Article

(How) Does Initial Self-Control Undermine Later Self-Control in Daily Life?

Personality and Social Psychology Bulletin
2018, Vol. 44(9) 1315–1329

DOI: 10.1177/0146167218766857
journals.sagepub.com/home/pspb
SAGE

Benjamin M. Wilkowski[1], Elizabeth Louise Ferguson[1], Laverl Z. Williamson[1], and Shaun K. Lappi[1]

Abstract

Past research suggests that self-control lapses occur more frequently following demanding experiences in daily life. However, the reason for these effects is debated. Three studies were therefore conducted to better understand self-control lapses. Exploratory analyses were conducted in Study 1 to identify possible effects. Studies 2 and 3 evaluated these effects' reliability. Two patterns were identified. First, initial desire–goal conflict predicted later increases in subjective fatigue. This was in turn related to less effective self-control attempts. Second, initial self-control attempts also led participants to enact desires more frequently. This latter effect occurred even when (and perhaps *especially when*) those later desires were not resisted. In contrast, the strength model of self-control did not receive support, as initial self-control attempts did not affect the success of subsequent self-control attempts. These studies therefore suggest initial self-control does play an important role in producing later self-control lapses—just a different role than predicted by the strength model.

Keywords

self-control, ego depletion, fatigue, daily life

Received October 20, 2017; revision accepted February 19, 2018

After a long day trying to stick to a new diet, a college student sits down to study for an exam. She knows it is important to study, but she struggles to focus. When her roommate invites her to the bar, she finally gives up on her studies and heads off to get drunk.

Such self-control lapses are a familiar occurrence for many people. Consistent with many people's intuitions, past studies of daily life show that such lapses appear more likely to occur following demanding circumstances possibly involving self-control. For example, they are more likely to occur late in the day (Kouchaki & Smith, 2014), following demanding workloads (e.g., Job, Walton, Bernecker, & Dweck, 2015), and food deprivation (Danziger, Levav, & Avnaim-Pesso, 2011). Moreover, these lapses have important consequences—undermining ethical decision making (Kouchaki & Smith, 2014), academic achievement, healthy eating, responsible spending (Job, Walton, Bernecker, & Dweck, 2015), and even judges' parole decisions (Danziger et al., 2011).

Yet precisely why do such lapses occur? Although these effects have been clearly documented, there continue to be debates about their proper theoretical interpretation (see Gunia, Barnes, & Sah, 2014 vs. Job et al., 2015; Kouchaki & Smith, 2014 vs. Vohs, Baumeister, & Schmeichel, 2012). In this article, we report three studies examining the effects of initial self-control-related processes on subsequent self-control lapses in daily life. In each study, we used a daily self-control framework (Hofmann, Baumeister, Forster, & Vohs, 2012) to open-endedly test a classic model (e.g., Baumeister, Vohs, & Tice, 2007; strength model), more recent alternatives to it (e.g., Inzlicht & Schmeichel, 2012; process model), as well as several other logical possibilities not considered in the past literature.

The Daily Self-Control Framework

Before introducing the models, it is important to first understand what self-control is and how it can be examined in daily life. Following others (Fujita, 2011; Hofmann, Baumeister, et al., 2012), we adopt a motivational definition of self-control. Specifically, we define it as those processes involved in overcoming a momentary desire in support of longer term goals.[1] The college student from our opening

[1]University of Wyoming, Laramie, USA

Corresponding Author:
Benjamin M. Wilkowski, Department of Psychology, University of Wyoming, Department 3415, 1000 E. University Ave., Laramie, WY 82071, USA.
Email: BWilkows@uwyo.edu

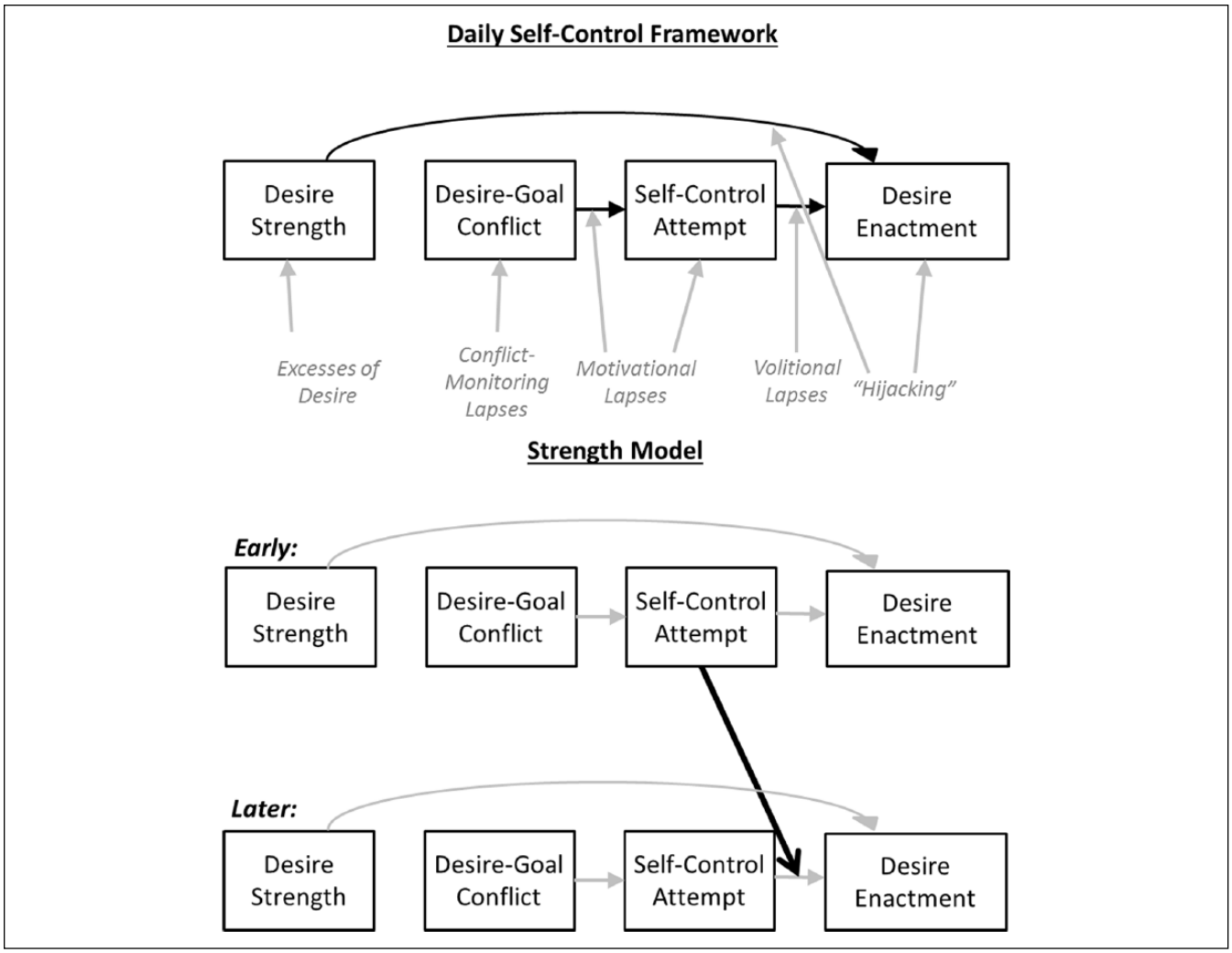

Figure 1. A Visual Depiction of the Daily Self-Control Framework (upper panel) and the Strength Model's Predictions in Daily Life (lower panel).

example is engaged in self-control because she is attempting to resist her alcohol desire to further her academic goals.

Building on this, Hofmann, Baumeister, et al. (2012) introduced a framework for examining self-control in daily life (see Figure 1, upper panel). When a person first encounters a relevant stimulus (e.g., an invitation to the bar), this framework suggests that a desire can emerge of varying *strength* (e.g., a strong desire for alcohol). Many of our desires are completely unproblematic—such as our desire to sleep at night or to eat healthy food at appropriate meal times. The satisfaction of such desires is needed for our continued biological functioning and may even facilitate the pursuit of many goals. However, sometimes our desires are problematic because they *conflict* with our long-term goals. Our college student cannot simultaneously go to the bar and study for her test at the same time. Hofmann et al. labeled such problematic desires *temptations*. When a desire–goal conflict is detected, they can motivate *self-control attempts* (e.g., to resist alcohol). These self-control attempts are often successful, and the desire is not enacted. Sometimes, however, they fail, as in the case of our student getting drunk.

Building on this, Hofmann and Kotabe (2012) proposed a taxonomy of self-control lapses (see Figure 1, upper panel). First, *volitional lapses* occur when a person tries to resist temptation but fails. Perhaps our student tried to resist alcohol, but she ultimately failed. *Motivational lapses* occur when a person does not even try to resist a problematic temptation. Perhaps our college student did not even try to resist her desire for alcohol. *Conflict-monitoring lapses* occur when a person fails to notice desire–goal conflict. Perhaps our student mistakenly believed that getting drunk will help her study better. *Excess of desire* occur when a desire is so strong it overpowers all else. Perhaps our college student's desire for alcohol was so strong it was irresistible. Finally, studies have suggested that desires can sometimes *hijack* working memory resources, leading a person to consciously allocate effort to its satisfaction (Hofmann & van Dillen, 2012). This prohedonic effort could lead to greater desire-enactment independently of desire-strength.

One Possibility: The Strength Model

So how precisely does initial self-control affect later self-control? Perhaps the most well-known (and intuitive) explanation lies in the strength model of self-control (Baumeister et al., 2007). This theory suggests that, much like a muscle, all acts of self-control rely on a limited resource that depletes with use (Baumeister et al., 2007). As a result, initial self-control attempts result in a state of *ego depletion*, wherein subsequent self-control attempts are less effective. According to this model, our students' initial dieting efforts depleted her self-control resources, rendering her less capable of later resisting alcohol.

Building on this model, Hofmann, Vohs, and Baumeister (2012) suggested that initial self-control attempts in daily life might trigger a volitional self-control lapse, such that subsequent self-control attempts are less successful (see Figure 1, lower panel). Although most studies have tested the strength model in laboratory settings (see Carter, Kofler, Forster, & McCullough, 2015; Hagger, Wood, Stiff, & Chatzisarantis, 2010, for meta-analyses), two studies have directly tested this prediction in daily life. Muraven, Collins, Shiffman, and Paty (2005) first found that early-day self-control exertion led participants to exceed their intended level of evening alcohol consumption. Hofmann, Vohs, and Baumeister (2012) examined the strength model's predictions more broadly by examining people's attempts to resist 15 different desires. They found that attempts to resist these desires early in the day rendered subsequent self-control attempts less effective (i.e., desires were enacted more often when they were resisted). Thus, one purpose of the current investigation was to continue to examine the strength model's predictions in daily life.

Another Possibility: No Effects At All

Although two prior studies (Hofmann, Vohs, & Baumeister, 2012; Muraven et al., 2005) supported the strength model's predictions in daily life, it is far from a foregone conclusion that such effects will replicate. A far larger literature has tested the strength model's prediction in laboratory experiments. Such studies typically manipulate initial self-control exertion and examine its effect on later self-control performance. Although an initial meta-analysis supported this effect (Hagger et al., 2010), subsequent meta-analyses called it into question by applying statistical corrections for bias (Carter et al., 2015; Carter & McCullough, 2014). A large-scale, preregistered replication attempt also failed to replicate this effect (Hagger et al., 2016). This raises the possibility that initial self-control may have no effect whatsoever on later self-control. We also considered this possibility in our studies (e.g., by conducting Bayesian tests of the null hypothesis).

A Third Possibility: Shifts in Motivation or Attention

Recent publications raise doubts about laboratory-based "ego-depletion" effects (Carter & McCullough, 2014; Hagger et al., 2016). Nonetheless, many readers will likely find it difficult to believe initial bouts of self-control have *no effect whatsoever* on subsequent self-control. After all, examples like our student's failure to resist alcohol seem so utterly familiar to many of us, and several studies of daily life suggest that self-control lapses are more likely to occur under demanding conditions (e.g., Job et al., 2015).

Thus, it is possible that initial bouts of self-control produce later self-control lapses in some other fashion. After all, the strength model outlines just one very specific way in which initial self-control might influence later self-control (see Figure 1, lower panel). Other models lead to different predictions when applied to the daily self-control framework.

For example, Inzlicht and Schmeichel's (2012) increasingly influential process model suggests that initial self-control attempts lead a person's motivation and attention to shift from self-control to desire-satisfaction.[2] This provides a very different explanation of why our student may have failed to resist alcohol (see Figure 2, upper panel). First, her initial dieting efforts may have strengthened her subsequent motivation for alcohol, producing an *excess of desire*. Second, the same dieting efforts may have simultaneously reduced her motivation to pursue goals requiring self-control. Hofmann and Kotabe (2012) proposed that such *motivational lapses* should reduce the frequency of self-control attempts. Because our student now cares less about her academic goals, she may not even attempt to exert self-control in support of them. Third, this model suggests our college student will shift attention away from her goals, resulting in a *conflict-monitoring lapse* (see Inzlicht & Gutsell, 2007). Because she is paying less attention to her academic goals, she is less likely to view her desires for social-drinking as problematic. Finally, this model suggests that she will shift her attention toward desire-satisfaction. In other words, her working memory resources and conscious efforts should be "hijacked" by her desires (Hofmann & van Dillen, 2012), which could increase desire-enactment independently of desire-strength. Thus, the process model (Inzlicht and Schmeichel, 2012) outlines several other fashions in which initial bouts of self-control could produce later self-control lapses.

A Fourth Possibility: Other Elicitors of Self-Control Lapses

The process model (Inzlicht & Schmeichel, 2012) is therefore useful in highlighting how initial bouts of self-control may produce different types of self-control lapses other than volitional lapses. However, this and other models continue to suggest that it is initial *self-control attempts* which trigger subsequent self-control lapses. We know of no theory that explicitly considers other possible elicitors of self-control lapses. Nonetheless, research indicates motivational conflict can elicit negative affect and undermine goal pursuit (Emmons & King, 1988; Riediger &

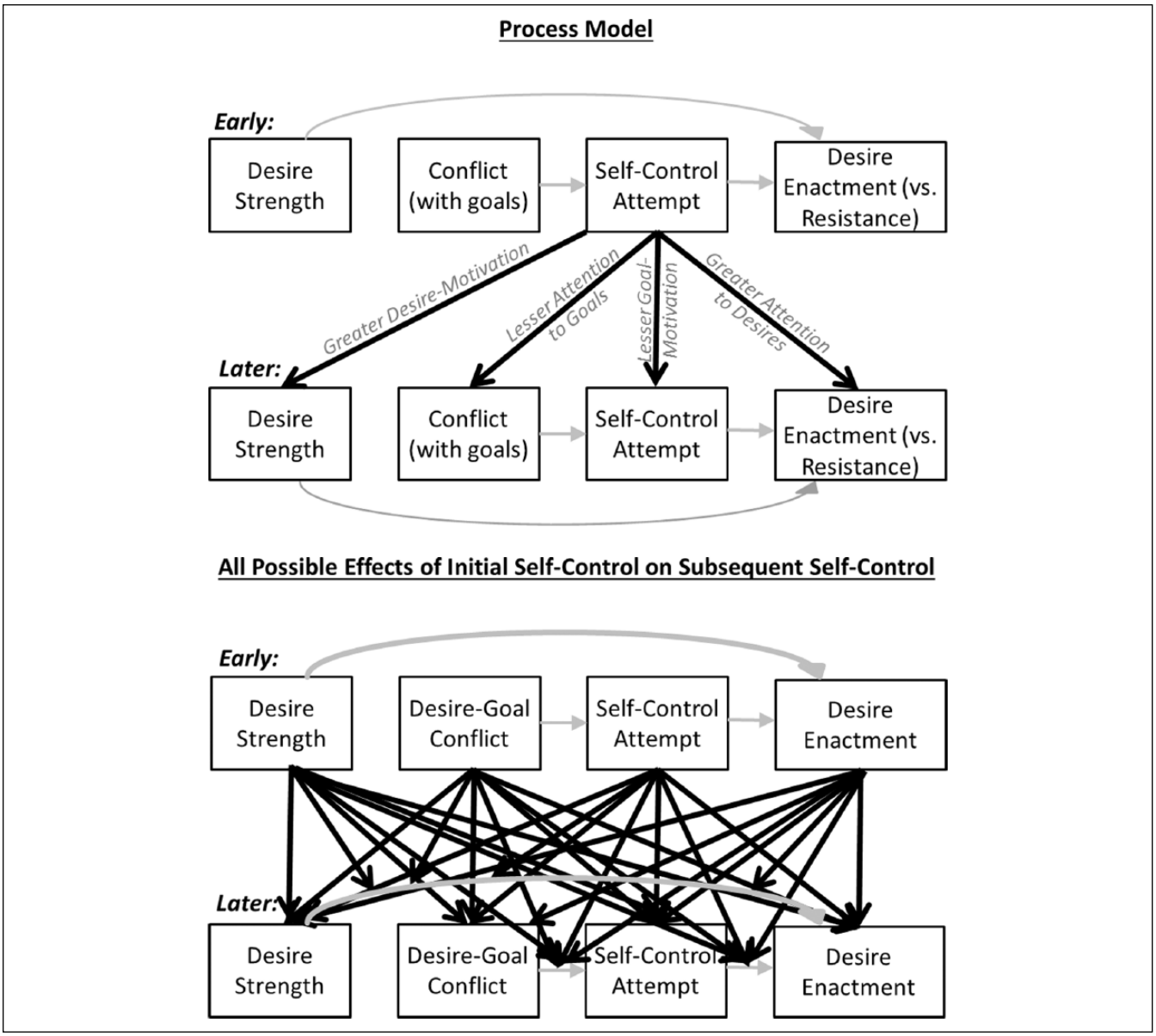

Figure 2. A Visual Depiction of the Process Model's Predictions (upper panel) and All Possible Effects of Initial Self-Control on Subsequent Self-Control (lower panel).

Freund, 2004). Research on desire-satiation also suggests that excessive indulgence in a desire will reduce the strength of subsequent desires (Redden, 2015). Within the strength model tradition (Baumeister et al., 2007), research on the "replenishment" of self-control resources suggests that the enactment of many desires (e.g., rest, ingesting glucose, any positive-affect-inducing desire) should increase the success of subsequent self-control attempts. It is thus quite possible that other processes are involved in triggering (or preventing) subsequent self-control lapses. Figure 2 (lower panel) illustrates all of the possible ways in which initial self-control could affect later self-control. In the current studies, we open-endedly explored them all.

A Fifth Possibility: Subjective Fatigue's Critical Role

We have all experienced *subjective fatigue.* Our college student's dieting efforts made her feel tired, and made it *feel* like it was harder to control her desire for alcohol. Many of us can relate. Perhaps that is why so many people so strongly believe that initial self-control must influence later self-control in some fashion. Some prior work suggests that that this subjective feeling is indeed critically involved in self-control lapses (Clarkson, Hirt, Jia, & Alexander, 2010; Hockey, 2013). In the current investigation, we therefore open-endedly explored the self-control-related processes, which might elicit fatigue and the consequences of fatigue for ensuing self-control.

The Current Investigation

We conducted three studies to better understand self-control lapses in daily life. In Study 1, we conducted a series of systematic, exploratory analyses to identify any possible effect of initial self-control on later fatigue and self-control. In Studies 2 and 3, we examined the replicability of effects identified in Study 1. Because the strength model figures prominently in the literature, we also conducted focused analyses of this model's predictions in all studies. Bayesian analyses were also conducted to examine the null hypothesis.

Study 1

In Study 1, participants completed an experience-sampling survey 7 times a day, asking if they recently experienced a desire. When a desire was identified, they were asked about its strength, conflict with goals, attempts to resist it, and enactment of it. This study thus closely replicated the procedures of Hofmann, Vohs, and Baumeister (2012). We conducted a systematic series of exploratory analyses to identify any possible effect of initial self-control on later self-control, and we also conducted focused analyses to examine whether strength model's predictions replicated.

Method

Participants and statistical power. Ninety-one undergraduate psychology students (56 females; *M* age = 20.0 years) participated in exchange for partial course credit. Seven additional participants began the study but did not provide a single valid daily report. In all studies, students were required to own a smartphone so they could complete the daily protocol. Study 1 participants provided a total of 4,515 total desire reports, 3,512 of which could be used to test the strength model's predictions (see below for exclusion criteria). Following Funder et al.'s (2014) recommendations, this sample size was determined by an a priori goal to achieve 95% power to detect Hofmann, Vohs, and Baumeister's (2012) Prior × Current Self-Control-Attempts interaction, that is, odds ratio (OR) = 1.15 or β(log) = 0.1, which Wilhelm Hofmann kindly calculated and provided at our request. Across all studies, no inferential analyses were conducted prior to the termination of data collection.

Measures and procedures. Like many labor-intensive studies, measures were included in all current studies to test multiple, unrelated hypotheses (Finkel, Eastwick, & Reis, 2015). Here, we describe only those measures relevant to current concerns. All measures are presented in full in the supplement. Participants arrived at an orientation session and provided informed consent. Prior studies in our laboratory suggested that participants from our subject pool sometimes have trouble distinguishing "goals" and "desires." To make this distinction concrete, we asked participants to identify three specific long-term goals they were currently working toward most days of their life.

Next, the experience-sampling protocol was explained to participants. Participants were informed they would receive seven text messages per day for the following 7 days, distributed between 9:00 a.m. and 11:00 p.m. Texts were sent at a random time during each 2-hr time window, with the constraint that no two text messages could occur within 30 min of each other. The same, randomly generated schedule was used for all participants (e.g., everyone received their first text at 10:41 a.m. on Sunday). The message contained a link to an online survey (hosted on SurveyGizmo), allowing participants to directly access the survey from their smartphone. They were instructed to respond within 10 min of the text. Participants were informed they needed to complete at least 40 (out of 49 possible) reports to receive full credit.

Following Hofmann, Vohs, and Baumeister (2012), we defined desires for participants as, "The urge to perform an action because it leads to an immediate feeling of satisfaction or immediate relief of distress." Participants were asked to think of a desire they experienced within the last 30 min and select it from a drop-down menu of Hoffmann et al.'s 15 desires. Options included the desire to drink a nonalcoholic beverage (8% of reported desires), drink alcohol (3%), drink coffee (6%), eat (21%), have sex (3%), play sports (3%), relax (11%), sleep (13%), smoke (1%), socialize (6%), spend money (2%), use media (TV, video games, cell phone, etc.; 10%), use the bathroom (5%), or work (5%). (We excluded Hofmann et al.'s aggression option, as reports of this desire were rare and excluded from their analyses.) Participants could also specify other desires they experienced (1% of reported desires) or indicate no desire.

When participants identified a desire, they were asked "How strong is this desire?" and they responded using a 0 (*no desire at all*) to 7 (*irresistible*) scale. To measure desire–goal conflict, participants were asked three questions beginning with "Does this desire conflict with your goal to . . ." and ending with one of the goals they identified at the orientation session. A fourth item asked whether the desire conflicted with other, unspecified goals. Participants indicated their response using a 0 (*no conflict at all*) to 4 (*very high conflict*) scale. We averaged across these four items for analyses. To measure self-control attempts, participants were asked, "Did you attempt to resist the desire?" and they could provide a yes or no response. Finally, to measure desire-enactment, participants were asked, "Did you act on this desire—at least to some extent?" and they could again provide a yes or no response. All response scales were designed to match those of Hofmann, Vohs, and Baumeister (2012).

Participants were next given the option to report a second and third desire also occurring within the last 30 min. When participants indicated no desire, the self-control-related questions were not asked. When zero desires were reported, nine "bogus questions" (not intended for analysis) were instead asked to discourage participants from reporting zero

desires simply to finish the survey more quickly. Participants reported an average of 1.61 desires per report, slightly higher than Hofmann, Vohs, and Baumeister's (2012) rate of 1.14.

Finally, participants answered questions about their mood. As part of this, participants were asked to indicate how "tired" and "fatigued" they were, using a 1 (*very slightly or not at all*) to 5 (*extremely*) response scale. Descriptive statistics and further data preparation information are reported in Supplementary Section 3.

Calculation of prior self-control indices. We calculated Hofmann, Vohs, and Baumeister's (2012) index of prior self-control attempts, which weighs very recent self-control attempts more heavily than earlier attempts. To do so, we multiplied attempts from each prior timepoint of the same day by a value indicating their recency. For example, self-control attempts from the immediately prior timepoint were multiplied by six, and attempts occurring six timepoints previously (the maximum possible in a day) were multiplied by one. We then summed these values to create a recent self-control attempts score for each timepoint. Because this score could not be calculated for the first timepoint of each day, these timepoints were excluded from analyses involving this variable. Parallel indices representing prior conflict, desire-strength, enactment, fatigue, and desire to sleep were also calculated.

Results

General analytic procedures. All datasets in the current investigation exhibited a nested structure, so they were analyzed with multilevel modeling (MLM; Nezlek, 2008; Raudenbush & Bryk, 2002). Effects of theoretical interest are reported in this article itself. Effects of secondary interest are reported in the supplement, along with the details of how each analysis was conducted. In the interests of simplicity, we only report effects from exploratory analyses, which later replicated. Additional patterns that failed to replicate are discussed in Supplementary Section 5 (Tables S4 and S9). Because there is no consensually valid effect size index for MLM (Nezlek, 2008), we report unstandardized multilevel regression coefficients. We also report 95% confidence intervals (CIs). If these intervals exclude zero, the effect can be considered significant.

For the strength model's predictions, an important question is whether each dataset provides *support* for the null hypothesis. Traditional null hypothesis tests are incapable of doing this. We therefore conducted a Bayesian test recommended by Wagenmakers (2007). We first used the Bayesian Information Criterion (BIC) to determine whether a model including the Prior × Current Self-Control Attempts interaction fit the data worse than a model excluding this effect. Lower BIC values indicate better model fit. We used Kaplan and Depaoli's (2012) guidelines to interpret the strength of evidence based on BIC differences (BIC differences of 0-2 = weak evidence; 2-6 = positive evidence; 6-10 = strong evidence; >10 = very strong evidence). Next, we calculated Bayes Factor (BF_{01}) using a formula provided by Wagenmakers (2007). This indicates the relative likelihood of the data according to null hypothesis, relative to the strength model's hypothesis.

Exploratory analyses

General strategy. We conducted a systematic series of exploratory analyses to locate any possible effect of initial self-control on subsequent fatigue and self-control. Including a large number of predictors in a single MLM can result in model nonconvergence, especially when many effects are nonsignificant (Raudenbush & Bryk, 2002). We thus conducted these analyses in steps, and removed clearly nonsignificant effects after each step. For variable removal, 90% CIs were consulted to provide a more conservative estimate of effects entered at later steps. After any effect of potential theoretical interest was located, we next examined it without any covariates unnecessary for its calculation. We do not focus on any effect which could not be replicated in the same direction at the zero-order level, as such suppression effects are often hard to interpret and frequently fail to replicate.

Replication of the daily self-control framework. As a first step, we sought to replicate Hofmann, Baumeister, et al.'s (2012) daily self-control framework in cross-sectional analyses. All effects replicated. Desire–goal conflict was related to greater self-control attempts, $b = 0.52$, 95% CI = [0.43, 0.59]. Self-control attempts were, in turn, related to less desire-enactment, $b = -1.39$, 95% CI = [–1.56, –1.23], whereas desire-strength was related to greater desire-enactment, $b = 0.24$, 95% CI = [0.18, 0.30].

Effects of prior self-control on current self-control. We next simultaneously entered all prior self-control variables (before time *t*) as predictors of all current self-control variables (at time *t*), and as moderators of all effects specified in the previous step. We found that prior self-control attempts (before time *t*) were related to significantly greater desire-enactment (at time *t*), $b = 0.01$, 95% CI = [0.0001, 0.02] (without necessary covariates: $b = 0.01$, 95% CI = [0.004, 0.02]). Thus, participants acted on desires more often following prior self-control exertion. As discussed in greater detail below, this effect occurred even when current desires were not resisted at all. It is thus inconsistent with the strength model. Nonetheless, it is potentially consistent with alternative models (e.g., Inzlicht & Schmeichel, 2012).

There were relatively few other significant effects of theoretical interest in these analyses, none of which replicated (see Supplementary Section 5).

Effect of self-control on fatigue. We next sought to determine what effect self-control variables might have on fatigue. As an initial step, we entered all current self-control

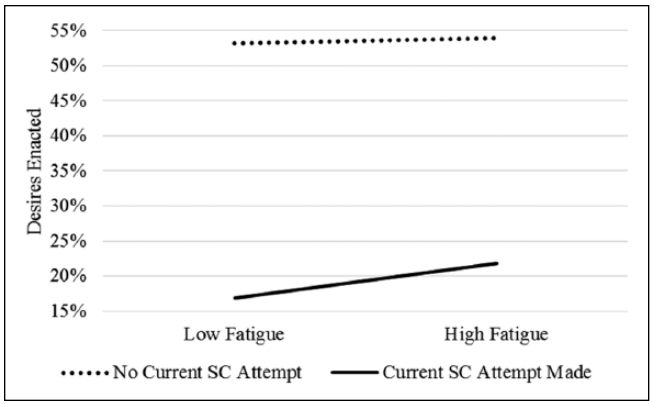

Figure 3. Desire-enactment as a function of subjective-fatigue and self-control attempts, Study 1.

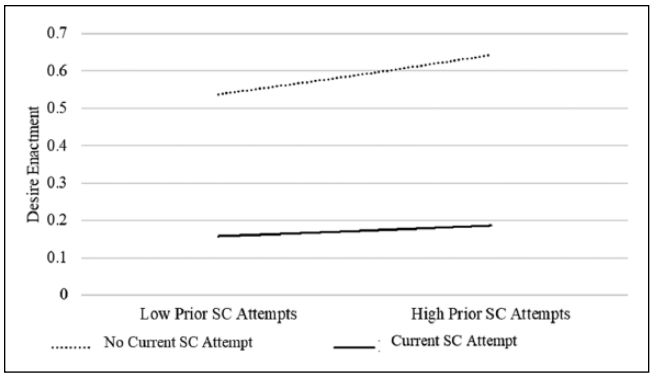

Figure 4. Desire-enactment as a function of prior and current self-control attempts, Study 1.

variables (at time *t*) as predictors of current fatigue (at time *t*). The desire to sleep was entered as a control variable. Current self-control attempts (at time *t*), $b = 0.13$, 95% CI = [0.08, 0.18], was significantly related to fatigue. There was also some (nonsignificant) evidence that current desire–goal conflict (at time *t*) was related to fatigue, $b = 0.04$, as the 90% CI excluded zero [0.004, 0.08], but the 95% CI did not [–0.004, 0.09].

However, these effects are ambiguous, as they could reflect the effects of self-control on fatigue or vice versa. Thus, we next examined effects of prior self-control on current fatigue. This analysis controlled for the prior desire to sleep and prior subjective fatigue. Although this analysis does not show causality, it at least clarifies the direction of effects. Prior desire–goal conflict (before time *t*) was related to significantly greater fatigue (at time *t*), $b = 0.004$, 95% CI = [0.0001, 0.007] (effect without necessary covariates: $b = 0.005$, 95% CI = [0.002, 0.008]). This suggests that desire–goal conflict may play a role in eliciting fatigue.

Effect of fatigue on self-control. Finally, we added fatigue as a predictor of each self-control process and as a moderator of each relationship from the daily self-control framework. Replicating the above analyses, fatigue was related to significantly greater desire–goal conflict and greater self-control attempts (see Tables S5 and S6).

Perhaps more interesting, though, the main effect of subjective fatigue on desire-enactment was significant, $b = 0.08$, 95% CI = [0.004, 0.16] (effect without necessary covariates: $b = 0.06$, 95% CI = [0.02, 0.13]), as was the Fatigue × Self-Control Attempts interaction on desire-enactment, $b = 0.20$, 95% CI = [0.03, 0.37] (effect without necessary covariates: $b = 0.14$, 95% CI = [0.04, 0.25]). The estimated means for this interaction are depicted in Figure 3 (Preacher, Curran, & Bauer, 2006). Simple slope analyses indicated that fatigue was related to significantly greater desire-enactment in the presence of self-control attempt, $b = 0.15$, 95% CI = [0.09, 0.24], but not in the absence of an attempt, $b = 0.02$, 95% CI = [–0.06, 0.09]. Thus, self-control attempts are less effective when people are fatigued.

Focused tests of the strength model's prediction. Exploratory analyses did not yield the interaction between prior and current self-control attempts predicted by the strength model. They did yield a somewhat related main effect. Because this model is well-known, we next conducted focused analyses of its predictions. To do so, current self-control attempts (at time *t*), prior self-control attempts (before time *t*), and their interaction were simultaneously entered as predictors of desire-enactment (at time *t*). Replicating the above tests of the daily self-control framework, the main effect of current self-control attempts was significant, $b = -2.25$, 95% CI = [–2.64, –1.87], such that current self-control attempts were related to less desire-enactment. Replicating the above exploratory analyses, the main effect of prior self-control attempts was also significant, $b = 0.02$, 95% CI = [0.01, 0.03], such that prior self-control attempts were related to greater desire-enactment.

However, the strength model hypothesizes an interaction between prior and current self-control attempts, such that prior self-control attempts render current self-control attempts less effective. However, this interaction was not significant, $b = -0.02$, 95% CI = [–0.04, 0.005]. The estimated means for this interaction are displayed in Figure 4. Simple slope analyses revealed that prior self-control attempts were related to significantly greater desire-enactment when a self-control attempt was *not* made, $b = 0.03$, 95% CI = [0.01, 0.04]. However, this effect was not significant when a self-control attempt *was* made, $b = 0.01$, 95% CI = [–0.007, 0.03]. This pattern is not consistent with the strength model, as this model suggests that initial self-control should undermine the effectiveness of subsequent self-control attempts. As we discuss in greater detail below, it is potentially consistent with some alternative models.

To determine whether this dataset provided support for the null hypothesis of no interactive effect, a Bayesian analysis (Wagenmakers, 2007) was next conducted. A model

specifying the null hypothesis fit the data better (BIC = 3,836.11) than a model containing a Prior × Current Self-Control Attempts interaction (BIC = 3,842.12), BIC difference = 6.01, BF_{01} = 20.18. This provides "strong" evidence for the null hypothesis (Kaplan & Depaoli, 2012) and suggests that the data are approximately 20 times more likely to result from the null hypothesis than the strength model's predictions.

Discussion

Study 1 yielded several findings of note. First, this study did not support the strength model's predictions. Initial self-control attempts did not render subsequent self-control attempts less effective. In fact, Bayesian analyses provided strong evidence in favor of the null hypothesis of no interactive effect.

Instead, a seemingly similar—but importantly different—effect emerged from exploratory analyses. Initial self-control attempts increased subsequent desire-enactment regardless of whether the ensuing desires were resisted or not. There was even some evidence that such effects were most apparent when ensuing desires were *not* resisted (i.e., in the simple slopes of the focused tests of the strength model).

It is important to emphasize that this effect cannot be explained by the well-known strength model (Baumeister et al., 2007). According to this model, initial self-control attempts should deplete the resource needed for self-control. Thus, initial self-control attempts should only lead people to enact desires more often *if they attempt to resist them*. This theory provides no mechanism for explaining increases in desire-enactment in the absence of a self-control attempt. We reserve further theoretical discussion until the general discussion, but we nonetheless briefly note that this finding is potentially consistent with other theories (e.g., Inzlicht & Schmeichel, 2012).

Beyond this, subjective fatigue was also useful in understanding self-control lapses. Desire–goal conflict appeared to play a role in eliciting fatigue, as initial conflict was related to subsequent increases in fatigue. This replicates a prior study, which found that such motivational conflicts were related to subjective experiences of "depletion" (Milyavskaya & Inzlicht, 2017). Beyond this, subjective fatigue was also related to volitional self-control lapses, in that it predicted desire-enactment when a self-control attempt was made.

Study 2

Effects from Study 1 were obtained from exploratory analyses in which a large number of effects were examined. To guard against possible false positive, it is thus important to examine whether these effects replicate in independent datasets. In Study 2, we therefore reanalyzed data from (Wilkowski & Ferguson, 2016). Unlike Study 1, all questions in Study 2 centered on a long-term goal (rather than a momentary desire). Participants provided two reports a day on subjective fatigue, temptations encountered during long-term-goal pursuit, attempts to resist temptations, and the success of those attempts. This allowed us to examine the replicability of Study 1's fatigue-related effects and to again test the strength model's predictions using an analytic design similar to Muraven et al. (2005). Nonproblematic desires were not measured in this study, and thus it did not provide an opportunity to replicate effects purely related to desire-enactment.

There was also a subtler, but potentially important difference between Study 1 and 2. Following Hofmann, Vohs, and Baumeister (2012), Study 1 assessed self-control attempts in a dichotomous fashion, forcing participants to either say they resisted a desire or not. In Study 2, self-control attempts were assessed on a continuous 1 to 9 scale, allowing participants to accurately report when they made a brief or "half-hearted" self-control attempt. This small difference could potentially alter fatigue-related effects. Prior research indicates that when participants are sufficiently motivated to apply effort, they can overcome cognitive fatigue (Boksem, Meijman, & Lorist, 2006; Hockey & Earle, 2006). Thus, fatigue may only affect self-control success when a self-control attempt is made, but relatively little effort is applied toward it. We conducted analyses to assess this.

Method

Participants and statistical power. A total of 58 undergraduate psychology students (34 female, *M* age = 19.7) completed the study for partial course credit. They provided a total of 670 usable daily reports, 330 of which could be used to test most predictions (see below for analytic design). As this study was originally conducted for other purposes, a priori power analyses were not conducted for current purposes; and its statistical power is admittedly lower than Studies 1 and 3. Nonetheless, it was designed to ensure 95% power to detect the average effect size found in social/personality psychology (*D* = .43; see Funder et al., 2014) at the level of analyses reported here.

Procedures and measures. During an orientation session, participants were asked to provide brief descriptions of four long-term goals they were currently working toward. Next, the daily protocol's procedures were explained. Each day, participants were asked to complete a mid-day and end-of-day survey focused on the first and second half of their day, respectively. Automated text reminders were sent to participants, timed to participant's naturally occurring sleep–wake cycle. Participants could complete the survey using any Internet-connected computer. Participants were instructed that they would only receive credit for days on which they completed both surveys. This permitted us to examine the effect of early-day self-control on late-day self-control. Participants were given 14 days to complete 7 days of this protocol.

Each daily survey began with questions about the participant's mood. As part of this, they were asked how "tired" and "fatigued" they were. Participants were next asked to briefly describe their first goal and answer questions about it. They were asked one question each concerning desire–goal conflict ("Were you tempted to do things which would interfere with this goal?"), self-control attempts ("Did you try to resist temptations that would interfere with achieving this goal?"), and self-control-success ("Did you successfully resist temptations that would interfere with achieving this goal?"). This was repeated for the remaining three goals. Participants answered all questions using a 1 (*not at all*) to 9 (*definitely*) response scale. Descriptive statistics and data preparation information are provided in Supplementary Section 8.

Results

Effect of initial desire–goal conflict on fatigue. We first examined whether Study 1's fatigue-related effects would replicate in Study 2. We began by examining the effect of initial desire–goal conflict on subsequent fatigue. We included all significant predictors from Study 1 as predictors of current (late-day) subjective-fatigue (see Table S12). Critically, the main effect of prior (i.e., early-day) desire–goal conflict was significant, $b = 0.18$, 95% CI = [0.04, 0.33], such that initial conflict was related to later increases in fatigue. Thus, Studies 1 and 2 both suggest that desire–goal conflict elicits fatigue.

Fatigue's effect on volitional self-control lapses. We next examined fatigue's relationship with volitional self-control lapses. In our initial analysis, we simultaneously entered fatigue, self-control attempts, and their interaction as predictors of self-control success. (No other variables from the final relevant Study 1 model were available for inclusion.) All daily reports (early-day and late-day) were included as independent observations in this analysis, as they were all equally relevant. The main effect of fatigue on self-control success was not significant, $b = -0.03$, 95% CI = [–0.07, 0.02]. The main effect of self-control attempts was significant, $b = 0.63$, 95% CI = [0.58, 0.70], such that self-control attempts were related to greater success. More importantly, though, the Fatigue × Self-Control Attempts interaction was significant, $b = 0.05$, 95% CI = [0.02, 0.08]. The estimated means are presented in Figure 5 (upper panel). Interestingly, subjective-fatigue was not significantly related to self-control success when self-control attempts were high, $b = 0.04$, 95% CI = [–0.02, 0.11]. Instead, fatigue was related to significantly less self-control success when self-control attempts were low, $b = -0.09$, 95% CI = [–0.16, –0.03].

This may indicate that fatigue's effects are most apparent when a self-control attempt is made, but *little effort* is applied (Boksem et al., 2006; Hockey & Earle, 2006). To test this possibility, we created a new dichotomous self-control attempt variable, coded as 0 when no self-control attempt was reported at all (i.e., 1 = *not at all* on the original response scale) and as 1 when any attempt was reported (i.e., ≥2 on the original response scale). This variable and its interaction with fatigue were added to the model. Fatigue's interaction with the dichotomous self-control attempt variable was indeed significant, $b = -0.44$, 95% CI = [–0.80, –0.08]. As can be seen in Figure 5 (lower panel), fatigue was not significantly related to self-control success in the complete absence of any self-control attempt, $b = 0.05$, 95% CI = [–0.03, 0.14]. However, fatigue was significantly related to less self-control success when some minimal self-control attempt was made, $b = -0.12$, 95% CI = [–0.20, –0.03]. The original interaction between fatigue and the continuous self-control-attempt variable remained significant, $b = 0.10$, 95% CI = [0.05, 0.15], with no changes in direction or significance of the simple slopes. This may indicate that the deleterious effects of fatigue can be overcome with sufficient effort.

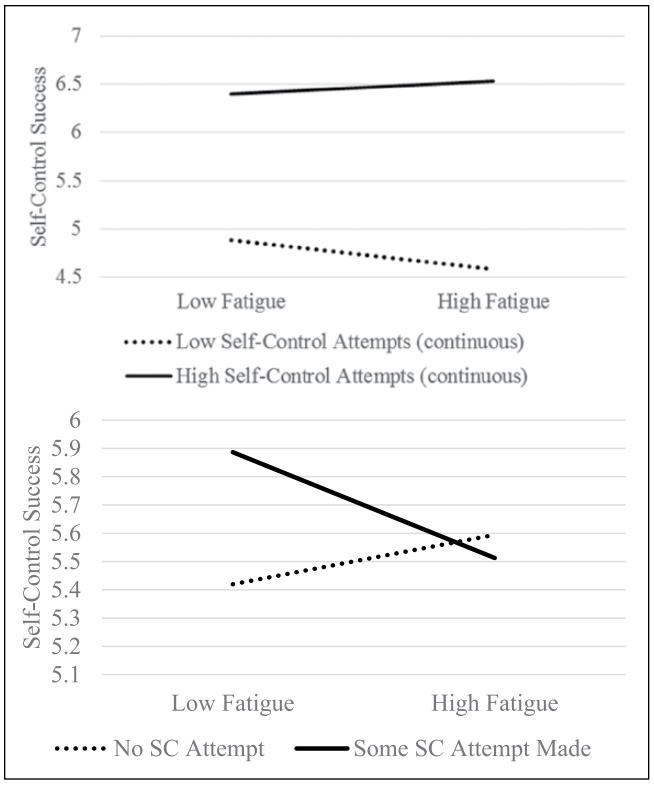

Figure 5. Self-control success as a function of fatigue and self-control attempts, Study 2.
Note. Upper panel displays effects involving the original, continuous measure of self-control-attempts. Lower panel displays effects involving a dichotomized measure.

Tests of the strength model. To examine the strength model's predictions, current (i.e., late-day) self-control attempts, prior (i.e., early-day) self-control attempts, and their interaction were simultaneously entered as predictors of current (i.e., late-day) self-control success. The main effect of prior self-control attempts was not significant, $b = 0.03$, 95% CI = [–0.04, 0.11].

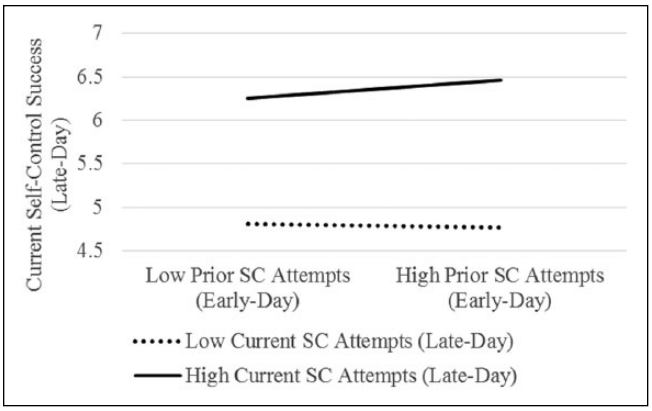

Figure 6. Current self-control success as a function of prior and current self-control attempts, Study 2.

The main effect of current self-control attempts was significant, $b = 0.68$, 95% CI = [0.59, 0.77], such that current self-control attempts were related to greater self-control success. The strength model hypothesizes a Prior × Current Self-Control Attempts interaction. However, this interaction was not significant, $b = 0.04$, 95% CI = [–0.01, 0.08]. Estimated means are presented in Figure 6. Simple slope analyses indicated that prior self-control attempts were not significantly related to self-control success, regardless of whether current self-control attempts were high, $b = 0.07$, 95% CI = [–0.02, 0.17] or low, $b = -0.01$, 95% CI = [–0.11, 0.08].

We next conducted Bayesian analyses (Wagenmakers, 2007) to determine whether this dataset instead supported the null hypothesis of no interactive effect. A model specifying the null hypothesis (BIC = 1,103.5) fit the data better than a model including the Prior × Current Self-Control Attempts interaction (BIC = 1,106.7), BIC difference = 3.2, $BF_{01} = 4.95$. This analysis provides "positive" evidence for the null hypothesis (Kaplan & Depaoli, 2012), and suggests that the data are approximately 5 times more likely to occur under the null hypothesis than under the strength model's predictions.

Discussion

Consistent with Study 1 and Milyavskaya and Inzlicht (2017), Study 2's results indicate that initial desire–goal conflicts were related to subsequent increases in fatigue. Thus, motivational conflict may play an important role in eliciting fatigue.

Beyond this, there was also modest support for a relationship between fatigue and volitional self-control lapses. Fatigue appeared to reduce self-control success when a self-control attempt was made, but little effort was applied toward it. In line with prior fatigue research (Boksem et al., 2006; Hockey & Earle, 2006), fatigue's effects appeared to dissipate when a person applied a great deal of effort to the self-control attempt. Thus, Study 2 did not provide an exact replication of Study 1. Thus, the evidence for a replicable pattern should be considered modest currently. Nonetheless, even this modest evidence should warrant future research into fatigue and volitional self-control lapses.

Finally, Study 2 failed to provide evidence for the strength model's predictions. Early-day self-control attempts did not render late-day self-control attempts less effective. Instead, Bayesian analyses provided support for the null hypothesis. It should be acknowledged that Study 2's power was lower than other studies, and that it only focused on a small subset of participants' goals. Nonetheless, its findings converge with the results of other studies, which do not have these limitations.

Study 3

In Study 3, we next turned to a previously collected daily dataset, which included the same self-control-related variables as Study 1. This study thus provided an opportunity to replicate the relationship between initial self-control attempts and subsequent desire-enactment found in Study 1, as well as an additional opportunity to examine the strength model's predictions. Fatigue was not measured, so Study 3 did not provide an opportunity to further examine fatigue-related effects.

Participants

A total of 76 undergraduate students (44 female; *M* age = 21.23) completed the study for partial course credit. These participants provided a total of 2,526 valid desire reports, 1,851 of which could be used to test the strength model's predictions (exclusion criteria were identical to Study 1). This study was designed with multiple purposes in mind, so a priori power analyses were not conducted specifically for current purposes. Instead, this study was more generally designed to ensure 95% power to detect a small effect size ($D = .2$) at the level of analysis reported here.

Procedure

Procedures were similar to Study 1 with the following exceptions. The experience-sampling protocol consisted of six automated text messages per day for 7 days. Participants were told they needed to complete 30 of the 42 possible surveys to receive full credit. Some items' wording was slightly altered (see Supplementary Section 12). Participants also reported their level of desire–goal conflict, self-control attempts, and desire-enactment using a continuous 0 (*not at all*) to 4 (*extremely*) response scale. Further information (items, descriptive statistics and data preparation) is provided in Supplementary Sections 11 to 13.

Results

To examine the strength model's predictions, we simultaneously entered current self-control attempts (at time *t*), prior

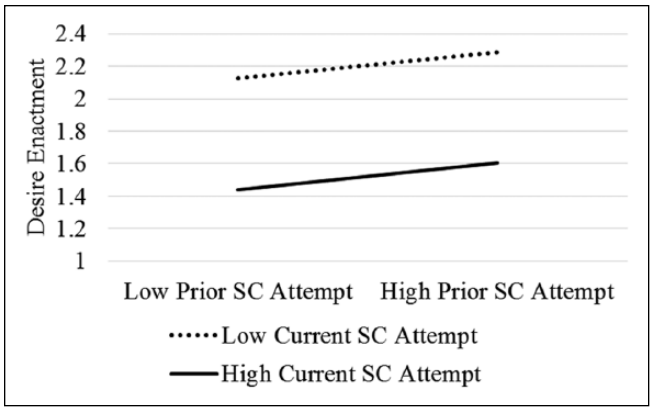

Figure 7. Desire-enactment as a function of prior and current self-control attempts, Study 3.

self-control attempts (before time *t*), and their interaction as predictors of current desire-enactment (at time *t*). The main effect of current self-control attempts was significant, $b = -0.48$, 95% CI = [–0.62, –0.34], such that self-control attempts were related to less desire-enactment.

Replicating Study 1, the main effect of prior self-control attempts was also significant, $b = 0.006$, 95% CI = [0.002, 0.009], such that prior self-control attempts were related to greater desire-enactment. This effect also appeared in analyses designed to replicate Study 1's exploratory analyses, $b = 0.005$, 95% CI = [0.0001, 0.009]; see Table S16. Thus, Studies 1 and 3 indicate that people are more likely to enact desires following periods of self-control exertion.

However, the strength model hypothesizes a Prior × Current Self-Control Attempts interaction. As in prior studies, this effect was not significant, $b = 0.0001$, 95% CI = [–0.004, 0.004]. Estimated means are displayed in Figure 7. Simple slope analyses indicated the prior self-control attempts were related to significantly greater desire-enactment both when current self-control attempts were high, $b = 0.005$, 95% CI = [0.001, 0.01], and low (i.e., absent), $b = 0.006$, 95% CI = [0.002, 0.01]. This pattern is not consistent with the strength model.

Bayesian analyses again provided "strong" evidence (Kaplan & Depaoli, 2012) for the null hypothesis, as a model including the Prior × Current Self-Control Attempts interaction (BIC = 6,172.32) fit the data worse than a model specifying the null hypothesis (BIC = 6,164.82), BIC difference = 7.5, $BF_{01} = 42.4$. This indicates that the data are 42.4 times more likely if the null hypothesis is correct, relative to the strength model's predictions.

Discussion

Like prior studies, Study 3 failed to yield evidence of the strength model's predictions in daily life. In fact, Bayesian analyses provided strong evidence against this effect. However, Study 3 indicated that initial self-control attempts were related to significantly higher levels of subsequent desire-enactment—regardless of whether those subsequent desires were resisted or not. Thus, initial self-control exertion does not appear to weaken people's ability to successfully exert self-control. Instead, it seems to promote the enactment of desires—regardless of whether those desires are resisted or not. This is potentially consistent with several alternatives to the classic strength model (e.g., Inzlicht & Schmeichel, 2012).

General Discussion

Summary of Results

The current studies yielded three patterns of note (see Figure 8 for a summary). First, the strength model's predictions were not supported, with Bayesian analyses providing evidence against such effects. Second, self-control attempts were instead related to later increases in desire-enactment. This effect occurred even when (and perhaps *especially* when) those later desires were not resisted. Finally, subjective fatigue appeared to result from prior conflict between desires and goals and lead self-control attempts to be less successful.

These findings may help to explain why laboratory tests of the strength model sometimes fail to yield reliable self-control lapses (e.g., Hagger et al., 2016). First, laboratory-based "ego-depletion" effects may not reflect one unitary effect. Instead, they may reflect an amalgamation of several distinct effects with different elicitors and underlying processes. Some lapses occur because of prior motivational conflict and fatigue, whereas other lapses occur because of a shift from self-control attempts to desire-enactment.

Beyond this, many laboratory studies have been miscalibrated to detect either effect. For example, many such studies try to make the initial self-control task as difficult as possible (e.g., standing on one foot while solving arithmetic problems; Webb & Sheeran, 2003). Studies 1 and 2 suggest that it may be more important to maximize motivational conflict (e.g., as Wang, Novemsky, Dhar, & Baumeister, 2010, did by maximizing conflict between two choice options). Likewise, laboratory studies sometimes directly ask participants to exert self-control on a second task (e.g., suppress laughter). As discussed below, some effects may be most apparent when people can intentionally pursue desire-gratification (e.g., as Schmeichel, Harmon-Jones, & Harmon-Jones, 2010, Study 2b, allowed their participants to do).

Implications for the Strength Model

The strength model (Baumeister et al., 2007) has been immensely influential. It called attention to the detrimental impact self-control lapses can have on many domains, ranging from academic success to drug use. Thus, it has already had an immeasurable impact on psychological research. Nonetheless,

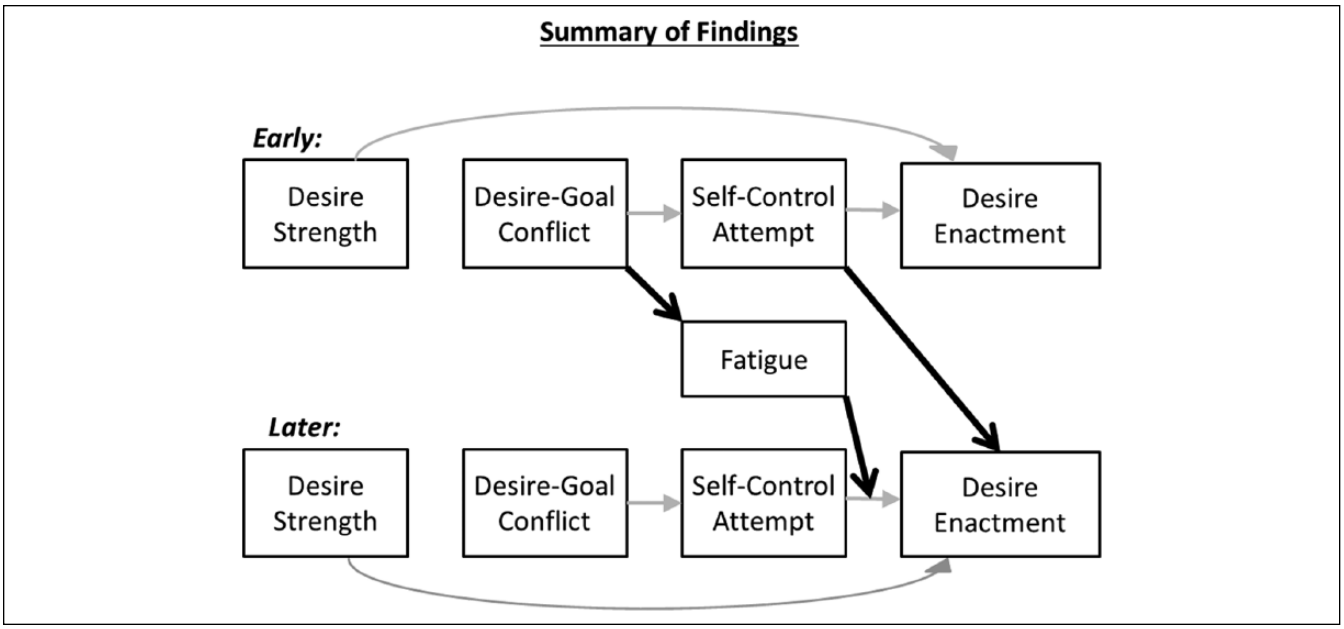

Figure 8. A Visual Summary of the Current Findings.

the robustness of laboratory-based effects have been questioned (Carter et al., 2015; Hagger et al., 2016), and alternative proposals are emerging for how self-control lapses may be elicited (e.g., Inzlicht & Schmeichel, 2012; Kurzban, Duckworth, Kable, & Myers, 2013).

In three studies, we found no evidence supporting this model's predictions in daily life. Initial self-control attempts had no influence over the success of subsequent self-control attempts. In each study, Bayesian analyses instead provided "strong" to "positive" evidence (Kaplan & Depaoli, 2012) for the null hypothesis of no interactive effect.

Of course, no one investigation can ever provide definitive evidence against (or for) any theory. Properly educated scientists will consider this obvious, but it still must be explicitly stated for clarity. A different operationalization could lead to different effects. The strength model's predictions may be too brief to be detected in daily protocols. Or it is possible that strength model's predictions can only be detected in daily life once numerous moderators are considered (e.g., positive affect, motivation, rest, glucose ingestion/rinsing, implementation intentions, etc.; Baumeister et al., 2007). The current studies do not address these possibilities.

Accordingly, we believe that the strongest contribution of these studies is the significant effects they did yield. These studies indicate that initial bouts of self-control do influence later self-control—just not in the way predicted by the strength model. In other words, the current studies should *not* be interpreted as a call to erase "ego-depletion" effects from our textbooks or our journals (though a new term which does not imply an underlying resource would be useful). Instead, these studies should encourage a second generation of self-control theories. In this way, the strength model does live on—by helping to give birth to newer theories that more closely approximate the truth.

An Alternative: Self-Control Attempts Promote Later Desire-Enactment

In Studies 1 and 3, we found that participants were especially likely to enact desires following prior self-control attempts. This effect was apparent regardless of whether the later desires were resisted or not. Because this effect was straightforwardly replicated, it clearly deserves further attention.

How might this effect be explained? This effect initially emerged from exploratory analyses, so we can make no definitive claims here. However, a close inspection of the findings provides some guidance. First, it cannot be attributed to a shift in motivation or conflict-monitoring, as some theories suggest (Inzlicht & Schmeichel, 2012). After all, initial self-control attempts did not boost desire-strength. They did not reduce the motivation to exert self-control in support of one's long-term goals, and they did not interfere with the detection of desire–goal conflict (see Tables S5-S7).

Furthermore, the tests of the strength model's predictions make it clear that this is not a volitional lapse. They were not due to the reduced effectiveness of self-control attempts. If anything, the effect was actually more apparent when participants did *not* exert self-control. In the Study 1 simple slope analyses of the strength model's predictions, initial self-control only significantly predicted desire-enactment in the absence of a self-control attempt. Beyond this, initial self-control attempts were not related to later self-control success in Study 2, and this variable refers only to the successful resistance of problematic temptations. Such evidence is far

from definitive, but it suggests that the answer may lie elsewhere.

As such, the results may support the fourth prediction from Inzlicht and Schmeichel's (2012) process model. Initial self-control may lead to a shift of attention toward desire-enactment. In a similar vein, Hofmann and van Dillen (2012) suggest that desires sometimes "hijack" working memory resources, leading a person to intentionally pursue desire-satisfaction. Let us return to the college student from our opening example. After a day of effortful dieting, she may have shifted her conscious efforts to instant gratification—specifically by getting drunk. This is subtly but importantly different from a motivational explanation. Our student did not *desire* drunkenness more. Instead, she *invested more effort* to satisfy this desire. The current research does not directly support this account, of course, as prohedonic effort was not measured. Future research is needed to investigate this directly.

If this is the case, then two interesting questions arise. First, what triggers this shift of cognitive resources to desire-satisfaction? Several theories suggest that different desires and goals compete for access to attention (Hofmann & van Dillen, 2012; Kavanagh, Andrade, & May, 2005) and control over behavioral decisions (Berkman, Kahn, & Livingston, 2016). Cognitions that license and justify enactment may allow desires to "win" this competition. This may include assessment of sufficient progress toward long-term goals (Hofmann & van Dillen, 2012), assessments of sufficient or excessive effort investment (Hockey, 2013; Kivetz & Simonson, 2002), or beliefs that continued self-control exertion is impossible (Job et al., 2015). Beyond this, a second question concerns how adaptive these shifts are. If they are delayed until desires are no longer problematic (e.g., do not drink alcohol till after the exam), this could be considered an adaptive way of balancing long-term goals with immediate gratification. If it encourages the enactment of problematic temptations, this would remain problematic.

The Elicitation and Consequences of Subjective Fatigue

Past researchers have debated whether subjective fatigue is necessary for self-control lapses, with some results indicating it is (e.g., Clarkson et al., 2010) and others suggesting it is not (e.g., Vohs, Glass, Maddox, & Markman, 2011). The current studies provide an intriguing answer to this question. One type of self-control lapse (reviewed in the previous section) appears to function independently of fatigue. The second type, however, necessarily involves fatigue. Thus, the elicitation of fatigue may be essential for producing self-control lapses in some circumstances and entirely unnecessary under other circumstances.

What then are the circumstances which elicit fatigue-based self-control lapses? In Studies 1 and 2, desire–goal conflicts appeared to elicit fatigue, as initial reports of conflict predicted ensuing increases in fatigue (cf. Milyavskaya & Inzlicht, 2017). Returning to our opening example, the conflict between our student's health goals and snacking desire may have made her feel fatigued. Prior accounts of self-control lapses have certainly suggested that motivational conflict plays a critical role (Baumeister & Vohs, 2007). However, they suggest that conflict triggers later lapses precisely because it motivates the initial exertion of self-control. What is unique about the current data (and that of Milyavskaya & Inzlicht, 2017) is that it suggests motivational conflict elicits fatigue *independently of self-control exertion.*

Under what circumstances will fatigue-based lapses be apparent? The current data suggest that fatigued individuals are more likely to display a volitional self-control lapse, enacting desires even when they attempt to resist them. Because our college student felt fatigued, she may have been unable to successfully control her desires for alcohol. However, the pattern from Study 2 was complex and did not exactly replicate Study 1. Thus, there is only modest evidence for the replicability of this effect currently. Nonetheless, Study 2 appeared to indicate that fatigue's effects can be overcome with sufficient effort, and future research should examine this effect more fully.

How can these effects be explained theoretically? Again, we can make no strong claims, as these effects emerged from exploratory analyses. Nonetheless, the combination of the two effects constrains theorizing considerably. Accordingly, we offer preliminary suggestions in the hope they will guide subsequent research.

Building on the resource-competition theories mentioned above (Berkman et al., 2016; Hofmann & van Dillen, 2012), we propose that when different goals and desires conflict, each may capture a share of a person's cognitive resources. This division of resources may be subjectively perceived as cognitive fatigue. As the long-term goal has captured some resources, self-control attempts can still be made. Our college student can try to resist alcohol. Because fewer resources are available, however, they are less effective. She may fail to resist alcohol precisely because her cognitive resources are split between dieting goals, eating-enjoyment desires, studying goals, and social-drinking desires. According to this view, the resources needed for self-control do not deplete or shrink with use. Instead, they are sometimes divided toward multiple, conflicting ends, and this renders self-control attempts ineffective (cf. Kurzban et al., 2013).

We find this account intriguing, and it provides a parsimonious explanation for both the antecedents and consequences of fatigue. It can even explain why effort may help people overcome fatigue, as it would allow long-term goals to capture sufficient resources to render self-control attempts effective. For now, however, this is only a speculation, which makes sense of our findings. Future research is needed to directly test this account.

Conclusion

In summary, three studies of daily life indicated that initial bouts of self-control do play a role in producing subsequent self-control lapses—but not the role hypothesized by the well-known strength model of self-control. Initial self-control attempts increased subsequent desire-enactment, and this occurred even when (and perhaps *especially* when) the subsequent desires were not resisted. Beyond this, desire–goal conflict appears to elicit subjective fatigue, and volitional self-control-lapses were more likely to occur under conditions of fatigue. We offer preliminary proposals to explain these effects. We encourage future research seeking to further test these effects' reliability and our preliminary theoretical explanations of them (among other possible explanations).

Acknowledgments

We would like to thank Wilhelm Hofmann for providing effect size estimates used in our Study 1 power analysis, and Marina Milyavskaya for suggestions regarding the analyses. Data for these studies are available at https://osf.io/q9c8y/.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Notes

1. Although some have defined self-control more narrowly as effortful inhibition, they nonetheless suggest that effortful inhibition is merely a tool in service of one's long-term goals when they conflict with more immediate desires (e.g., Baumeister & Vohs, 2007).
2. Other alternatives to the strength model have also been proposed (e.g., Inzlicht, Schmeichel, & Macrae, 2014; Kurzban, Duckworth, Kable, & Myers, 2013). However, they do not produce clear predictions that can be straightforwardly operationalized in the daily self-control framework. Thus, we do not focus explicitly upon them here.

Supplemental Material

Supplementary material is available online with this article.

References

Baumeister, R. F., & Vohs, K. D. (2007). Self-regulation, ego depletion, and motivation. *Social and Personality Psychology Compass*, *1*, 115-128.

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

Berkman, E. T., Kahn, L. E., & Livingston, J. L. (2016). Valuation as a mechanism of self-control and ego depletion. In E. R. Hirt, J. J. Clarkson, & L. Jia (Eds.), *Self-regulation and ego-control* (pp. 255-279). San Diego, CA: Academic Press.

Boksem, M. A. S., Meijman, T. F., & Lorist, M. M. (2006). Mental fatigue, motivation and action monitoring. *Biological Psychology*, *72*, 123-132.

Carter, E. C., Kofler, L. M., Forster, D. E., & McCullough, M. E. (2015). A series of meta-analytic tests of the depletion effect: Self-control does not seem to rely on a limited resource. *Journal of Experimental Psychology: General*, *144*, 796-815.

Carter, E. C., & McCullough, M. E. (2014). Publication bias and the limited strength model of self-control: Has the evidence for ego depletion been overestimated? *Frontiers in Psychology*, *5*, Article 823.

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

Danziger, S., Levav, J., & Avnaim-Pesso, L. (2011). Extraneous factors in judicial decisions. *Proceedings of the National Academy of Science*, *108*, 6889-6892.

Emmons, R. A., & King, L. A. (1988). Conflict among personal strivings: Immediate and long-term implications for psychological and physical well-being. *Journal of Personality and Social Psychology*, *54*, 1040-1048.

Finkel, E. J., Eastwick, P. W., & Reis, H. T. (2015). Best research practices in psychology: Illustrating epistemological and pragmatic considerations with the case of relationship science. *Journal of Personality and Social Psychology*, *108*, 275-297.

Fujita, K. (2011). On conceptualizing self-control as more than the effortful inhibition of impulses. *Personality and Social Psychology Review*, *15*, 352-366.

Funder, D. C., Levine, J. M., Mackie, D. M., Morf, C. C., Sansone, C., Vazine, S., & West, S. G. (2014). Improving the dependability of research in personality and social psychology: Recommendations for research and educational practice. *Personality and Social Psychology Review*, *18*, 3-12.

Gunia, B. C., Barnes, C. M., & Sah, S. (2014). The morality of larks and owls: Unethical behavior depends on chronotype as well as time of day. *Psychological Science*, *25*, 2272-2274.

Hagger, M. S., Chatzisarantis, N. L. D., Alberts, H., Anggono, C. O., Batailler, C., Birt, A. R., & Zwienenberg, M. (2016). A multilab preregistered replication of the ego-depletion effect. *Perspectives on Psychological Science*, *11*, 546-573.

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

Hockey, R. (2013). *The psychology of fatigue: Work, effort, and control*. Cambridge, UK: Cambridge University Press.

Hockey, R., & Earle, F. (2006). Control over the scheduling of simulated office work reduces the impact of workload on mental fatigue and task performance. *Journal of Experimental Psychology: Applied*, *1*, 250-265.

Hofmann, W., Baumeister, R. F., Forster, G., & Vohs, K. D. (2012). Everyday temptations: An experience-sampling study of desire, conflict, and self-control. *Journal of Personality and Social Psychology*, *102*, 1318-1335.

Hofmann, W., & Kotabe, H. (2012). A general model of preventive and interventive self-control. *Social and Personality Psychology Compass*, *6*, 707-722.

Hofmann, W., & van Dillen, L. (2012). Desire: The new hot spot in self-control research. *Current Directions in Psychological Science*, *21*, 317-322.

Hofmann, W., Vohs, K. D., & Baumeister, R. F. (2012). What people desire, feel conflicted about, and try to resist in everyday life. *Psychological Science*, *23*, 582-588.

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

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

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

Job, V., Walton, G. M., Bernecker, K., & Dweck, C. S. (2015). Implicit theories about willpower predict self-regulation and grades in everyday life. *Journal of Personality and Social Psychology*, *108*, 637-647.

Kaplan, D., & Depaoli, S. (2012). Bayesian structural equation modeling. In R. H. Hoyle (Ed.), *Handbook of structural equation modeling* (pp. 650-673). New York, NY: Guilford Press.

Kavanagh, D. J., Andrade, J., & May, J. (2005). Imaginary relish and exquisite torture: The elaborated intrusion theory of desire. *Psychological Review*, *112*, 446-467.

Kivetz, R., & Simonson, I. (2002). Earning the right to indulge: Effort as a determinant of customer preferences toward frequency program rewards. *Journal of Marketing Research*, *39*, 155-170.

Kouchaki, M., & Smith, I. H. (2014). The morning morality effect: The influence of time of day on unethical behavior. *Psychological Science*, *25*, 95-102.

Kurzban, R., Duckworth, A., Kable, J. W., & Myers, J. (2013). An opportunity cost model of subjective effort and task performance. *Behavioral and Brain Sciences*, *36*, 661-679.

Milyavskaya, M., & Inzlicht, M. (2017). What's so great about self-control? Examining the importance of effortful self-control and temptation in predicting real-life depletion and goal attainment. *Social Psychological and Personality Science*, *8*, 603-611.

Muraven, M., Collins, R. L., Shiffman, S., & Paty, J. A. (2005). Daily fluctuations in self-control demands and alcohol intake. *Psychology of Addictive Behaviors*, *19*, 140-147.

Nezlek, J. B. (2008). An introduction to multilevel modeling for social and personality psychology. *Social and Personality Psychology Compass*, *2*, 842-860.

Preacher, K. J., Curran, P. J., & Bauer, D. J. (2006). Computational tools for probing interaction in multiple linear regression, multilevel modeling, and latent curve analysis. *Journal of Educational and Behavioral Statistics*, *31*, 437-448.

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (2nd ed.). Thousand Oaks, CA: SAGE.

Redden, J. P. (2015). Desire over time: The multi-faceted nature of satiation. In W. Hofmann & L. F. Nordgren (Eds.), *The psychology of desire* (pp. 82-103). New York, NY: Guilford Press.

Riediger, M., & Freund, A. M. (2004). Interference and facilitation among personal goals: Differential associations with subjective well-being and persistent goal pursuit. *Personality and Social Psychology Bulletin*, *30*, 1511-1523.

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

Vohs, K. D., Baumeister, R. F., & Schmeichel, B. J. (2012). Motivation, personal beliefs, and limited resources all contribute to self-control. *Journal of Experimental Social Psychology*, *48*, 943-947.

Vohs, K. D., Glass, B. D., Maddox, W. T., & Markman, A. B. (2011). Ego depletion is not just fatigue: Evidence from a total sleep deprivation experiment. *Social Psychological and Personality Science*, *2*, 166-173.

Wagenmakers, E.-J. (2007). A practical solution to the pervasive problems of p values. *Psychonomic Bulletin and Review*, *14*, 779-804.

Wang, J., Novemsky, N., Dhar, R., & Baumeister, R. F. (2010). Trade-offs and depletion in choice. *Journal of Marketing Research, XLVII*, 910-919.

Webb, T. L., & Sheeran, P. (2003). Can implementation intentions help to overcome ego-depletion? *Journal of Experimental Social Psychology*, *39*, 279-286.

Wilkowski, B. M., & Ferguson, E. L. (2016). The steps that can take us miles: Examining the short-term dynamics of long-term daily goal pursuit. *Journal of Experimental Psychology: General*, *145*, 516-529.