-lived effect of practice on studying, in the hypothesized direction, such that participants in the initiation practice group studied more than participants in the inhibition group and the control group two days following the completion of the practice manipulation. Similarly, there was a main effect of practice on likelihood of exercise at the 14-21 day interval, again in the hypothesized direction, whereby participants in the initiation group were more likely to exercise than participants in the inhibition and control groups.

However, of particular interest given the college-aged sample, the findings regarding likelihood of alcohol consumption in Study 2 varied somewhat distinctly from the findings for the other dependent variables. For alcohol consumption, the effect of practice on quantity consumed

was opposite from the effect predicted—participants in both practice groups drank more alcohol than participants in the control condition. There are several plausible reasons for why the effect of practice on alcohol consumption was contrary to the hypothesized effect of practice improving self-control. For example, prior research has suggested that abstinence messages may actually lead to increased alcohol consumption among college students (Engs & Hanson, 1989); therefore, it is possible that practicing inhibition via resisting junk food may have promoted a more general abstinence-from-temptations message that, ironically, resulted in an increased likelihood of alcohol consumption. In addition, the possibility remains that practicing self-control may have inadvertently created a depletion effect (Muraven et al., 1998) that was reflected in the outcome of alcohol consumption, whereby participants who practiced self-control may have had fewer resources available for future self-control pursuits. Indeed, previous research has demonstrated that exerting self-control may limit the self-control resources people have available to exert in the realm of drinking behavior (e.g., Muraven, Collins, Shiffman, & Paty, 2005). Although such depletion effects as a result of practice were not observed for other dependent variables in the current studies, there exists the possibility that this effect may be stronger for drinking behavior than the other behaviors examined in the current work. Additionally, other factors such as stable differences in the temptation to drink (e.g., Muraven & Shmueli, 2006) that were not measured in Study 2 could possibly account for the differential results observed for alcohol consumption.

In addition, a consistent, significant interaction emerged between practice and trait self-control. Participants who practiced inhibition and were high in trait self-control by inhibition demonstrated a decreased likelihood of alcohol consumption, confirming one of the plausible hypotheses that practice may be particularly effective for participants who are already high in that form of self-control at the trait level. This interaction between practice and trait inhibition does not rule out the possibility of a reactance effect for alcohol consumption, as outlined above;

indeed, prior research has indicated that people vary in the degree to which they demonstrate reactance, particularly in response to messages of abstinence (Bensley & Wu, 1991). However, the findings for participants who were high in trait initiation were quite unexpected: when participants who were higher in trait initiation practiced self-control by inhibition, they actually experienced an increased likelihood of alcohol consumption. Although this increased likelihood of alcohol consumption could again point to a possible psychological reactance effect, other plausible explanations may address the specific pattern with high trait self-control by initiation more effectively. Specifically, this finding raises the possibility of a “work hard, play hard” effect by which people who are high in initiation at the trait level may be particularly vulnerable to the potentially depleting effects of exerting inhibition, whether via practice or otherwise. Although the “work hard, play hard” effect is often discussed colloquially and appears to be perceived as a legitimate expression of behavior among young adults, particularly college students (e.g., Mitchell, 2011; Parker & Williams, 2003), research regarding its psychological antecedents and associated health and achievement outcomes associated is lacking. The absence of empirical evidence regarding the outcomes associated with the “work hard, play hard” effect hinders further speculation about how this effect may operate with respect to different behaviors relevant for self-control, especially those beyond alcohol and other substance use.

In addition, this unexpected finding raises the question of whether trait self-control may influence the degree to which people find particular behaviors both inhibiting and, yet, replenishing when they fail to exercise the self-control needed to inhibit the behavior. Our previous work (e.g., Davisson & Hoyle, 2013) suggests that there exist differences in the degree to which people find particular behaviors simultaneously replenishing and requiring inhibition. However, it remains to be seen whether differences in correlations between ratings of

replenishment and inhibition vary systematically as a function of individual difference variables, including trait self-control.

Using exercise as an outcome that should tap self-control by initiation, I observed several significant interactions between practice and exertion of self-control—albeit some in directions that were unexpected or opposite of those hypothesized. The effect of practice varied as a function of exertion of self-control, but the effectiveness of practice form depended on which type of demands on self-control participants experienced. When demands on self-control by inhibition were greater than usual, practicing inhibition led to an increased likelihood of exercising. This finding suggests that the effect of practicing inhibition may be greatest when people experience more daily demands on self-control via inhibition. The effect for initiation was similar: practicing initiation resulted in a heightened likelihood of exercise when people experienced greater-than-average demands on self-control by initiation. Although this finding did not align with the hypothesized effect, that practicing initiation would yield increased exercise when both types of self-control demands were high, the varying nature of this effect suggests that the effectiveness of practice with self-control may change depending on the form and level of self-control demands one happens to encounter on a day-to-day basis.

In addition, several other findings from Study 2 replicated results from Study 1 and supported the hypotheses more generally. Using studying as a dependent variable, Study 2 replicated the finding that participants reported studying more on days when they experienced greater-than-average demands on self-control by initiation. In addition, participants consumed less alcohol on days when they experienced more-than-usual demands on self-control by initiation. This finding replicates the finding from Study 1, whereby participants studied more on days when they experienced greater-than-average demands on initiation, but also extends the

finding by replicating the pattern for an outcome variable that primarily taps self-control by inhibition and not initiation.

Overall, the pair of studies described here contributes to the broader self-control literature in several ways. The current studies make use of a novel way of measuring self-control exertion using idiographic exertion scores. By conceptualizing self-control as an idiosyncratic process, within which people vary substantially in the degree to which particular behaviors tax their self-control, these studies account for variability in self-control behaviors that would otherwise be treated as error variance. Put differently, use of idiographic self-control exertion scores enables one to address the possibility that, for some people, eating the radishes or resisting the freshly-baked chocolate chip cookies (e.g., Muraven et al., 1998) does not require as much self-control as it does for others.

In addition, the pair of studies described here uncovers a pattern demonstrating that, when people experienced increased demands on self-control via initiation, they actually evidenced more adaptive self-control outcomes across alcohol use, exercise, studying, and eating behaviors. These findings stand in direct contrast to the depletion effect that has been well-documented throughout replications of the limited resource model (Baumeister et al., 2007), including other experience sampling studies that have demonstrated that increased self-control demands lead to poorer self-control outcomes (e.g., Muraven et al., 2005). Finally, the current work—through both the pattern just described and via other results demonstrating differential findings across inhibition and initiation—provides further evidence for a conceptual distinction between self-control by inhibition and self-control by initiation.

Limitations

The results of Study 2 were mixed, replicating some effects from Study 1, and demonstrating support for some hypotheses but not others. Previous research (e.g., Muraven,

2010b; Oaten & Cheng, 2007) has demonstrated a consistent and robust effect of practicing self-control on subsequent self-control behavioral outcomes, necessitating consideration of why a robust effect of practice was not observed in Study 2 across the set of behaviors assumed to require self-control. Moreover, the hypothesis that practicing initiation should improve initiation and inhibition, but that practicing inhibition should only serve to improve inhibition, was not entirely supported, prompting the question of why this would be the case, given support otherwise for the hypothesized similarities and differences between self-control by inhibition and initiation.

One limitation related to the practice manipulation was that participants in both of the practice groups received one reminder of the practice manipulation each day ($n = 14$ total manipulations), in the morning. Participants were instructed to read and respond to this reminder after awakening, but received no further reminders of the practice manipulation. The majority of participants (95%) responded to 13 out of 14 of these manipulation reminders, with over 90% responding to the maximum 14 reminders. Although the number of practice manipulations participants responded to did not have a significant effect on any of the behavioral outcomes assessing self-control, it is plausible that there were not enough practice manipulations, even at the maximum, to have a strong effect on these behaviors. Furthermore, it is possible that the tasks chosen as practice manipulations (i.e., resisting one treat per day, eating one extra fruit or vegetable serving per day) may not have been strong enough manipulations of the act of inhibition or initiation. Prior research incorporating manipulations of self-control practice (e.g., Muraven, 2010b; Muraven et al., 1999) has often made use of practice manipulations that ask participants to exert self-control via practice multiple times daily. Study 2 asked participants to exert self-control via one act of inhibition or initiation each day; therefore, it is possible that increasing the number of self-control acts the manipulation prompts may result in a stronger effect of practice on subsequent self-control behaviors.

Experience sampling studies often face limitations due to participant dropout and participant fatigue, due in part to the participant demand associated with studies asking participants to respond to several signals per day (Reis & Gable, 2001). However, in the current research, participant dropout was low ($n = 1$ in Study 1, $n = 3$ in Study 2) and thus did not likely contribute to any absent or unexpected findings. In addition, compliance across both Study 1 and Study 2 was quite high, albeit slightly lower in the longer Study 2. Thus, it is unlikely that compliance (or lack thereof) played a role in or could explain the findings discussed earlier. Although participant fatigue appears not to have been a factor in the compliance rates observed in either of the studies, there were other factors that may have contributed to compliance rates that could be improved for future studies. For example, several participants who opted for e-mail alerts reported that, on occasion, alerts were delivered randomly to their spam folders, despite experiencing no problems with delivery during the intake session practice or during the beginning of the study. Asking participants at the intake session to add the e-mail address to their contact list would reduce similar (albeit rare) issues in future studies. In addition, although the majority of participants in both studies completed the signals using a smartphone, there were several students who did not have access to such a device, making participant burden for these participants higher and, possibly, compliance lower than could be otherwise expected given the overall rates. Future studies may consider restricting participation to those who own smartphones, particularly considering recent industry reports (e.g., Nielsen, 2013) that approximately two-thirds of college students report owning such a device.

In addition, one key limitation of the study that influences interpretations of the results concerns the days on which participants began the practice manipulation and experience sampling portions of the study. Because people began the study on different days of the week (all days except Sunday), day-of-the-week analyses are rendered difficult and hinder interpretation of

results, particularly over the shorter interval (i.e., Days 14-16), which did not include both weekdays and weekend days for all participants in the sample. Given that college students are more likely to drink excessively (or at all) on Thursdays, Fridays, and Saturdays (e.g., DelBoca et al., 2004; Wood, Sher, & Rutledge, 2007), the difficulty of carrying out these day-of-week analyses given the implementation of the current studies may have contributed to the unexpected findings regarding alcohol consumption. Similar limitations are likely for other dependent variables examined in the study, particularly exercise and eating behaviors.

Future Research

The absence of consistent and robust observed effects of practice across the set of dependent variables makes clear the possibility that the practice manipulation may not have been strong enough. Indeed, results from the studying dependent variable indicated a small effect of practice on the last day of practice and the two days immediately following the manipulation, but no longer-term effects, suggesting that any effect of practice was short-lived. However, the collection of effects involving practice across the set of dependent variables does suggest that strengthening the practice manipulation may be a potential avenue for further research. In particular, the strongest practice effects were observed for outcomes that were directly related to the domain of the practice manipulation—eating. Indeed, previous research (e.g., Gailliot et al., 2007; Muraven, 2010a) has made use of practice manipulations that could be judged as being stronger than those used in Study 2. For example, Muraven (2010a) manipulated self-control practice (ostensibly by inhibition) by asking participants to avoid all sweets daily for a two-week period. This manipulation of self-control practice by inhibition is objectively stronger than asking participants to avoid one treat daily for two weeks. However, concerns about manipulation strength should be carefully balanced with concerns about excessive intrusion into participants' typical experiences during an experience sampling study. Indeed, analyses unrelated to the key

hypotheses from Study 1 revealed that participants did display some measure of reactivity when it came to reporting on eating behavior (Gottfredson, Davisson, & Hoyle, 2013). However, future research could balance these concerns by testing whether different levels of inhibition used in different practice manipulations have differential reactivity effects in addition to effects on self-control behavioral outcomes of interest.

In addition to altering the content of manipulations, as mentioned above, it is plausible that simply increasing the number of manipulations participants receive may serve to increase the impact of the practice effect on behavioral outcomes assessing self-control. Although it is clear from the manipulation checks (via participant reports of inhibition and initiation) that the majority of participants experienced the manipulation behaviorally, increasing the number of manipulations received may serve to heighten the psychological impact of the practice manipulation. Future studies incorporating a practice manipulation of inhibition or initiation could, for example, send reminder alerts at meal-times to ensure that participants experience the full psychological effect of inhibiting tempting treats or initiating healthy eating behaviors. Additionally, a stronger manipulation of inhibition via eating behaviors could ask participants to give up the treat they profess to like best (as many practicing Catholics do during the Lent season). Similarly, asking participants to eat the vegetable they dislike the most for two weeks could potentially heighten the psychological experience of initiating behavior. These slight changes to a practice manipulation of initiation or inhibition via changing typical eating behaviors would have the added benefit of reinforcing the idiosyncratic nature of self-control exertion. The effect of idiosyncratic practice could be further tested by adding a comparison group composed of participants asked to initiate or inhibit the same behavior (e.g., asking all inhibition group participants to avoid sweets, as in Muraven, 2010a).

One unexpected finding from Study 2 was that, when it came to likelihood of exercise, the effect of practice depended on the form and level of self-control demands people experienced. Practicing inhibition led to increased likelihood of exercising when daily demands on self-control by inhibition were greater than usual; conversely, practicing initiation led to an increased likelihood of exercise when daily demands on self-control by initiation were high. This finding suggests the possibility that the effect of practice may depend not on the form of the behavioral self-control outcome, but rather, on the form of demands experienced throughout the day. One possibility for future research would be to tailor the practice manipulation to participants' perceived or likely demands on self-control for particular days. For example, demands on exertion of initiation may be higher on weekdays for those attempting to attend classes, be productive in the workplace, or make it to the gym after work, so practice manipulations attempting to bolster initiation may prove more useful on weekdays. Similarly, demands on exertion of inhibition may heighten on weekends among opportunities to eat unhealthy foods, spend outside of one's budget at the mall, or drink to excess with friends at the bar. These potentially increased demands on inhibition may strengthen the effect of practice manipulations targeting inhibition. On a related note, and as mentioned in the limitations section, participants began both studies on different days of the week, limiting analyses and interpretation of day-of-the-week effects that may be particularly consequential for alcohol consumption (Wood et al., 2007). Therefore, future research could standardize the days that participants begin similar experience sampling studies to simplify interpretations of these likely day-of-the-week effects on both the independent variable of practice manipulation and on the outcomes of interest, including eating, exercise, and alcohol consumption.

One question left unanswered by the current studies is whether practicing self-control for a period of time (in the case of Study 2, two weeks) may help people who are low in self-control

at the trait level compensate for those deficits in trait self-control that are associated with negative outcomes, including in the realms of academic achievement (Tangney et al., 2004), physical health (Crescioni et al., 2011), and even romantic relationships (Vohs, Finkenauer, & Baumeister, 2011). The empirical evidence from the current studies is mixed. No consistent evidence for an effect of trait self-control, either on its own or moderated by practice, was observed for the initiation-relevant outcomes behaviors like studying, healthy eating, and exercise. However, several significant effects involving trait self-control were observed for the inhibition-relevant outcomes, including alcohol consumption and unhealthy eating. Specifically, for alcohol consumption and for resisting junk food, participants who were low in trait inhibition and trait initiation, respectively, evidenced less alcohol consumption and more resisting of junk food when they had practiced self-control. In other words, there was some evidence to suggest that participants who were low in trait self-control appeared to be bolstered by practicing self-control, though this effect was not observed consistently across all dependent variables.

However, an unexpected pattern emerged such that participants who were high in trait initiation who practiced inhibition actually evidenced more reports of alcohol use and fewer reports of resisting junk food. This pattern dovetails with findings from recent research suggesting that people with high trait self-control may avoid temptations or self-control dilemmas altogether (Hofmann et al., 2012). Although avoiding situations that may test one's self-control may be initially advantageous, the presence of these ironic effects for alcohol consumption and resisting junk food in the current work support other recent empirical evidence suggesting that one downside to high trait self-control may be a lack of experience in situations presenting self-control dilemmas (Imhoff, Schmidt, & Gerstenberg, 2013). These disparate findings warrant continued research examining the seemingly complex relationship between trait self-control, practice at self-control, and outcomes relevant for health and achievement. For example, future

research could examine whether particular types of practice manipulations, perhaps those targeting more involved initiation-relevant behaviors such as studying (e.g., Oaten & Cheng, 2006a) or exercise (e.g., Oaten & Cheng, 2006b) may be more effective for people who are already high in trait levels of initiation.

Conclusion

This set of two studies provided evidence for a distinction between self-control by inhibition and self-control by initiation, and offered qualified support for a practice effect that may vary across the form of self-control. However, Study 2 failed to confirm several of the key hypotheses, particularly those relating to the effectiveness of practicing self-control given moderators such as trait self-control and exertion of inhibition or initiation. One key possibility for the lack of effects involving practice is that the practice manipulation may not have been strong enough to produce the effects hypothesized. Given the absence of consistent effects involving practice, I suggest possibilities for stronger and more targeted practice manipulations that may allow for more robust examinations of the effectiveness of practicing inhibition and initiation on subsequent self-control behaviors, while balancing concerns about reactivity associated with the reporting of eating behaviors in the context of an experience sampling protocol.

Despite the absence of consistent practice effects and limitations mentioned, these studies do provide preliminary evidence that the practice of inhibition and initiation may have distinct effects on behavioral outcomes of each form of self-control. The studies demonstrate the value, perhaps even the necessity, of documenting momentary changes in exertion of self-control through the use of idiographic self-control exertion scores. In addition, the consistent pattern observed in both studies that, when participants experienced more demands on self-control via initiation, they engaged in behaviors reflective of good self-control, is a novel finding that

emphasizes how the effects of self-control exertion on subsequent behavior may be construed and interpreted differently depending on the operationalization of self-control used. Furthermore, this pattern suggests that exerting self-control may not always result in depletion of self-control resources and, subsequently, deleterious outcomes for personal well-being. More broadly, these studies provide further evidence for a conceptual distinction between self-control by inhibition and initiation.

Appendix A: Study 1 Intake Session Materials

Section 1: Demographics

What is your age? (Please fill in.) _____

What is your sex?

____ Male ____ Female

What is your year in school?

____ Freshman ____ Junior
____ Sophomore ____ Senior

What is your ethnicity?

____ Caucasian ____ Pacific Islander
____ African-American ____ Native American
____ Asian-American ____ Other
____ Hispanic or Latino

Section 2: Ratings of Behaviors

1. For some behaviors, some people find that they have to force themselves to engage in the behavior. For each of the behaviors listed below, please rate how much you have to force yourself to do that activity/behavior. (Scale ranged from 1, *not at all*, to 5, *a lot*.)

2. For some behaviors, some people find that they have to resist the temptation to engage in that behavior. For each of the behaviors listed below, please rate how much you have to resist the temptation to do that activity/behavior. (Scale ranged from 1, *not at all*, to 5, *a lot*.)

3. For some behaviors, some people find that the behavior is replenishing or “recharges their battery.” For each of the behaviors listed below, please rate how much each behavior replenishes or recharges you. (Scale ranged from 1, *not at all*, to 5, *a lot*.)

4. How often have you performed this activity in the past month? (Scale used: (1) *monthly or less often*, (2) *at least once a week*, (3) *just about every day*.)

5. When you perform this activity, how often is it in the same physical location? (Scale used: (1) *rarely*, (2) *sometimes*, (3) *usually*.)

1. Take a nap
2. Eat junk food
3. Spend time with friends
4. Do assigned reading for class
5. Eat healthy foods (e.g., fruits, vegetables)
6. Use the internet or text during class
7. Complete errands (e.g., grocery shopping, going to the bank)

8. Exercise
9. Personal hygiene tasks (e.g., flossing)
10. Go to class
11. Have a difficult conversation with someone
12. Go to work
13. Watch television or movies
14. Read for pleasure
15. Go shopping (online or at a physical store)
16. Play video/online games
17. Skip class
18. Study for a test or quiz
19. Call friends or family
20. Take a break for lunch or dinner
21. Surf the internet
22. Complete chores (e.g., clean room, do laundry)
23. Spend time with romantic partner
24. Pay attention in class
25. Work in a group or on a team
26. Attend a meeting
27. Go to practice

Section 3: Individual Difference Measures

A. Two-Factor Self-Control Scale (Hoyle & Davisson, 2013)

Directions: Below is a list of statements about behavioral tendencies. Please read each statement carefully and indicate how often your own behavior reflects the tendency. (Scale ranged from 1, *hardly ever*, to 5, *nearly always*.)

1. I am able to resist temptations.
2. I have no trouble getting started on difficult or time consuming projects.
3. I have trouble resisting my cravings.
4. I waste a lot of time before getting down to work.
5. It is hard for me to resist acting on my feelings, even when they lead me astray.
6. I go right to work on challenging new obligations.
7. I stop myself from doing things I know I shouldn't do.
8. I delay as long as possible before starting something I expect to be unpleasant.
9. Problematic impulses get the best of me.
10. I waste time on things that don't really matter, rather than working on things that do.
11. I can deny myself something I want but don't need.
12. I choose leisure over making progress on things I need to do.
13. My bad habits cause problems for me.
14. I just can't seem to get going, even when I have much to do.
15. I am unable to control the urge to do something I know I shouldn't.
16. Even when the list of things to do is long, it is easy for me to get started.
17. I am able to control my negative emotions.
18. I get started on new projects right away.
19. When I want something that is bad for me, I go after it anyway.

20. When I know I should do something, I try to do it right away.
21. I am able to control how I react to impulses.
22. I can make myself do what I should.
23. I think before I speak.
24. I do nothing despite having plenty to do.
25. I find it hard to deny myself something I want.
26. I am able to make myself do something I don't want to do.
27. When I am faced with a temptation, I find it hard to resist.
28. If I don't want to do something, I will put it off and do something else instead.
29. If I want to do something I know I shouldn't, I won't do it.
30. When I have to have a difficult conversation with someone, I don't put it off.

B. Urgency, Premeditation, Perseverance, Sensation Seeking (UPPS) Scale (Whiteside & Lynam, 2001).

Directions: Using the scale provided, please indicate how much each of the following statements reflects how you are typically. (The scale ranged from 1 to 5, with 1 indicating “not at all” and 5 indicating “very much.”)

1. I have a reserved and cautious attitude toward life.
2. My thinking is usually careful and purposeful.
3. I am not one of those people who blurt out things without thinking.
4. I like to stop and think things over before I do them.
5. I don't like to start a project until I know exactly how to proceed.
6. I tend to value and follow a rational, “sensible” approach to things.
7. I usually make up my mind through careful reasoning.
8. I am a cautious person.
9. Before I get into a new situation I like to find out what to expect from it.
10. I usually think carefully before doing anything.
11. Before making up my mind, I consider all the advantages and disadvantages.
12. I have trouble controlling my impulses.
13. I have trouble resisting my cravings (for food, cigarettes, etc.).
14. I often get involved in things I later wish I could get out of.
15. When I feel bad, I will often do things I later regret in order to make myself feel better now.
16. Sometimes when I feel bad, I can't seem to stop what I am doing even though it is making me feel worse.
17. When I am upset I often act without thinking.
18. When I feel rejected, I will often say things that I later regret.
19. It is hard for me to resist acting on my feelings.
20. I often make matters worse because I act without thinking when I am upset.
21. In the heat of an argument, I will often say things that I later regret.
22. I am always able to keep my feelings under control.
23. Sometimes I do things on impulse that I later regret.
24. I generally like to see things through to the end.
25. I tend to give up easily.
26. Unfinished tasks really bother me.
27. Once I get going on something I hate to stop.

28. I concentrate easily.
29. I finish what I start.
30. I'm pretty good about pacing myself so as to get things done on time.
31. I am a productive person who always gets the job done.
32. Once I start a project, I almost always finish it.
33. There are so many little jobs that need to be done that I sometimes just ignore them all.

C. Marlowe-Crowne Social Desirability Scale, Short Form C (Reynolds, 1982).

Directions: Listed below are a number of statements concerning personal attitudes and traits. Read each statement and decide whether or not it pertains to you personally. For each statement, please indicate T (true) or F (false).

1. It is sometimes hard for me to go on with my work if I am not encouraged.
2. I sometimes feel resentful when I don't get my way.
3. On a few occasions, I have given up doing something because I thought too little of my ability.
4. There have been times when I felt like rebelling against people in authority even though I knew they were right.
5. No matter who I'm talking to, I'm always a good listener.
6. There have been occasions when I took advantage of someone.
7. I'm always willing to admit it when I make a mistake.
8. I sometimes try to get even rather than forgive and forget.
9. I am always courteous, even to people who are disagreeable.
10. I have never been irked when people expressed ideas very different from my own.
11. There have been times when I was quite jealous of the good fortune of others.
12. I am sometimes irritated by people who ask favors of me.
13. I have never deliberately said something that hurt someone's feelings.

D. NEO-PI-R Conscientiousness Scale (Costa & McCrae, 1992); Self-Discipline, Deliberation, Order, Achievement-Striving, and Dutifulness Facets.

Directions: Please use the following scale to indicate how accurately each statement describes how you generally are relative to other people you know who are the same sex and roughly the same age as you are. (The scale ranged from 1, *strongly disagree*, to 5, *strongly agree*.)

1. I'm pretty good about pacing myself so as to get things done on time.
2. Over the years I've done some pretty stupid things.
3. I waste a lot of time before settling down to work.
4. I think things through before coming to a decision.
5. I am a productive person who always gets the job done.
6. Occasionally I act first and think later.
7. I have trouble making myself do what I should.
8. I always consider the consequences before I take action.
9. Once I start a project, I almost always finish it.
10. I often do things in the spur of the moment.
11. When a project gets too difficult, I'm inclined to start a new one.
12. I rarely make hasty decisions.

13. There are so many little jobs that need to be done that I sometimes just ignore them all.
14. I plan ahead carefully when I go on a trip.
15. I have a lot of self-discipline.
16. I think twice before I answer a question.
17. I would rather keep my options open than plan everything in advance.
18. I try to perform all the tasks assigned to me conscientiously.
19. I am easy-going and lackadaisical.
20. I keep my belongings neat and clean.
21. Sometimes I'm not as dependable or reliable as I should be.
22. I have a clear set of goals and work toward them in an orderly fashion.
23. I am not a very methodical person.
24. I pay my debts promptly and in full.
25. When I start a self-improvement plan, I usually let it slide after a few days.
26. I like to keep everything in its place so I know just where it is.
27. Sometimes I cheat when I play solitaire.
28. I work hard to accomplish my goals.
29. I never seem to be able to get organized.
30. When I make a commitment, I can always be counted on to follow through.
31. I don't feel like I'm driven to get ahead.
32. I strive to achieve all I can.
33. I tend to be somewhat fastidious or exacting.
34. I adhere strictly to my ethical principles.
35. I'm not compulsive about cleaning.
36. I try to do jobs carefully, so they won't have to be done again.
37. I strive for excellence in everything I do.
38. I spend a lot of time looking for things I've misplaced.
39. I'd really have to be sick before I'd miss a day of work.
40. I'm something of a "workaholic."

Appendix B: Study 1 Experience Sampling Materials

Section 1: AM Signal Items

1. How many hours did you sleep last night?
2. What time did you wake up today?
3. How difficult was it for you to wake up today?
 - 1 = Very difficult
 - 2 = Difficult
 - 3 = Neutral
 - 4 = Easy
 - 5 = Very easy
4. Are you currently on a diet of any kind? (yes/no)
If yes, please list its name:
5. How many classes do you have scheduled today?
6. Please list any major assignments you have to complete today (e.g., tests, papers, presentations).

Section 2: Target Signal Items

1. Where are you completing this survey?
 - My own apartment/dorm room
 - Someone else's apartment/dorm room
 - Classroom
 - Library
 - Gym
 - Dining hall/restaurant
 - On the bus
 - At work
 - Walking between locations
 - Other location (please fill in: _____)
2. Since the last time you were signaled, please check the boxes to indicate which of the following behaviors you did:
 - Took a nap
 - Ate junk food
 - Spent time with friends
 - Did assigned reading for class
 - Ate healthy foods (e.g., fruits, vegetables)
 - Used the internet or texted during class

Completed errands (e.g., grocery shopping, going to the bank)
Exercised
Completed personal hygiene tasks (e.g., flossing, showering)
Went to class
Had a difficult conversation with someone
Went to work
Watched television or movies
Read for pleasure
Went shopping
Played video/online games
Skipped class
Studied for a test or quiz
Called friends or family
Took a break for lunch or dinner
Used the internet
Completed chores (e.g., clean room, do laundry)
Spent time with romantic partner
Paid attention in class
Worked in a group or on a team
Attended a meeting
Went to practice

3. Right now, how much willpower do you have to resist temptations? (Scale ranged from 1, *none at all*, to 5, *a great deal*.)

4. Right now, how much willpower do you have to get things done? (Scale ranged from 1, *none at all*, to 5, *a great deal*.)

Section 3: PM Signal Items

1. Did you exercise today? (*yes/no*)
 - 1b. How many minutes did you spend exercising today?
2. Did you read for pleasure today? (*yes/no*)
3. Did you go shopping today (either at a physical store or online)? (*yes/no*)
 - 3b. Approximately how much money did you spend?
4. Did you smoke any cigarettes today? (*yes/no*)
 - 4b. Approximately how many cigarettes did you smoke today?
5. Did you watch a movie today? (*yes/no*)
6. Did you watch any television today, either online (Hulu, Netflix, YouTube, etc.) or on cable (including sports)? (*yes/no*)
 - 6b. About how many hours did you spend watching television today?
7. Did you do laundry today? (*yes/no*)
8. Did you drink any alcohol today? (*yes/no*)
 - 8b. How many drinks did you have today?
9. Did you pray or meditate today? (*yes/no*)
10. Did you go out with friends today? (*yes/no*)
11. Did you go out with a romantic partner today? (*yes/no*)
12. Did you play any video or online games today? (*yes/no*)

- 12b. How much time did you spend playing video/online games today?
13. Did you cook a meal or bake today? (*yes/no*)
14. Did you talk on the phone with friends or family today? (*yes/no*)
15. Did you use any drugs recreationally today? (*yes/no*)
- 15b. Which drugs did you use today? (Check all that apply.)
- Marijuana
 - Cocaine
 - Adderall/Ritalin (off-label)
 - Narcotic painkillers (e.g., Oxycontin, Percocet, Vicodin) (off-label)
 - Ecstasy/MDMA
 - Methamphetamines
 - Heroin
 - Hallucinogens
 - LSD/acid
 - Amphetamines (e.g., speed, other stimulants)
 - Tranquilizers (e.g., Valium, Xanax) (off-label)
 - Sedatives
16. Did you attend a cultural event today (e.g., concert, art exhibit, lecture, etc)? (*yes/no*)
17. How many classes did you attend today?
18. Approximately how much time did you spend studying or doing schoolwork today?
19. Right now, how much willpower do you have to resist temptations? (Scale ranged from 1, *none at all*, to 5, *a great deal*.)
20. Right now, how much willpower do you have to get things done? (Scale ranged from 1, *none at all*, to 5, *a great deal*.)
21. What was the most difficult thing you had to resist today?
22. What was the most difficult thing you had to force yourself to do today?
23. Did anything out of the ordinary occur today? (*yes/no*) If yes, please fill in a brief answer.

Appendix C: Study 2 Intake Session Materials

Section 1: Demographics

What is your age? (Please fill in.) _____

What is your sex?

____ Male ____ Female

What is your year in school?

____ Freshman ____ Junior
____ Sophomore ____ Senior

What is your major? (Please fill in.) _____

What is your GPA? (Please fill in.) _____

What is your ethnicity?

____ Caucasian ____ Pacific Islander
____ African-American ____ Native American
____ Asian-American ____ Other
____ Hispanic or Latino

Section 2: Ratings of Behaviors

1. For some behaviors, some people find that they have to force themselves to engage in the behavior. For each of the behaviors listed below, please rate how much you have to force yourself to do that activity/behavior. (Scale ranged from 1, *not at all*, to 5, *a lot*.)

2. For some behaviors, some people find that they have to resist the temptation to engage in that behavior. For each of the behaviors listed below, please rate how much you have to resist the temptation to do that activity/behavior. (Scale ranged from 1, *not at all*, to 5, *a lot*.)

3. For some behaviors, some people find that the behavior is replenishing or “recharges their battery.” For each of the behaviors listed below, please rate how much each behavior replenishes or recharges you. (Scale ranged from 1, *not at all*, to 5, *a lot*.)

4. How often have you performed this activity in the past month? (Scale used: (1) *monthly or less often*, (2) *at least once a week*, (3) *just about every day*.)

5. When you perform this activity, how often is it in the same physical location? (Scale used: (1) *rarely*, (2) *sometimes*, (3) *usually*.)

1. Take a nap
2. Eat junk food
3. Spend time with friends
4. Do assigned reading for class

5. Eat healthy foods (e.g., fruits, vegetables)
6. Use the internet or text during class
7. Complete errands (e.g., grocery shopping, going to the bank)
8. Exercise
9. Personal hygiene tasks (e.g., flossing, showering)
10. Go to class
11. Have a difficult conversation with someone
12. Go to work
13. Watch television or movies
14. Read for pleasure
15. Go shopping
16. Play video/online games
17. Skip class
18. Study for a test or quiz
19. Call friends or family
20. Take a break for lunch or dinner
21. Surf the internet
22. Complete chores (e.g., clean room, do laundry)
23. Spend time with romantic partner
24. Pay attention in class
25. Work in a group or on a team
26. Attend a meeting
27. Participate in an extracurricular activity
28. Resist junk food
29. Use social media (e.g., Facebook, Twitter, Instagram)
30. Procrastinate
31. Plan tasks (e.g., plan out schoolwork, use a planner)
32. Spend time with friends or romantic partner instead of studying
33. Drink caffeinated beverages (e.g., coffee, tea, soda, Red Bull, Five-Hour Energy, etc.)

Section 3: Individual Difference Measures

A. Two-Factor Self-Control Scale (Hoyle & Davisson, 2013)

Directions: Below is a list of statements about behavioral tendencies. Please read each statement carefully and indicate how often your own behavior reflects the tendency. (Scale ranged from 1, *hardly ever*, to 5, *nearly always*.)

1. I am able to resist temptations.
2. I have no trouble getting started on difficult or time consuming projects.
3. I have trouble resisting my cravings.
4. I waste a lot of time before getting down to work.
5. It is hard for me to resist acting on my feelings, even when they lead me astray.
6. I go right to work on challenging new obligations.
7. I stop myself from doing things I know I shouldn't do.
8. I delay as long as possible before starting something I expect to be unpleasant.
9. Problematic impulses get the best of me.
10. I waste time on things that don't really matter, rather than working on things that do.

11. I can deny myself something I want but don't need.
12. I choose leisure over making progress on things I need to do.
13. My bad habits cause problems for me.
14. I just can't seem to get going, even when I have much to do.
15. I am unable to control the urge to do something I know I shouldn't.
16. Even when the list of things to do is long, it is easy for me to get started.
17. I am able to control my negative emotions.
18. I get started on new projects right away.
19. When I want something that is bad for me, I go after it anyway.
20. When I know I should do something, I try to do it right away.
21. I am able to control how I react to impulses.
22. I can make myself do what I should.
23. I think before I speak.
24. I do nothing despite having plenty to do.
25. I find it hard to deny myself something I want.
26. I am able to make myself do something I don't want to do.
27. When I am faced with a temptation, I find it hard to resist.
28. If I don't want to do something, I will put it off and do something else instead.
29. If I want to do something I know I shouldn't, I won't do it.
30. When I have to have a difficult conversation with someone, I don't put it off.

B. Urgency, Premeditation, Perseverance, Sensation Seeking (UPPS) Scale (Whiteside & Lynam, 2001).

Directions: Using the scale provided, please indicate how much each of the following statements reflects how you are typically. (The scale ranged from 1 to 5, with 1 indicating “not at all” and 5 indicating “very much.”)

1. I have a reserved and cautious attitude toward life.
2. My thinking is usually careful and purposeful.
3. I am not one of those people who blurt out things without thinking.
4. I like to stop and think things over before I do them.
5. I don't like to start a project until I know exactly how to proceed.
6. I tend to value and follow a rational, “sensible” approach to things.
7. I usually make up my mind through careful reasoning.
8. I am a cautious person.
9. Before I get into a new situation I like to find out what to expect from it.
10. I usually think carefully before doing anything.
11. Before making up my mind, I consider all the advantages and disadvantages.
12. I have trouble controlling my impulses.
13. I have trouble resisting my cravings (for food, cigarettes, etc.).
14. I often get involved in things I later wish I could get out of.
15. When I feel bad, I will often do things I later regret in order to make myself feel better now.
16. Sometimes when I feel bad, I can't seem to stop what I am doing even though it is making me feel worse.
17. When I am upset I often act without thinking.
18. When I feel rejected, I will often say things that I later regret.

19. It is hard for me to resist acting on my feelings.
20. I often make matters worse because I act without thinking when I am upset.
21. In the heat of an argument, I will often say things that I later regret.
22. I am always able to keep my feelings under control.
23. Sometimes I do things on impulse that I later regret.
24. I generally like to see things through to the end.
25. I tend to give up easily.
26. Unfinished tasks really bother me.
27. Once I get going on something I hate to stop.
28. I concentrate easily.
29. I finish what I start.
30. I'm pretty good about pacing myself so as to get things done on time.
31. I am a productive person who always gets the job done.
32. Once I start a project, I almost always finish it.
33. There are so many little jobs that need to be done that I sometimes just ignore them all.

C. Marlowe-Crowne Social Desirability Scale, Short Form C (Reynolds, 1982).

Directions: Listed below are a number of statements concerning personal attitudes and traits. Read each statement and decide whether or not it pertains to you personally. For each statement, please indicate T (true) or F (false).

1. It is sometimes hard for me to go on with my work if I am not encouraged.
2. I sometimes feel resentful when I don't get my way.
3. On a few occasions, I have given up doing something because I thought too little of my ability.
4. There have been times when I felt like rebelling against people in authority even though I knew they were right.
5. No matter who I'm talking to, I'm always a good listener.
6. There have been occasions when I took advantage of someone.
7. I'm always willing to admit it when I make a mistake.
8. I sometimes try to get even rather than forgive and forget.
9. I am always courteous, even to people who are disagreeable.
10. I have never been irked when people expressed ideas very different from my own.
11. There have been times when I was quite jealous of the good fortune of others.
12. I am sometimes irritated by people who ask favors of me.
13. I have never deliberately said something that hurt someone's feelings.

D. NEO-PI-R Conscientiousness Scale (Costa & McCrae, 1992); Self-Discipline, Deliberation, Order, Achievement-Striving, and Dutifulness Facets.

Directions: Please use the following scale to indicate how accurately each statement describes how you generally are relative to other people you know who are the same sex and roughly the same age as you are. (The scale ranged from 1, *strongly disagree*, to 5, *strongly agree*.)

1. I'm pretty good about pacing myself so as to get things done on time.
2. Over the years I've done some pretty stupid things.
3. I waste a lot of time before settling down to work.

4. I think things through before coming to a decision.
5. I am a productive person who always gets the job done.
6. Occasionally I act first and think later.
7. I have trouble making myself do what I should.
8. I always consider the consequences before I take action.
9. Once I start a project, I almost always finish it.
10. I often do things in the spur of the moment.
11. When a project gets too difficult, I'm inclined to start a new one.
12. I rarely make hasty decisions.
13. There are so many little jobs that need to be done that I sometimes just ignore them all.
14. I plan ahead carefully when I go on a trip.
15. I have a lot of self-discipline.
16. I think twice before I answer a question.
17. I would rather keep my options open than plan everything in advance.
18. I try to perform all the tasks assigned to me conscientiously.
19. I am easy-going and lackadaisical.
20. I keep my belongings neat and clean.
21. Sometimes I'm not as dependable or reliable as I should be.
22. I have a clear set of goals and work toward them in an orderly fashion.
23. I am not a very methodical person.
24. I pay my debts promptly and in full.
25. When I start a self-improvement plan, I usually let it slide after a few days.
26. I like to keep everything in its place so I know just where it is.
27. Sometimes I cheat when I play solitaire.
28. I work hard to accomplish my goals.
29. I never seem to be able to get organized.
30. When I make a commitment, I can always be counted on to follow through.
31. I don't feel like I'm driven to get ahead.
32. I strive to achieve all I can.
33. I tend to be somewhat fastidious or exacting.
34. I adhere strictly to my ethical principles.
35. I'm not compulsive about cleaning.
36. I try to do jobs carefully, so they won't have to be done again.
37. I strive for excellence in everything I do.
38. I spend a lot of time looking for things I've misplaced.
39. I'd really have to be sick before I'd miss a day of work.
40. I'm something of a "workaholic."

Appendix D: Study 2 Practice Manipulation Materials

Section 1: AM Signal Items

A. Control group

1. Today, we would like you to solve the following math problem. Please write your answer in the space provided. (*Participants were then given a randomly assigned 2-digit by 2-digit multiplication problem that changed daily.*)

B. Inhibition group

1. Today, we would like you to eat the way you usually do, except that we would like you to take one opportunity to resist a "treat" that you would like to have or ordinarily indulge in. For example, you could resist a snack or soda from a vending machine, turn down a baked good when offered, or decide not to eat pizza when it is ordered. It doesn't matter how you decide to do it, but please resist one treat today.

2. What is your daily assignment today? (Please fill in.) (***Manipulation check 1***)

C. Initiation group

1. Today, we would like you to eat the way you usually do, except that we would like you to add one more fruit or vegetable serving than you were planning on or ordinarily have. For example, you may decide to add a piece of fruit to your typical breakfast, or avoid your typical side and order a side salad at lunch or dinner. It doesn't matter how you decide to do it, but please eat one additional fruit or vegetable serving today.

2. What is your daily assignment today? (Please fill in.) (***Manipulation check 1***)

Section 2: PM Signal Items on Days except 1, 8, and 14

A. Inhibition and Initiation Groups

1. What was your daily assignment today that you received this morning? (Please fill in.) (***Manipulation check 2***)

2. How difficult was it for you to modify your eating behavior today? (Response scale: 1, *very difficult*, to 5, *very easy*)

3. How much effort did you use to modify your eating behavior today? (Response scale: 1, *no effort at all*, to 5, *a great deal of effort*)

4. How successful were you at modifying your eating behavior today? (Response scale: 1, *not at all successful*, to 5, *very successful*)

5. **Inhibition group:** What treat did you resist today? (Please fill in.) (**Manipulation check 3**) **Initiation group:** What extra fruit or vegetable serving did you have today? (Please fill in.) (**Manipulation check 3**)

B. Control Group

1. Today, we would like you to solve the following math problem. Please write your answer in the space provided. (*Participants were then given a randomly assigned 2-digit by 2-digit multiplication problem that changed daily.*)
2. How difficult was it for you to complete the math problems today? (Response scale: 1, *very difficult*, to 5, *very easy*)
3. How much effort did you use to complete the math problems today? (Response scale: 1, *no effort at all*, to 5, *a great deal of effort*)

Section 3: PM Signal Items on Days 1, 8, and 14

A. Inhibition/Initiation groups only:

1. What was your daily assignment today that you received this morning? (Please fill in.) (**Manipulation check 2**)
2. How difficult was it for you to modify your eating behavior today? (Response scale: 1, *very difficult*, to 5, *very easy*)
3. How much effort did you use to modify your eating behavior today? (Response scale: 1, *no effort at all*, to 5, *a great deal of effort*)
4. How successful were you at modifying your eating behavior today? (Response scale: 1, *not at all successful*, to 5, *very successful*)
5. **Inhibition group:** What treat did you resist today? (Please fill in.) (**Manipulation check 3**) **Initiation group:** What extra fruit or vegetable serving did you have today? (Please fill in.) (**Manipulation check 3**)

B. Control group only:

1. Today, we would like you to solve the following math problem. Please write your answer in the space provided. (*Participants were then given a randomly assigned 2-digit by 2-digit multiplication problem that changed daily.*)
2. How difficult was it for you to complete the math problems today? (Response scale: 1, *very difficult*, to 5, *very easy*)
3. How much effort did you use to complete the math problems today? (Response scale: 1, *no effort at all*, to 5, *a great deal of effort*)

C. All Groups:

1. Did you exercise today? (*yes/no*)
 - 1b. How many minutes did you spend exercising today?
2. Did you read for pleasure today? (*yes/no*)
3. Did you go shopping today (either at a physical store or online)? (*yes/no*)
 - 3b. Approximately how much money did you spend?
4. Did you smoke any cigarettes today? (*yes/no*)
 - 4b. Approximately how many cigarettes did you smoke today?
5. Did you watch a movie today? (*yes/no*)
6. Did you watch any television today, either online (Hulu, Netflix, YouTube, etc.) or on cable (including sports)? (*yes/no*)
 - 6b. About how many hours did you spend watching television today?
7. Did you do laundry today? (*yes/no*)
8. Did you drink any alcohol today? (*yes/no*)
 - 8b. How many drinks did you have today?
9. Did you pray or meditate today? (*yes/no*)
10. Did you go out with friends today? (*yes/no*)
11. Did you go out with a romantic partner today? (*yes/no*)
12. Did you play any video or online games today? (*yes/no*)
 - 12b. How much time did you spend playing video/online games today?
13. Did you cook a meal or bake today? (*yes/no*)
14. Did you talk on the phone with friends or family today? (*yes/no*)
15. Did you use any drugs recreationally today? (*yes/no*)
 - 15b. Which drugs did you use today? (Check all that apply.)
 - Marijuana
 - Cocaine
 - Adderall/Ritalin (off-label)
 - Narcotic painkillers (e.g., Oxycontin, Percocet, Vicodin) (off-label)
 - Ecstasy/MDMA
 - Methamphetamines
 - Heroin
 - Hallucinogens
 - LSD/acid
 - Amphetamines (e.g., speed, other stimulants)
 - Tranquilizers (e.g., Valium, Xanax) (off-label)
 - Sedatives
16. Did you attend a cultural event today (e.g., concert, art exhibit, lecture, etc)? (*yes/no*)
17. How many classes did you attend today?
18. Approximately how much time did you spend studying or doing schoolwork today?
19. Right now, how much willpower do you have to resist temptations? (Scale ranged from 1, *none at all*, to 5, *a great deal*.)
20. Right now, how much willpower do you have to get things done? (Scale ranged from 1, *none at all*, to 5, *a great deal*.)
21. What was the most difficult thing you had to resist today?
22. What was the most difficult thing you had to force yourself to do today?
23. Did anything out of the ordinary occur today? (*yes/no*) If yes, please fill in a brief answer.

Appendix E: Study 2 Experience Sampling Items

Section 1: AM Signal Items

1. How many hours did you sleep last night?
2. What time did you wake up today?
3. How difficult was it for you to wake up today?
 - 1 = Very difficult
 - 2 = Difficult
 - 3 = Neutral
 - 4 = Easy
 - 5 = Very easy
4. Are you currently on a diet of any kind? (yes/no)
If yes, please list its name:
5. How many classes do you have scheduled today?
6. Please list any major assignments you have to complete today (e.g., tests, papers, presentations).

Section 2: Target Signal Items

1. Where are you completing this survey?
 - My own apartment/dorm room
 - Someone else's apartment/dorm room
 - Classroom
 - Library
 - Gym
 - Dining hall/restaurant
 - On the bus
 - At work
 - Walking between locations
 - Other location (please fill in: _____)
2. Since the last time you were signaled, please check the boxes to indicate which of the following behaviors you did:
 - Take a nap
 - Eat junk food
 - Spend time with friends
 - Do assigned reading for class
 - Eat healthy foods (e.g., fruits, vegetables)
 - Use the internet or text during class

Complete errands (e.g., grocery shopping, going to the bank)
 Exercise
 Personal hygiene tasks (e.g., flossing, showering)
 Go to class
 Have a difficult conversation with someone
 Go to work
 Watch television or movies
 Read for pleasure
 Go shopping
 Play video/online games
 Skip class
 Study for a test or quiz
 Call friends or family
 Take a break for lunch or dinner
 Surf the internet
 Complete chores (e.g., clean room, do laundry)
 Spend time with romantic partner
 Pay attention in class
 Work in a group or on a team
 Attend a meeting
 Participate in an extracurricular activity
 Resist junk food
 Use social media (e.g., Facebook, Twitter, Instagram)
 Procrastinate
 Plan tasks (e.g., plan out schoolwork, use a planner)
 Spend time with friends or romantic partner instead of studying
 Drink caffeinated beverages (e.g., coffee, tea, soda, Red Bull, Five-Hour Energy, etc.)

3. Right now, how much willpower do you have to resist temptations? (Scale ranged from 1, *none at all*, to 5, *a great deal*.)

4. Right now, how much willpower do you have to get things done? (Scale ranged from 1, *none at all*, to 5, *a great deal*.)

Section 3: Evening Signal Items

1. Did you exercise today? (*yes/no*)
 - 1b. How many minutes did you spend exercising today?
2. Did you read for pleasure today? (*yes/no*)
3. Did you go shopping today (either at a physical store or online)? (*yes/no*)
 - 3b. Approximately how much money did you spend?
4. Did you smoke any cigarettes today? (*yes/no*)
 - 4b. Approximately how many cigarettes did you smoke today?
5. Did you watch a movie today? (*yes/no*)
6. Did you watch any television today, either online (Hulu, Netflix, YouTube, etc.) or on cable (including sports)? (*yes/no*)
 - 6b. About how many hours did you spend watching television today?
7. Did you do laundry today? (*yes/no*)

8. Did you drink any alcohol today? (*yes/no*)
 - 8b. How many drinks did you have today?
9. Did you pray or meditate today? (*yes/no*)
10. Did you go out with friends today? (*yes/no*)
11. Did you go out with a romantic partner today? (*yes/no*)
12. Did you play any video or online games today? (*yes/no*)
 - 12b. How much time did you spend playing video/online games today?
13. Did you cook a meal or bake today? (*yes/no*)
14. Did you talk on the phone with friends or family today? (*yes/no*)
15. Did you use any drugs recreationally today? (*yes/no*)
 - 15b. Which drugs did you use today? (Check all that apply.)
 - Marijuana
 - Cocaine
 - Adderall/Ritalin (off-label)
 - Narcotic painkillers (e.g., Oxycontin, Percocet, Vicodin) (off-label)
 - Ecstasy/MDMA
 - Methamphetamines
 - Heroin
 - Hallucinogens
 - LSD/acid
 - Amphetamines (e.g., speed, other stimulants)
 - Tranquilizers (e.g., Valium, Xanax) (off-label)
 - Sedatives
16. Did you attend a cultural event today (e.g., concert, art exhibit, lecture, etc)? (*yes/no*)
17. How many classes did you attend today?
18. Approximately how much time did you spend studying or doing schoolwork today?
19. Right now, how much willpower do you have to resist temptations? (Scale ranged from 1, *none at all*, to 5, *a great deal*.)
20. Right now, how much willpower do you have to get things done? (Scale ranged from 1, *none at all*, to 5, *a great deal*.)
21. What was the most difficult thing you had to resist today?
22. What was the most difficult thing you had to force yourself to do today?
23. Did anything out of the ordinary occur today? (*yes/no*) If yes, please fill in a brief answer.

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Biography

Erin Kathleen Davisson was born on April 25, 1985 in Merced, California. She received her Bachelor of Arts degree in Psychology from the University of Richmond in 2007.

List of Publications

Shea, C.T., Davisson, E.K., & Fitzsimons, G.M. (in press). Riding others' coattails: Low self-control individuals value self-control in others. *Psychological Science*.

vanDellen, M.R., Campbell, W.K., Hoyle, R.H., & Bradfield, E.K. (2011). Overcompensating, resisting, and breaking: A meta-analytic examination of theoretical models of reactions to self-esteem threat. *Personality and Social Psychology Review, 15*, 51-74.

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Burnette, J.L., Davis, D.E., Green, J.D., Worthington, Jr., E.L., & Bradfield, E.K. (2009).

Insecure attachment and depressive symptoms: The mediating role of rumination, empathy, and trait forgiveness. *Personality and Individual Differences, 46*, 276-280.

List of Honors

2011-2013 National Institute on Drug Abuse, Predoctoral NRSA Fellowship

Project title: *Fluctuations in Self-Control Capacity*

2008, 2010 Vertical Integration Program, Duke University