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Self-Regulation and the Extended Now: Controlling the Self Alters the Subjective Experience of Time

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These studies investigated self-regulation and subjective experience of time from the perspective of the regulatory resource model. Studies 1–2 showed that participants who were instructed to regulate their emotions while viewing a film clip perceived that the film lasted longer than participants who did not regulate their emotions. In Study 3, participants provided time estimates during a resource-depleting or nondepleting task. Subsequent task persistence was measured. Time perceptions mediated the effect of initial self-regulation on subsequent self-regulated performance. In Study 4, participants performed either a resource-depleting or a nondepleting thought-listing task and then performed a different regulatory task. Compared with nondepleted participants, depleted participants persisted less on the 2nd task but estimated that they had persisted longer. Subjective time estimates statistically accounted for reduced persistence after depletion. Together, results indicate people believe that self-regulatory endeavors last overly long, a belief that may result in abandonment of further self-control.

> Put your hand on a hot stove for a minute, and it seems like an hour. Sit with a pretty girl for an hour, and it seems like a minute. THAT'S relativity.
>
> —Albert Einstein

Although Einstein's statements were meant to illustrate his concept of relativity, he also reminds us that the experience of time is subjective, and it can differ by situation. We were especially interested in Einstein's first observation, which, stated more generally, suggests that regulating the self can elongate the felt duration of time. In the present research, we hypothesized that effortful self-regulation would lead to extended perceptions of the duration of a self-regulatory task and that elongated time perceptions would result in reduced efforts to self-regulate subsequently. Across four studies, we found support for these hypotheses, evidence that contributes to understanding the conditions that hinder people's obtainment of self-regulatory goals.

Each day, people engage in multiple attempts to change, alter, or otherwise modify the self. The broad theoretical framework of self-regulation can be applied to understanding the factors that help and hinder people's ability to change the self. Self-regulation is involved in a variety of tasks, including getting up early to exercise, averting attention away from a tempting distraction, and stifling a giggle. We define self-regulation as operations by the self to alter its own habitual or unwanted responses to achieve a conscious or nonconscious goal. The processes typically encompassed in self-regulation include the modification of an undesired response; the replacement of an undesired response with a desired response; and most forms of inhibition, in which the occurrence of a response is repressed.

Not incidentally, several temporal processes underlie people's attempts at self-regulation, such as *time duration* ("How long has it been?"), *time orientation* ("Am I focused on the present or the future?"), and *intertemporal choice* ("Which option is better for me now versus later?"). The current research investigated subjective duration judgments ("How long has it been?") as affected by and as determining self-regulatory efforts.

Although time can be studied from a macrocosmic approach, such as predicting self-regulation from global time orientation (e.g., present vs. future focused), time and self-regulation can also be studied with a more microcosmic lens, through differences in perceived duration. It is this aspect of temporal processes in which we are most interested because we believe that duration judgments play an important role in people's decisions (implicit or explicit) regarding self-regulatory efforts.

What aspect of self-regulation would be most affected by subjective duration? If one considers an act of self-regulation to have two components—the initiation of the regulatory response and the maintenance of that response—it seems that self-regulatory maintenance would be most influenced by duration judgments. Given that the maintenance of self-regulated behavior must occur over time, we hypothesized that subjective time perception would be most crucial in the maintenance of self-regulation. We invoke a self-regulatory resource model to derive our predictions regarding

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the effects of initial self-regulation and the effects of elongated time perception on subsequent self-regulation.

A Self-Regulatory Resource Approach

There are many accounts for why people fail at self-regulation (e.g., Metcalfe & Mischel, 1999; Polivy & Herman, 2002; Rothman, 2000), and the model from which we work points to lack of self-regulatory resources as one such reason. This model views the ability to move oneself toward a self-regulatory goal as resulting from a generalized resource that allows people to control impulses and desires (Baumeister & Heatherton, 1996; Heatherton & Baumeister, 1996). We refer to this theory as the self-regulatory resource model or the resource-depletion model. In cybernetic terms, the self-regulatory resource approach focuses on the "operate" phase of the test-operate-test-exit (TOTE) loop (e.g., Carver & Scheier, 1982). In this article, we follow the practice of using the terms *self-regulation* and *self-control* interchangeably (Baumeister & Vohs, 2003).

According to the resource-depletion model, self-regulatory ability can be temporarily depleted or fatigued by self-control demands, such as when people try to resist temptation or control their emotions (e.g., Vohs & Heatherton, 2000). When engaged in a self-regulatory task, regulatory resources become depleted and remain depleted for some period afterward. According to the theory, an initial act of self-regulation is followed by a period of poorer self-regulatory ability, presumably due to a hangover effect of reduced regulatory resources. This postulate has been confirmed empirically in research using a two-task paradigm in which participants perform either a self-regulatory task (e.g., watching a video while engaging in emotion control) or a nonregulatory control task (e.g., viewing the same video without engaging in emotion control); afterward, all participants perform a second, target task that requires self-regulation. Self-regulatory resource depletion is evident when participants in the initial self-regulation group perform worse on the second regulatory task relative to participants who initially did not engage in self-regulation. Results from almost 20 studies (e.g., Baumeister, Bratslavsky, Muraven, & Tice, 1998; Muraven, Tice, & Baumeister, 1998; Schmeichel, Vohs, & Baumeister, 2003; Vohs, Ciarocco, & Baumeister, 2003; Vohs & Heatherton, 2000) have demonstrated these resource-depletion effects.

Research on self-regulatory resources has largely focused on establishing the parameters and utility of the model. Consequently, research on the self-regulatory resource model has not yet examined possible mechanisms of resource depletion. That is, the self-regulatory resource model does not address why engaging in self-regulation leads to diminished self-regulatory capacities subsequently, except to say that self-regulatory resources are depleted. The current studies investigated the hypotheses that after a self-regulatory task, people will overestimate its duration and, further, that perceiving that much time has passed will lead to reduced self-regulatory efforts. We used a paradigm in which participants engaged in regulatory or nonregulatory tasks initially and then estimated the duration of their respective task. We predicted that the former group would perceive the duration of their behavioral acts as longer than the latter. Self-regulators were also expected to show the typical research depletion pattern of impaired self-regulation subsequently. Furthermore, we hypothesized that longer duration estimates would statistically account for the depletion effect, such that having engaged in a self-control act initially (as opposed to not having engaged in an initial act of self-control) would lead to longer duration estimates and also result in poorer subsequent self-regulation.

Self-Regulation Changes the Perception of Time

Our prediction that regulatory acts will produce longer time estimates than nonregulatory acts follows from the idea that self-regulation brings about an attention to time that is absent in nonregulatory situations. Because people who are self-regulating tend to monitor their behavior (Baumeister, Heatherton, & Tice, 1994), they are likely to be attuned to the passage of time ("How long has it been?"). These monitoring responses and resultant attention to time are not found among people who are not regulating. Stated simply, it is likely that the act of self-regulation is associated with close attention to time.

Attention to time is also a central feature of tasks that produce longer time estimates. In the duration judgment literature, both retrospective and prospective methods are used to assess time perception. In the former, participants are asked after an episode has passed to estimate the length of that episode. In the latter, participants are told prior to an episode that they will be asked to render a duration judgment about the time period that they are about to experience (see Block & Zakay, 1997; Zakay & Block, 1997). A meta-analysis of the two methods points to a reliable difference in length of prospective and retrospective time estimates, indicating that prospective time estimates consistently produce longer time estimates than retrospective time estimates (see Block & Zakay, 1997).

One primary reason for this difference is that in the prospective time-estimation paradigm, participants are much more aware of time than are participants in the retrospective time-estimation paradigm. Although we were interested in only retrospective time estimates (i.e., looking back on an episode to determine how long it lasted), we took this finding regarding the differences in prospective versus retrospective time estimates and applied it to the idea that being in a regulatory task leads people to attend closely to time. Consequently, longer retrospective duration judgments are likely to be found among regulators (who are time aware) as compared with nonregulators (who are not time aware).

Self-Regulation Maintenance May Especially Depend on Subjective Duration Judgments

Behavioral scientists and people who have tried to break undesirable habits know quite well that continuing self-regulatory behaviors is quite difficult. The difficulty of successful self-regulation maintenance is reflected in the disheartening data on success at weight loss and smoking cessation, which indicate that any given attempt to lose weight or quit smoking is largely unsuccessful (e.g., NIH Technology Assessment Conference Panel, 1993; Schachter, 1982). As outlined recently by Polivy and Herman (2002), these failures occur not because people do not start their diets or make earnest attempts to quit smoking but rather because people cannot seem to adhere to new self-change schedules. Hence, maintenance of self-regulatory behaviors appears to be a significant failing point for many attempts at self-control.

Demonstrating the factors that affect the tendencies to continue or quit regulating is therefore crucial to gaining a better understanding of this troublesome and elusive aspect of self-change.

Why would self-regulation maintenance be affected by perceptions of time? We suggest two possibilities. One possibility is that people have an implicit or explicit goal regarding how much time they will spend on a given self-control task. Elongated perception of time passage, then, would signal that this threshold has been reached prematurely, resulting in earlier disengagement from the regulatory task.

A second reason centers on the idea that elongated perceptions of time may render one "stuck" in the present, a state that has negative consequences for future-oriented behavior. When the subjective experience of time is elongated, each moment is drawn out and the present feels longer than it would normally. We call this subjective feeling an *extended-now* state and postulate that being in an extended-now state leads people to lose focus on the future and instead become engulfed by the present. The extended-now state would likely narrow attention such that current feelings, thoughts, impulses, urges, and desires would be given extra weight, whereas distal (or even near-future) goals, ambitions, or plans would seem less consequential. Accordingly, current behavior would likely be a function of immediate desires and simple stimulus-response patterns and not deliberate, guided actions toward some future goal.

This thesis is consonant with two recent theories that have implications for self-regulation failure, one from the animal literature and one on global time orientation. In a provocative article, "Are Animals Stuck In Time?" Roberts (2002) concluded that nonhuman animals are trapped in the present, unaware of the past or the future. Animal behaviors that may appear to contain elements of past or future thought are, in actuality, fixed-action patterns designed to increase survival. For instance, studies assessing whether animals plan for the future, such as whether they might make a tool to use tomorrow to get food, have shown that animals make tools only to satisfy a currently experienced need. Likewise, animals' hoarding behavior does not reflect future orientation, as evidenced by research in which animals' food caches are pilfered, yet subsequent hoarding behavior remains unchanged. In a section devoted specifically to studies of animal self-control, researchers have failed to find evidence that animals delay gratification; instead, animals consistently prefer a smaller, immediate reward over a larger, delayed reward. Moving to the human literature, Zimbardo and colleagues (Zimbardo & Boyd, 1999) examined individual differences in the tendency to orient toward the past, present, or future. This research found that present orientation predicted self-regulatory problems such as cigarette smoking, alcohol and drug use, driving fast, taking extreme chances while driving, and driving after imbibing alcohol (Keough, Zimbardo, & Boyd, 1999; Zimbardo, Keough, & Boyd, 1997). Thus, it may be that the extended-now, present-focused experience is a common component of many varieties of self-regulation failure, both in human and nonhuman animals.

Resource-Depletion and Extended-Now Hypotheses

To integrate our predictions, we propose the following line of reasoning about the interplay between time perception and self-regulatory resource depletion. Following from prior research on self-regulation (e.g., Schmeichel et al., 2003; Vohs & Heatherton, 2000), we expected that self-regulation would lead to subsequent decrements in self-regulatory resources. Following from extant self-regulation literature (see Baumeister et al., 1994), we hypothesized that self-regulation would also promote a closer attention to time. Paying close attention to time creates the experience of an elongated perception of time (Block & Zakay, 1997). Accordingly, we proposed that the result of engaging in self-regulation, relative to not engaging in self-regulation, would be a sense that present time is extended. This extended-now state is postulated to increase the salience of current thoughts, emotions, impulses, and desires to the detriment of longer term, abstract goals. In short, we posit that an extended-now state, which is the subjective feeling of elongated duration, can provide a mechanism for the resource-depletion finding that initial self-regulation leads to self-regulation decrements. When one is depleted, durations seem longer, and the present becomes prolonged; current impulses overshadow goal-oriented responses, increasing the likelihood of ensuing self-regulation failure.

Theoretical and Prediction Summary

We were interested in understanding self-regulation as a function of regulatory resource depletion and time perceptions. Working from a resource model of self-regulation, we predicted that engaging in self-regulation, as opposed to not engaging in self-regulation, would drain regulatory resources and lead to poorer self-regulatory performance on a subsequent task. We also predicted that engaging in self-regulation would result in longer retrospective estimates of task duration. This prediction is derived from the notion that self-regulation is associated with close attention to time. We postulated that time awareness among self-regulators would lead to an extended-now state, a state that involves overestimating subjective duration, being bogged down in the present, and being less cognizant of the future, which consequently leads people to forgo self-regulatory efforts in favor of immediate wishes and desires. In short, we hypothesized that initial self-regulation would result in an overestimation of the amount of time passed (because of increased time salience), a state that would lead to poorer self-regulation.

The Current Studies

In four studies, we assessed time perception after engaging in regulatory versus nonregulatory tasks. In Study 1, participants were instructed to exaggerate or suppress their internal and external emotional reactions to a sad film or were not given any emotion-relevant instructions. After the film, participants provided estimates of the film's length as a representation of the subjective duration of the task. Study 2 used a similar approach, in which participants were instructed prior to watching a sad and sometimes gruesome film to either suppress their emotional reactions or engage in emotional reappraisal (Gross, 1998); participants in a third condition were not given emotion-control instructions. Time estimates of the film's length were again collected. In both Studies 1 and 2, we hypothesized that having engaged in self-regulation (i.e., the suppression or exaggeration conditions), as compared with not engaging in self-regulation (i.e., the no-instruction or

reappraisal conditions), would predict longer estimates of the film's length.

Studies 3 and 4 tested the full process model, which predicted that engaging in tasks that use self-regulatory resources, compared with tasks that do not use self-regulatory resources, would result in perceptions that the behavioral act lasted much longer. Further, these studies aimed to show that believing that the self-regulatory task lasted overly long diminishes later self-regulatory efforts and that later self-regulatory efforts would also seem overly long. In Study 3, we used an emotional-behavior manipulation (i.e., instructing participants to emote while reading aloud boring historical biographies vs. asking participants to simply read aloud the same narratives without instructions to emote), which was interrupted at a set time to gauge time perception. Participants were then allowed to continue with the read-aloud task until they were unable to go on, with time spent continuing the task representing subsequent self-regulation. In Study 4, we first manipulated self-regulatory resource availability using a mental control task (i.e., using instructions to suppress thoughts of a white bear vs. no instructions) and then asked participants to perform a self-regulatory task in an unrelated domain. In this study, the measure of subsequent self-regulatory capacity was differences in breath-holding ability, as assessed from pre- to postmanipulation. We assessed duration judgments by having participants estimate how long they had held their breath during the second assessment. We hypothesized that being in a state of depletion after the initial thought-suppression task would lead participants both to underperform on the second breath-holding measurement and to also overestimate the amount of time they held their breath, relative to their nondepleted counterparts.

Note that the duration estimates in Study 4 were provided for the target task that we expected to show resource-depletion effects (i.e., the dependent measure of subsequent self-regulatory ability), whereas the duration estimates in Studies 1–3 were provided for the initial, depleting self-regulatory act. Thus, duration judgments and the extended-now state should carry over to a subsequent task, to the extent that the first or second (or both) tasks require self-regulatory responses. Because we assessed both time perception and self-regulatory ability in Studies 3 and 4, we were able to test the hypothesis that longer duration estimates statistically mediate the classic depletion finding that an initial self-regulatory task impairs subsequent self-regulatory ability.

Study 1

As the first test of our hypotheses, we used a self-regulation manipulation that has been shown in past research to consume regulatory resources. In Study 1, female participants were asked to regulate their emotional and expressive responses to a clip from the film *Terms of Endearment* (Brooks, 1983), which shows a dying mother saying good-bye to her children, husband, and mother. Previous research using this film clip (Vohs & Heatherton, 2000) has shown that because all participants were exposed to the same sad scenes, differential ability to subsequently self-regulate was a function only of regulatory instructions and not of mood (indeed, there were no significant mood differences between the groups). This finding indicates that the act of controlling one's emotions, and not the emotions themselves, led to diminished self-control capacity.

In the current study, participants were asked to suppress or exaggerate their emotional responses or were given no emotion-control instructions (see Muraven et al., 1998; Vohs & Heatherton, 2000). Subsequently, participants were asked to estimate the length of the film clip. We hypothesized that participants who were asked to regulate their emotions (i.e., both the exaggerate- and suppress-emotions conditions) would have the subjective experience that the film clip lasted longer than those not asked to control their emotions (i.e., the act-natural condition). Because we used a manipulation of self-regulation that has been shown to lead to later decrements in self-regulation, a parallel set of findings regarding time perception would be consistent with a mechanistic explanation for regulatory depletion.

Method

Participants. Forty-four female Introductory Psychology students participated in exchange for partial course credit. Data from 5 participants were discarded because they expressed knowledge or awareness that the experiment concerned the passage of time.

Procedure. The experimenter explained that participants would be engaging in a variety of tasks that assess different psychological mechanisms. He asked participants to "remove any jewelry (rings, watches, necklaces) you may be wearing" to guard against the possibility that participants would monitor the length of the video. This instruction was used in all studies reported herein and is common in research on the passage of time (for a review, see Block & Zakay, 1997).

Participants were then told that they would be watching a short film clip. The experimenter read one of three viewing instructions to manipulate participants' regulatory efforts (see Muraven et al., 1998; also Vohs & Heatherton, 2000). Participants in the suppress-emotion condition were asked to

> remain completely neutral on the inside and out. Please try your best not to let any feelings or responses you may have show on your face, and to the best of your ability, try to keep all of your internal reactions suppressed.

Participants in the natural-emotion condition were asked to be "as natural as possible, both on the inside and out. If you have any feelings or reactions to the movie, let them flow naturally." Participants in the exaggerate-emotion condition were asked to

> express your feelings as much as possible, both on the inside and out. Please try your best to show all of your feelings and responses in your facial expressions, and, to the best of your ability, try to feel internally, to the utmost, all of your emotional reactions.

All participants were seated approximately 3 feet in front of a video camera in full view that, they were told, would be recording them while watching the video "for record-keeping purposes." This videotape record of participants served as a manipulation check of participants' compliance with viewing instructions.

Participants viewed an 11-min 23-s clip of the film *Terms of Endearment*, after which participants completed a mood scale as a second manipulation check (Positive and Negative Affect Schedule [PANAS]; Watson, Clark, & Tellegen, 1988). After completing the PANAS, participants provided the primary dependent measure of time perception by estimating the length of the video clip in minutes and seconds. Participants also provided confidence judgments of their duration estimate on a scale ranging from 1 (*not at all confident)* to 7 (*extremely confident*) and subsequently completed a postexperimental questionnaire. Last, participants were debriefed and thanked.

Results

Manipulation checks. Several manipulation checks indicated that the instructions had their intended effects. First, all participants correctly described on the postexperimental questionnaire the instructions they were given prior to watching the film clip.

Second, facial expressions as recorded on videotape were coded for intensity using a coding system (see Vohs & Heatherton, 2000) in which a coder who was blind to condition rated participants' facial expressiveness. Facial expression codings were used to represent a measure of adherence to experimental instructions. Because of technical difficulties related to the videotapes of participants watching the film (i.e., all participants were videotaped, but some of the tapes were later found to be unreadable), we do not have facial expression data on all participants. On those participants for whom data were available (approximately 65% of the total participants), we tested the effect of instructions on ratings of expressiveness. Raters judged the expressiveness of participants' facial expressions on a scale from 1 (*not at all expressive*) to 7 (*very expressive*) at three different points during participants' viewing of the video. All three facial codings were averaged to form the facial expressiveness manipulation check. Analysis of variance (ANOVA) revealed an overall effect of instructions, $F(2, 26) = 6.25$, $p < .01$, $\eta_{p^2} = .33$. Participants in the exaggerate-emotions condition were more facially expressive ($M = 4.67$, $SD = 1.41$) than those in the act-natural condition ($M = 2.38$, $SD = 1.71$), $t(26) = 3.41$, $p < .01$, $d = 1.33$, and those in the suppress-emotions condition ($M = 2.86$, $SD = 1.21$), $t(26) = 2.70$, $p < .02$, $d = 1.06$; the latter two groups were not different from each other, $t(26) < 1$.

Third, participants were asked to rate how difficult it was to follow the instructions on a scale from 1 (*not at all difficult*) to 9 (*extremely difficult*). They were also given a self-report manipulation check of our instructions. As expected, participants in the suppress- and exaggerate-emotions conditions reported that following the instructions was more difficult than participants asked to act naturally, $F(2, 38) = 9.17$, $p < .001$, $\eta_{p^2} = .34$ ($M_{\text{suppress}} = 4.21$, $SD = 2.58$; $M_{\text{exaggerate}} = 4.77$, $SD = 1.83$; $M_{\text{act natural}} = 1.67$, $SD = 0.78$). Last, it was necessary to determine whether our self-regulation manipulation differentially affected participants' mood states as measured by the PANAS (Watson et al., 1988). Given that previous research (Baumeister et al., 1998; Vohs & Heatherton, 2000) has consistently found no mood effects of self-regulation manipulations, we also expected no mood differences as a function of condition. This expectation was supported: The groups did not differ on self-reported positive affect (PA) and negative affect (NA), $F(2, 38) = 1.11$, $p > .34$, $\eta_{p^2} = .06$, and $F(2, 38) = 1.91$, $p > .16$, $\eta_{p^2} = .10$, respectively (for PA: $M_{\text{exaggerate}} = 21.77$, $SD = 5.43$; $M_{\text{suppress}} = 22.64$, $SD = 6.02$; $M_{\text{act natural}} = 19.58$, $SD = 4.23$; for NA: $M_{\text{exaggerate}} = 19.46$, $SD = 6.15$; $M_{\text{suppress}} = 15.93$, $SD = 3.99$; $M_{\text{act natural}} = 16.50$, $SD = 4.62$). In sum, these analyses indicate that the amount of self-regulation required during the film was effectively manipulated.

Self-regulation condition predicting time perception. Our focus was on participants' perceptions of the amount of time that had elapsed during regulatory versus nonregulatory tasks. Participants were asked to estimate the length of the film clip, a rating that represented perceptions of time passage. We predicted that participants who regulated their emotions (i.e., the exaggerate- and suppress-emotions conditions) would perceive the length of the film clip as longer than those not asked to control their emotions (i.e., the act-natural condition).

To test for relative differences in time perception among conditions, we conducted a one-way ANOVA using condition as the predictor variable. The dependent measure was the ratio of subjective duration to objective duration, in accordance with standards from the time-perception literature (e.g., Block & Zakay, 1997). A ratio of 1.0 indicates perfect estimation of duration, whereas ratios higher than 1.0 indicate overestimation and ratios lower than 1.0 indicate underestimation of duration. The results from this analysis supported our hypothesis, $F(2, 38) = 7.22$, $p < .01$, $\eta_{p^2} = .29$. Participants in both the exaggerate-emotions condition ($M = 1.25$, $SD = 0.26$) and suppress-emotions condition ($M = 1.10$, $SD = 0.25$) rated the length of the film clip as longer than those in the act-natural condition ($M = 0.89$, $SD = 0.19$). Planned comparisons confirmed that there were significant differences between the suppress-emotions and act-natural conditions, $t(38) = 1.91$, $p = .06$, $d = 0.62$, as well as the exaggerate-emotions versus act-natural conditions, $t(38) = 3.27$, $p < .01$, $d = 1.06$. Further, and as expected, there were no significant differences between the suppress-emotions and exaggerate-emotions conditions, $t(38) = 1.36$, $p > .18$, $d = 0.44$. Figure 1 represents these results graphically.

Following the time estimate, participants were asked to report how confident they were in their time estimate. Self-reported confidence in the duration estimate was unrelated to condition, $F(2, 38) < 1$, $p > .38$, $\eta_{p^2} = .05$ ($M_{\text{exaggerate}} = 4.67$, $SD = 1.11$; $M_{\text{suppress}} = 4.07$, $SD = 1.28$; $M_{\text{act natural}} = 4.29$, $SD = 1.14$). Thus, participants' confidence of their time estimates was not affected by condition and did not appear to be systematically associated with time perceptions.

Discussion

In Study 1, we assessed estimates of time after participants had engaged in regulatory or nonregulatory tasks related to controlling

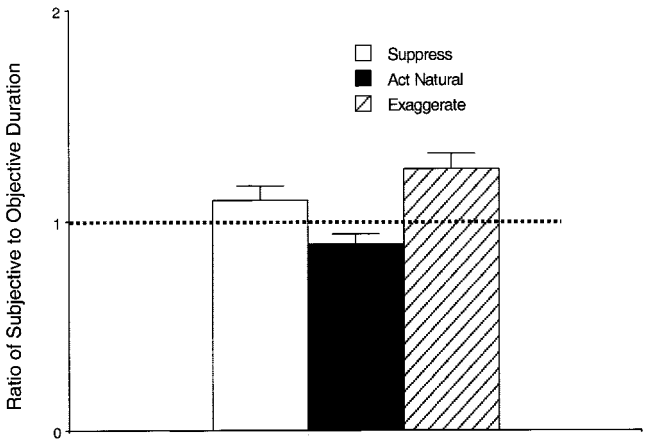

Figure 1. Mean ratio of subjective to objective time, Study 1. Bars represent mean ratio of time estimates by condition, which were computed by dividing participants' estimates of the film's length (subjective time) by the film's actual length (objective time). Error bars represent standard error of the mean for each condition.

emotions. Participants who had either exaggerated or suppressed their emotions during a sad film clip perceived that the film clip had lasted longer than had participants who were told to act naturally during the film.

The results of our first experiment were consistent with the idea that engaging in self-regulation skews perceptions of duration. Specifically, self-regulators experienced an extended-now state, which made the duration of the experimental task feel longer than it actually was. Because this paradigm has been used previously to differentially deplete self-regulatory resources, which in turn result in differential self-regulatory abilities for an ensuing task, we are encouraged with respect to the hypothesized links among reduced self-regulatory resources, distorted time perceptions, and resultant self-regulatory impairment.

Study 2

In Study 2, we adopted a somewhat different manipulation of self-regulation than the method used in Study 1. Consistent with Study 1, we manipulated self-regulatory resource depletion using an emotion-regulation paradigm in which participants were asked to view a film clip while either controlling or not controlling their affective responses. To link our findings to past behavioral work on self-regulation, we asked participants to view a clip from the film *Mondo Cane* (Jacopetti, 1961), which depicts the death of turtles, sea creatures, and other animals because of oil slicks and accompanying environmental devastation. This clip has been used in past research linking differential self-regulatory depletion patterns to viewing this film clip under conditions of emotion regulation versus no regulation (Muraven et al., 1998). Specifically, participants who had viewed this film while attempting to control their emotions, relative to those who had not been given a regulatory goal, showed a greater decrease in ability to squeeze a handgrip exerciser, thus suggesting that their capacity for self-control was compromised after expending regulatory resources.

Because all participants in the Muraven et al. (1998) study viewed the *Mondo Cane* clip, but only those who engaged in emotion control later exhibited impaired self-regulation abilities, our aim was to link the same stimulus in the current study to time-perception differences. Hence, we used methods that have been linked to variations in self-regulatory abilities with the goal of finding parallel patterns of time perception, which would be consistent with the notion that skewed perceptions of time are a possible mechanism for self-regulation failure after self-resource depletion.

A second aim was to extend the results of Study 1 using a somewhat different manipulation to test for differences in time perception, a manipulation that also allowed us to rule out a possible alternate explanation for the results obtained. We varied our manipulation of emotion control by borrowing from Gross's conceptualization of affect regulation (for a review, see Gross, 1998). Specifically, we asked participants to suppress their emotional reactions, act naturally during the film, or engage in reappraisal, a process in which affectively charged scenes are viewed in a detached manner. Gross argued that reappraisal is an effective method of controlling emotions, in part because it does not demand as much regulation as do other methods, such as suppressing one's emotions. In a series of studies, Richards and Gross (1999, 2000) demonstrated this claim empirically by showing that effects associated with emotion control (e.g., memory decrements because of emotion suppression) are absent when participants are given a reappraisal framework within which to view an emotional scene.

Additionally, the reappraisal condition allows us to test an alternate explanation for the results of Study 1. It could be that suppressing or exaggerating emotions led to longer judgments of time because they require more cognitive operations than merely watching the movie and not because participants were engaging in self-regulation per se. This hypothesis would suggest that all cognitively effortful tasks should result in longer time estimates, regardless of whether the task taps self-regulatory resources. We, however, believe that it is effortful self-regulatory tasks—and not only tasks in which people are engaged in information processing—that are prone to time overestimation. In the current study, we tested this hypothesis with an emotion-reappraisal condition, which also requires cognitive processing but does not deplete self-regulatory resources.

In Study 2, participants were given either suppress, reappraisal, or act-natural instructions prior to viewing the film and subsequently were asked to estimate the length of time spent viewing the film. Our predictions for the film length estimates followed from the results of Study 1 and from supportive evidence by Richards and Gross (1999, 2000). We hypothesized that the act-natural and reappraisal conditions would lead to generally accurate perceptions of the length of the film, because these tasks do not call for active self-regulation. In contrast, suppressing one's emotions is difficult and psychically costly, resulting in elongated time perceptions, which could provide an explanation for decreased self-regulation after suppression (e.g., Baumeister et al., 1998; Vohs & Heatherton, 2000). In short, we again set forth the hypothesis that participants who received suppress instructions would perceive the length of the experimental task to be significantly longer than participants in the other two conditions.

Method

Participants. Fifty-four Introductory Psychology students participated in exchange for partial course credit. Thirty-five participants were men, 17 participants were women, and 2 participants did not list their gender. Data from 4 participants were discarded because they asked about the length of the film clip prior to it being started or expressed knowledge or awareness of the experiment's purpose.

Procedure. Participants were greeted in a waiting area and led to a small room. The experimenter asked participants to remove jewelry, including rings, watches, and necklaces, which were kept with the experimenter until the end of the experiment. The experimenter then described that participants would be watching a short film clip and answering questions related to the clip.

The experimenter read one of three sets of viewing directions regarding the film clip. These directions constituted the emotion-regulation manipulation. For the suppress-emotions and act-natural conditions, we used the same instructions as were used in Study 1 (see also Vohs & Heatherton, 2000). For the reappraisal condition, we used instructions taken from Richards and Gross (2000), which ask participants to

> adopt a neutral attitude as you watch the clip. To do this, I would like for you to view the clip with the detached interest of a medical professional . . . try to think about it objectively and analytically rather than as personally.

Participants were then made aware of the video camera in the room and told that they would be videotaped "for record-keeping purposes" while

viewing the clip. The experimenter started the video camera, then the film clip, and exited the room. Participants viewed a 10-min 13-s clip of the film *Mondo Cane* that shows the damaging effects of oil slicks and pollution on animal and sea life. When the clip ended, the experimenter returned to the room and asked participants to complete the PANAS (Watson et al., 1988).

After completing the mood measure, participants were asked to estimate the length of the video clip. Participants also rated their confidence (1 = *not at all confident*; 7 = *extremely confident*) in their time estimate. Participants were then finished with the time-perception aspects of the experiment. After completing a second activity unrelated to time perception, participants completed a postexperimental questionnaire, were debriefed, and thanked.

Results

Manipulation checks. As in Study 1, we asked participants to describe the instructions they were given prior to the film clip. All participants correctly described the condition to which they were assigned. We again asked coders who were blind to experimental condition to judge the intensity of participants' facial expressions while watching the film clip (see Vohs & Heatherton, 2000). Judges rated the expressiveness of participants' facial expressions on a scale from 1 (*not at all expressive*) to 7 (*very expressive*). Analyses of the averaged ratings again provided confirmation that the instructions were effective in manipulating facial expressiveness, $F(2, 47) = 5.33$, $p < .01$, $\eta_{p^2} = .19$, such that participants in the act-natural condition exhibited the most intense facial expressions ($M = 2.93$, $SD = 1.28$), followed by those in the reappraisal ($M = 1.94$, $SD = 1.94$) and suppress-emotions conditions ($M = 1.73$, $SD = 1.73$). The reappraisal and suppress-emotions conditions, which were the two conditions in which participants should have been showing outward control of their facial expressions, were indeed significantly different from the act-natural condition, $t(47) = 2.42$, $p < .02$, $d = 0.71$, and $t(47) = 2.92$, $p < .01$, $d = 0.85$, respectively, and they did not differ from each other, $t(47) < 1$.

Additionally, self-reports of the difficulty of adhering to the instructions (on a scale from 1 = *not at all difficult* to 9 = *extremely difficult*) differed by condition, $F(2, 46) = 10.70$, $p < .001$, $\eta_{p^2} = .33$, with participants in the act-natural condition rating the instructions as less difficult to follow ($M = 1.82$, $SD = 1.19$) than those in the suppress-emotions or reappraisal conditions ($M = 4.57$, $SD = 2.34$ and $M = 4.56$, $SD = 2.22$, respectively).

Last, it was again necessary to assess whether the self-regulation instructions differentially influenced participants' mood states. We again predicted no mood differences as a function of condition (see Baumeister et al., 1998; Vohs & Heatherton, 2000). This prediction was confirmed, because there were no differences among the groups on the PA and NA subscales of the PANAS (Watson et al., 1988), $F(2, 48) < 1$, $\eta_{p^2} = .02$, and $F(2, 48) = 1.69$, $p > .19$, $\eta_{p^2} = .07$, respectively (for PA: $M_{\text{reappraisal}} = 20.41$, $SD = 4.72$; $M_{\text{suppress}} = 23.93$, $SD = 6.73$; $M_{\text{act natural}} = 23.18$, $SD = 5.82$; for NA: $M_{\text{reappraisal}} = 15.59$, $SD = 6.32$; $M_{\text{suppress}} = 16.53$, $SD = 4.44$; $M_{\text{act natural}} = 14.76$, $SD = 4.24$). In total, these results indicate that our instructions during the film appeared to effectively manipulate self-regulatory exertion.

Self-regulatory condition predicting time perceptions. We predicted that there would be a significant difference among conditions in estimates of the film length as a function of self-regulation condition. To do this, we conducted a two-way ANOVA using condition (suppress vs. act natural vs. reappraisal) and gender as predictor variables. Once again, the dependent measure was the ratio of subjective duration to objective duration, with 1.0 indicating perfect estimations of duration. In support of our hypothesis, this model revealed a significant effect of condition on duration estimates, $F(2, 48) = 4.80$, $p < .02$, $\eta_{p^2} = .18$. Planned contrasts confirmed that participants in the suppress-emotions condition ($M = 1.27$, $SD = 0.40$) judged the length of the film clip to be much longer than participants in the reappraisal, $t(48) = 3.63$, $p < .05$, $d = 1.05$ ($M = 1.03$, $SD = 0.34$) and act-natural conditions, $t(48) = 3.13$, $p < .01$, $d = 0.90$ ($M = 0.98$, $SD = 0.30$). The two noneffortful conditions did not differ from each other, $t(48) < 1$ (see Figure 2). There was also a main effect of gender, $F(2, 48) = 5.29$, $p < .03$, $\eta_{p^2} = .11$, indicating that women perceived the film as lasting longer than did men, a finding that is consistently reported in duration judgment experiments (for a meta-analytic review of this effect, see Block, Hancock, & Zakay, 2000). Importantly, there was no interaction between gender and condition in predicting film length estimates, $F(1, 48) < 1.10$, $\eta_{p^2} = .05$. Thus, our predictions regarding the relative time estimation differences among groups as a function of self-regulatory efforts were confirmed.

Self-reports of participants' confidence in their duration judgments were subjected to ANOVA to determine whether they varied with condition. Confidence in time estimates was unrelated to condition for perceptions of the film length, $F(2, 48) < 1$, $p > .43$, $\eta_{p^2} = .04$ (PA: $M_{\text{reappraisal}} = 3.71$, $SD = 0.85$; $M_{\text{suppress}} = 4.00$, $SD = 1.10$; $M_{\text{act natural}} = 4.17$, $SD = 1.15$).

Discussion

In Study 2, we altered our manipulation of self-regulatory demands to replicate and extend our findings from Study 1, in which participants who engaged in self-regulatory tasks reported that the experience of time seemed longer relative to participants who were not engaging in self-regulatory tasks. In the current study, we used a manipulation from Gross and colleagues (see Richards & Gross,

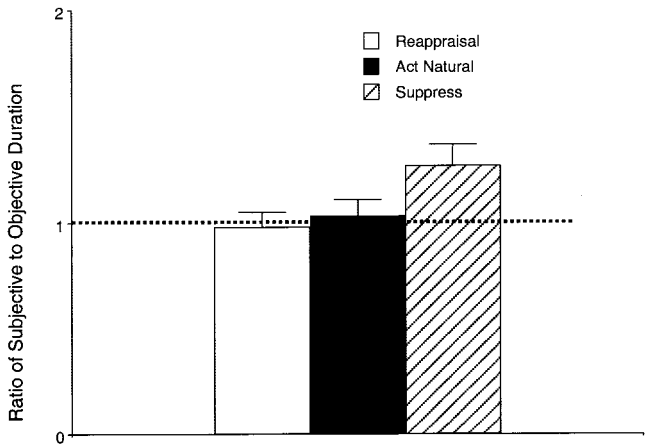

Figure 2. Mean ratio of subjective to objective time, Study 2. Bars represent mean ratio of time estimates by condition, which were computed by dividing participants' estimates of the film's length (subjective time) by the film's actual length (objective time). Error bars represent standard error of the mean for each condition.

2000), in which participants were asked to control their emotions in a manner that is conceptualized as being effective but not taxing. The current findings echo those of Richards and Gross (2000) in showing that instructions to detach oneself from the emotion-provoking stimulus do not result in the same pattern of elongated time perception as was found among people who were asked to control their emotions via suppression.

What are the mechanisms that separate suppression and reappraisal techniques, insofar as they result in different patterns of time perception? One aspect of emotion suppression that may affect people's ability to accurately keep track of time is the need for constant monitoring of oneself when engaged in suppression. As outlined by Wegner (e.g., Wegner, 1994), the process of suppression necessarily engages a second, nonconscious monitor (*ironic monitor*) that constantly monitors the mental landscape for the unwanted stimulus. In the case of emotion regulation, the ironic monitor monitors the self to see if the unwanted emotion is present (e.g., "How am I doing now?"). If one aspect of monitoring is an implicit sense of time, then processes that require increased monitoring may lead to an awareness of the movement of time, which may therefore lead to longer duration estimates (as in the prospective time-estimation paradigm; see Block & Zakay, 1997). Accordingly, the act-natural and reappraisal conditions, which did not require self-monitoring, would not have prompted the same attention to time that was present in the suppress condition.

A second crucial component to the varying influences of suppression versus reappraisal on time perception may lie in their differential effectiveness. The ineffectiveness of suppression leads to a reapplication of the suppression process over and over again, and the constant reapplication of the suppression strategy may facilitate the perception that more time has passed than in nonsuppression conditions. Likewise, the relative effectiveness of reappraisal (e.g., Richards & Gross, 2000), which may only need to be applied once, at the beginning of the episode, may result in perceptions that time is moving in step with its actual progression.

A last comment regarding the results of Studies 1 and 2 concerns participants' reports of confidence in their time estimates. Across both studies, we found no evidence that participants were differentially certain of their time estimates. Why would we expect differential confidence judgments as a function of condition? We included these ratings to determine whether participants who misjudged the duration of the task were cognizant that their sense of time was somewhat distorted, which may have manifested itself in lower confidence ratings. However, these participants were as confident as participants in the nonregulatory conditions in their perceptions of how much time had passed, although they were "(mis)remembering" the same time period as having lasted much longer.

Study 3

In Studies 1 and 2, we found that retrospective time perceptions were affected by whether the interval contained a resource-depleting, self-regulatory task. In both studies, the self-regulation task required emotion regulation; accordingly, in Study 3, we manipulated self-regulatory resource depletion using a nonemotion regulation task to ensure that differential time perceptions obtained regardless of the domain of self-regulatory depletion.

More ambitious, however, was our goal to assess time perception as a determinant of subsequent self-regulation and also as a mediator between an initial self-regulatory task and self-regulation on a subsequent task. We expected that engaging in self-regulation initially would lead to impairments in subsequent self-regulation, which is the classic self-regulatory resource-depletion effect, and that this effect would be mediated by duration estimates, which would be overly long for depletion participants. We tested our mediational hypotheses in Study 3 by interrupting participants in the middle of their experimental task (a task that either did or did not require self-regulation). Then, we let participants decide how long to continue with their experimental task after the time assessment. This way, we asked for retrospective accounts of duration and were able to test for the effect of duration estimates on self-regulation after the time perception measure.

Method

Participants. Forty-eight undergraduates (25 women, 23 men) participated in the experiment. Participants received partial course credit for completing the experiment.

Procedure. Participants came to the lab individually and were met by an experimenter who asked them to leave their book bags and all jewelry outside the experiment room. Participants were told that their first task was designed to look at the different types of tasks found in occupational settings and that their task involved reading aloud from a written text. Participants were given seven pages from a book called *Psychologists in Word and Image* (Wade, 1995) and told that a variety of professions, from news anchor to flight attendant, require people to read aloud pages of text. We said that we were interested in the motivational and affective consequences of such tasks. They were told that they should read the pages aloud using a clear voice until the experimenter returned. All participants were seated 3 feet in front of a video camera positioned in plain sight. They were told that we would be recording their reading for record-keeping purposes. Participants in the no control condition were given no more instructions after this point. Instructions for the behavioral control condition continued with the following: "People in these professions often have to act excited or interested in what they are reading, even if they are not. Please do your best to act happy, smile and 'get into it' when you are reading."

After 4 min 23 s,[1] participants were stopped by the experimenter, who gave them a questionnaire asking how long they thought the experimental task had lasted up until that point. After the time-perception assessment, participants were told that they could continue with the task for "as long as they could." Participants could stop at that point or anytime up to a ceiling of 15 min. After stopping the read-aloud task, participants were given the state version of the PANAS (Watson et al., 1988) and a postexperimental questionnaire on which they rated how well they had performed the read-aloud task (on a scale from 1 = *not at all well* to 10 = *extremely well*) and the difficulty of the task (on a scale from 1 = *not at all difficult* to 10 = *extremely difficult*).

Results

Manipulation checks. Once again we asked participants to list the instructions that they were given prior to the read-aloud task. All participants answered this question correctly with respect to their experimental condition assignment. We also gave participants

[1] We interrupted participants at a time of 4:23 because we wanted to use an uneven duration to reduce the odds that participants would render correct duration estimates merely by guessing.

the PANAS (Watson et al., 1988) to complete after the read-aloud task to test for mood differences. There was no significant difference on PA or NA: for PA, $t(46) < 1$, $p > .82$ ($M_{\text{no control}} = 22.58$, $SD = 7.55$; $M_{\text{behavioral control}} = 23.08$, $SD = 8.12$); for NA, $t(46) = 1.25$, $p > .21$, $d = 0.37$ ($M_{\text{no control}} = 14.96$, $SD = 4.48$; $M_{\text{behavioral control}} = 13.42$, $SD = 4.07$). Last, we asked participants to rate the difficulty of the task, and there was a significant difference between the groups on this measure, $t(46) = 2.10$, $p < .05$, $d = 0.62$, such that participants in the behavioral control group rated their task as much more difficult ($M = 4.83$, $SD = 2.73$) than participants in the no-control group ($M = 3.13$, $SD = 2.91$).[2]

To assess adherence with the experimental instructions, we had an independent judge rate the videotapes of participants in terms of their facial expressions at two points during the read-aloud task. (A second independent coder rated a subset of the participants to assess reliability; we found high similarities between the raters on both sets of ratings, $\kappa = .91$ for the first expressiveness rating and $\kappa = .85$ for the second expressiveness rating.) Using an average of facial expressiveness ratings, we found a significant difference in participants' expressiveness, $t(32) = 3.58$, $p < .001$, $d = 1.27$. The means indicated that behavioral-control participants were much more expressive than no-control participants, thus validating our intentions for the read-aloud instructions ($M_{\text{no control}} = 1.63$, $SD = 0.55$, $M_{\text{behavioral control}} = 2.79$, $SD = 1.20$).

Last, the coders judged how well the participants performed the read-aloud task, using as criteria clarity of speech, appropriate intonation and pronunciation, and overall speaking ability ($\kappa = .91$). Ratings on this measure showed that the two groups performed the read-aloud task equivalently, $t(32) < 1$. Together with the expressiveness data, these data suggest that although the behavioral control group used more expressiveness and emotionality when they spoke, they were not impaired in their ability to read the text effectively.

Self-regulation condition predicting time perception. We hypothesized that the experimental task of reading aloud versus reading aloud with expressiveness would predict time perception, as assessed for all participants after 4:23 had passed while performing the read-aloud task. A *t* test[3] of the ratio of subjective to objective time perception supported our hypothesis in showing a significant difference in conditions, $t(46) = 4.05$, $p < .001$, $d = 1.20$. The direction of the means show that although no-control participants were fairly accurate in their time perceptions ($M = 1.17$, $SD = 0.52$), behavioral-control participants thought they had been regulating for twice as long as they actually had been ($M = 2.01$, $SD = 0.88$). This was an important finding, because it replicated the results of Studies 1–2 and provided a necessary link in the mediational model.

Self-regulation condition predicting subsequent self-regulation. In this study, we also aimed to reproduce the findings of past research on resource depletion that has demonstrated impaired self-regulatory ability after initial self-regulation. We replicated the resource-depletion effect by finding a significant difference in behavioral continuance as a function of condition, $t(46) = 3.63$, $p = .001$, $d = 1.07$. Participants who had been asked to read the essays with emotion and expressiveness stopped much sooner than participants who read the essays without such instructions ($M_{\text{no control}} = 6.89$ min, $SD = 4.17$ vs. $M_{\text{behavioral control}} = 3.67$ min, $SD = 1.24$). With this significant link, we were now able to test the full mediational model.

Time perception predicting self-regulation. We next tested our hypothesis that differences in time perception, as assessed in the middle of the task, would predict participants' continuance with the task. A correlation between the two constructs supported our prediction in showing a reliable association, $t(46) = 5.44$ ($p < .001$, $\beta = -.63$). Hence, we found that the longer participants believed that they had been doing the read-aloud task, the shorter they continued with it after the 4:23 mark.

Tests of the mediational model. We next built a model that contained all the components of interest to see if time perceptions mediated the link between experimental condition and subsequent self-regulatory ability. In this model, time estimates (i.e., the ratio of subjective to objective duration) and experimental condition were used to predict subsequent time spent on the experimental task (i.e., the read-aloud task). As seen in Figure 3, the results of

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[2] Readers may wonder whether ratings of task difficulty could substitute for self-regulatory condition and provide a continuous measure of regulatory demands. We believe that task difficulty is not isomorphic with self-regulation, and we provide evidence in support of this notion from both the time estimation literature and from subsidiary analyses conducted on the current data. First, the idea that the difficulty of the task may have consequences for duration estimates was reviewed by Zakay and Block (1997). In their analysis of time estimation as a function of situational qualities, Zakay and Block concluded that the effect of task difficulty on retrospective duration estimations is equivocal, with some studies showing that difficult tasks lead to underestimation and other studies showing that difficult tasks lead to overestimation. From the perspective of the current studies, it may be that difficult tasks that have also required self-regulation have led to overestimates of duration in past time estimation research, but difficult tasks that have not required self-regulation may be involved in those studies that have led to underestimates. Thus, whether the difficult task demands self-regulation may be a moderator variable to help explain the unreliable effect of task difficulty on duration judgments. Second, we conducted ancillary analyses to check whether task difficulty could stand in place of time estimates in the current studies. We reexamined data from Study 3 to assess whether using difficulty ratings could stand as the mediator (instead of time estimates) in predicting subsequent self-regulation. (Recall that self-regulation condition predicted difficulty ratings in both Studies 3 and 4.) We found that difficulty ratings failed to predict persistence on the read-aloud task, $t(46) = .46$, $p > .64$ ($\beta = .07$), a necessary precondition for mediation. Moreover, in building a mediational model using difficulty ratings in place of time estimates, we see that task difficulty ratings failed to decrease the impact of experimental condition on subsequent self-regulation, $t(45) = 4.04$, $p < .01$ ($\beta = -.54$), nor was difficulty rating a significant predictor, $t(46) = 1.71$, $p = .10$ ($\beta = .23$). A similar set of findings was found in a second set of analyses in which we reanalyzed data from Study 4. In Study 4, we found that difficulty ratings did not predict change in breath holding in a regression model that included Time 1 breath holding and difficulty ratings as predictors of Time 2 breath holding, $t(44) = 64$, $p > .52$ ($\beta = -.04$). This null effect negated the possibility of having a full mediational model, but we still attempted a full mediational model. Once again, when including difficulty ratings as a substitute for time estimates in a mediational model that included Time 1 breath holding, difficulty ratings, and self-regulation condition, we found that the influence of self-regulation condition was left almost wholly intact, $t(43) = 17$, $p > .86$ ($\beta = -.01$), and that the effect of difficulty ratings was still far from significant, $t(43) = 1.82$, $p = .06$ ($\beta = -.14$). Hence, in Studies 3 and 4, difficulty ratings did not function as a proxy for time estimates.

[3] We found no effect of gender or of the Gender × Condition interaction predicting the dependent measures in Studies 3 and 4 ($ps > .25$).

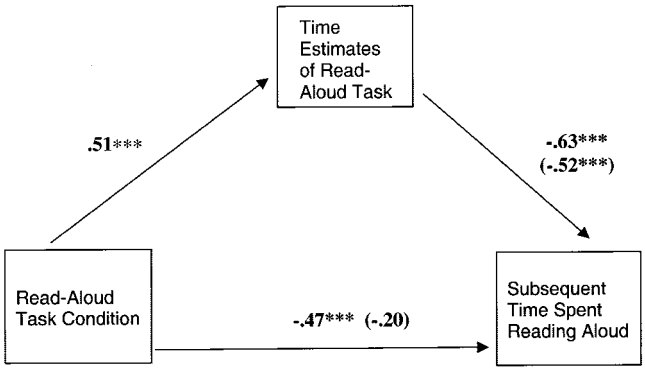

Figure 3. Path diagram of hypothesized model, with standardized beta weights, Study 3. "Read-Aloud Task Condition" stands for conditions in which participants were asked to read passages of text aloud either with instructions to exaggerate their emotions or without such instructions. "Time Estimates of Read-Aloud Task" is the ratio of subjective to objective duration of the experimental task. "Subsequent Time Spent Reading Aloud" represents self-regulatory ability and refers specifically to time spent continuing to perform the read-aloud task after time perception estimates were assessed. Self-regulatory resource conditions were dummy coded, such that 1 = no control and 2 = behavioral control. Direct effects (i.e., values without parentheses) represent the standardized regression coefficient (β). The value inside the parentheses represents the standard corrected regression coefficient. ***$p < .001$.

this model were supportive of the mediational hypothesis. In this model, the effect of experimental condition dropped to nonsignificance, $t(45) = 1.55$, $p > .12$ ($\beta = -.20$),whereas the effect of time perceptions remained significant, $t(45) = 3.95$, $p < .001$ ($\beta = -.52$).These results indicate that the effect of self-regulation initially on subsequent self-regulation was mediated by perceptions of time. A Sobel test of mediation (Sobel, 1982) confirmed that time estimates significantly mediated the relationship between experimental condition and subsequent self-regulatory performance (Sobel test = 2.81, $p < .01$). The full mediational model is displayed in Figure 3.

Discussion

In Study 3, we tested the idea that time perceptions mediate the effect of initial self-regulation on continuation of self-regulation. We assessed time perception in the middle of the experimental task and then allowed participants to continue with the task for as long as they could, stopping when they chose. We found that time perceptions statistically accounted for the decrease in self-regulatory behavior after an initial act of self-regulation. Participants who read a set of boring historical narratives with forced emotion and expressiveness perceived that their task lasted much longer than participants who read the same narratives plainly. Moreover, the behavioral-control participants did not continue with their task as long as the no-control participants did, and this effect was accounted for by their longer duration estimates.

Study 4

In Study 4, we incorporated the results of Studies 1, 2, and 3 along with previous tests of the resource-depletion model to assess the full process model of time perception and self-regulatory ability. In Study 3, we found that time perception, as measured in the middle of a task, was influenced by earlier self-regulatory ability and then later influenced subsequent self-regulatory ability during the same task. In Study 4, we sought to extend the findings of Study 3 and more directly connect them to the self-depletion model. More precisely, our aim was to show a link between the carryover effect found in resource-depletion studies and the alterations in time perception found in the earlier studies of the current investigation. To do so, we used a two-task design in which participants in a resource-depletion condition engaged in an initial self-regulatory task, whereas no-depletion control participants engaged in an initial task that was hypothesized not to use regulatory resources. Later, all participants performed a self-regulatory task to measure self-regulatory capacity. This second task was also the task for which participants provided duration estimates. Recall that in Study 3 we assessed duration judgments about the first task, which was the only task in which participants engaged. In contrast, participants in Study 4 performed two tasks so that we could (a) attempt to replicate the depletion effect of poorer self-regulation after an initial task of self-regulation and (b) further our extended-now hypothesis to include time intervals that came after the initial, depleting task. Given that the depletion pattern denotes a hangover effect, in which performing one self-regulatory task affects a subsequent self-regulatory task, and given that we found elongated time perceptions after an initial bout of self-regulation, we further hypothesized that being in a state of depletion after engaging in a self-regulation task would not only lead to subsequent decrements in self-regulatory capacity but also result in elongated time perceptions about the second, target self-regulation task.

In Study 4, we assessed self-regulatory capacity in terms of change in breath-holding ability from pre- to postmanipulation. A systematic, groupwide difference (decrease) in breath-holding ability from pre- to postmanipulation for participants in the self-regulatory depletion condition would suggest impairment in self-regulatory abilities. Although this specific operationalization had not been used in previous work on self-regulation, past research has operationalized self-regulatory ability as pre- to postmanipulation change in time holding a handgrip exerciser as a function of an intervening self-control task (i.e., differences in length of time squeezing the handgrip before and after engaging in emotion suppression; Muraven et al., 1998), similar to the current method.

In this full-blown test of the depletion and extended-now models, we predicted that participants' beliefs that they had held their breath longer than they actually had would be related to shorter actual time spent holding their breath. That is, we predicted that depleted participants would estimate that they had held their breath longer than nondepleted participants but would (in actuality) hold their breath for a shorter duration than their nondepleted counterparts. These findings would conceptually replicate Studies 1–2 and replicate previous experiments on self-regulatory resource effects (e.g., Muraven et al., 1998; Vohs & Heatherton, 2000) while also extending the results of Study 3 to include the direct link from self-regulation on an initial task to elongated time perceptions on the second task. Moreover, for Study 4, we posited that there would be a direct association between time estimates on the second task and performance on the second task, thereby linking subjective duration beliefs to self-regulatory behavior. Last, we hypothesized that the effects of self-regulatory resource depletion on later

self-regulatory capacity would be statistically accounted for by differences in time perception, thereby substantiating the hypothesized model.

Method

Participants. Forty-nine undergraduates (23 women, 26 men) participated in exchange for partial course credit. For time estimates, data were missing from 2 participants (1 participant failed to answer the question, and 1 participant gave the hour and minute when the assessment of breath estimate was taken). For change in self-regulatory ability, 2 participants were missing data because of mechanical failure on the second measurement.

Procedure. Participants came to the lab individually. Participants were told that the first task involved collecting information that would help inform a new method that may be used in future experiments. They were told that the experimenter was gathering "baseline data of the average breath-holding capacity for college students" in an attempt to "find physiological markers for psychological states." Participants were told to hold their breath "for as long as you are able or until you must give up," and the experimenter timed the duration with a stopwatch (out of participants' view). These instructions mirror those given to participants in other tasks that involve self-stopping as a measure of self-regulatory ability (e.g., Muraven et al., 1998; Vohs & Heatherton, 2000). Because individuals vary in their lung capacity by gender, age, athleticism, smoking status, and other factors, we used the within-subjects approach of asking participants to give two breath-holding samples, one premanipulation (Time 1) and one postmanipulation (Time 2).

Participants were then given instructions for a thought-listing task. Participants were instructed to "write out whatever you are thinking, keeping in mind that whatever you write will be completely anonymous." For half of the participants, the instructions ended at that point. For the other half, participants were told that to "help direct your thoughts on this task, please do not think of a white bear." Participants were then given instructions to place a check mark on the thought-listing sheet in the event that they did have white bear ideas or white bear thoughts (see Wegner, Schneider, Carter, & White, 1987; for thought suppression as a self-regulatory resource-depletion manipulation, see Muraven et al., 1998, Study 2). All participants were given 6 min for the thought-listing task. Afterward, participants were given the PANAS (Watson et al., 1988) to ensure that the manipulation did not alter mood states. Subsequently, all participants were asked to perform a second breath-holding task ostensibly because "multiple assessments provide the most reliable baseline estimates," and participants were again told to stop when they were unable to continue or had decided to give up. They were then given a questionnaire that asked them to estimate the amount of time they held their breath during the second assessment. Last, they were given a postexperimental questionnaire, debriefed, and thanked.

Results

Manipulation checks. As an initial manipulation check, we asked participants to report the instructions given prior to the thought-listing task. All participants correctly recalled the instructions. Second, it was again important to determine whether suppressing versus not suppressing thoughts influenced participants' mood states. We predicted no mood differences as a function of condition. This prediction was largely confirmed, such that scores on the NA subscale of the PANAS (Watson et al., 1988) did not vary with condition, $F(1, 48) < 1$, $\eta_{p^2} = .004$ ($M_{\text{no suppression}} = 14.42$, $SD = 3.72$; $M_{\text{suppression}} = 15.08$, $SD = 6.24$). However, PA varied moderately between groups, $F(1, 48) = 3.04$, $p = .09$, $\eta_{p^2} = .06$, such that participants in the suppression condition reported somewhat higher positive affect ($M_{\text{no suppression}} = 24.17$, $SD = 8.29$; $M_{\text{suppression}} = 29.40$, $SD = 12.25$). Last, participants in the suppression condition rated the thought-suppression task as more difficult than those in the no-suppression condition, $F(1, 48) = 7.46$, $p < .01$, $\eta_{p^2} = .14$ ($M_{\text{no suppression}} = 2.88$, $SD = 2.27$; $M_{\text{suppression}} = 4.96$, $SD = 3.01$). In total, these results indicate that our instructions regarding thought suppression appeared to effectively manipulate self-regulatory resource expenditure without affecting mood.

By way of preliminary analyses, we computed the relations between Time 1 breath-holding ability and the three key variables of time estimates, Time 2 breath-holding ability, and condition. Time 1 breath-holding ability was, of course, highly predictive of Time 2 breath-holding ability ($\beta = .87$, $p < .0001$), but was unrelated to Time 2 duration estimates ($\beta = .22$, $p = .14$), and self-regulatory resource condition ($\beta = .13$, $p = .39$).

Self-regulation condition predicting time perceptions. In the first test of the full model, we assessed whether participants' estimates of their breath-holding duration were predicted by suppression condition. As in Studies 1 and 2, we used the ratio of subjective to objective duration as our measure of duration estimates. A *t* test revealed that this ratio was significantly predicted by suppression condition, $t(44) = 2.25$, $p < .03$, $d = .67$, such that thought-suppression participants estimated that they held their breath longer ($M = 1.34$, $SD = 0.68$) than did participants who had not suppressed their thoughts ($M = 0.98$, $SD = 0.28$). (Descriptive statistics for time estimates are presented in Table 1.) Hence, compared with no-suppression participants, suppression participants overestimated their breath-holding duration. This finding replicated results from Studies 1 and 2 and secured a necessary link for us to test the full process model.

Self-regulation condition predicting subsequent self-regulation. To assess whether self-regulatory exertion led to decrements in a subsequent act of self-regulation, we computed a regression model in which Time 2 breath-holding scores were predicted by Time 1 breath-holding scores (the covariate) and self-regulatory condition (dummy coded as 1 = no suppression vs. 2 = suppression). As expected, there was a strong positive effect of Time 1 breath-holding scores on Time 2 breath-holding scores, $t(43) = 13.45$, p

Table 1
Time Estimates and Breath-Holding Ability, Study 4

Condition	Time 1 breath	Time 2 breath	Time 2 breath est.	Breath diff.
No control				
M	44.01	40.90	39.20	−3.12
SD	20.79	18.78	10.63	4.91
Behavioral control				
M	49.09	39.60	54.66	−9.49
SD	18.48	17.37	18.78	10.76

Note. No control and Behavioral control represent self-regulatory resource conditions in which participants completed unstructured or structured mental control exercises. Negative scores indicate poorer breath holding at Time 2. Time 1 breath = participants' breath-holding scores, as assessed premanipulation; Time 2 breath = participants' breath-holding scores, as assessed postmanipulation; Time 2 breath est. = participants' perceptions of the duration for which they held their breath at Time 2; Breath diff. = Time 2 minus Time 1 breath-holding scores to show change in breath-holding ability.

$< .001$ ($\beta = .90$), and there was also a significant effect of condition, $t(43) = 2.30$, $p < .03$ ($\beta = -.15$) (using difference scores, where negative numbers indicate less breath holding at Time 2: $M_{\text{no suppression}} = -3.11$, $SD = 4.91$; $M_{\text{suppression}} = -9.49$, $SD = 10.76$). The finding that participants who engaged in effortful self-regulation showed decrements in a subsequent act of self-control replicated past research on the resource model of self-regulation (Baumeister et al., 1998; Muraven et al., 1998; Vohs & Heatherton, 2000) and confirmed another piece of the model.

Time perception predicting subsequent self-regulation. We postulated that elongated time perceptions are important because they would lead to subsequent reductions in self-regulatory efforts. To test this claim, we computed a regression model with Time 1 breath-holding duration and estimates of Time 2 breath-holding duration entered simultaneously to predict Time 2 breath-holding scores. This analysis showed not only the expected effect of Time 1 breath holding, $t(44) = 14.38$, $p < .0001$ ($\beta = .93$), but also the predicted effect of duration estimates, $t(43) = 3.26$, $p < .01$ ($\beta = -.21$), such that longer time estimates were associated with poorer self-regulatory ability.

Tests of the mediational model. Finally, we assessed whether time perceptions mediated the link between self-regulatory exertion and subsequent decrements in self-regulated performance. We regressed actual breath-holding duration at Time 2 on Time 1 breath-holding duration (the covariate), self-regulation condition, and Time 2 breath-holding estimates simultaneously. If the effect of self-regulatory exertion on subsequent performance dropped to nonsignificance in this test, we have evidence that duration estimates mediated the effect. In line with this prediction, including the duration estimate reduced the previously significant effect of self-regulatory exertion on subsequent self-regulated performance to nonsignificance, $t(42) = 0.55$, $p > .50$ ($\beta = -.03$). A Sobel test of mediation (Sobel, 1982) indicated that duration estimates were indeed a significant mediator of the link between self-regulatory exertion and subsequent self-regulatory performance (Sobel test = 1.90, $p = .057$). The full mediational model is displayed in Figure 4.

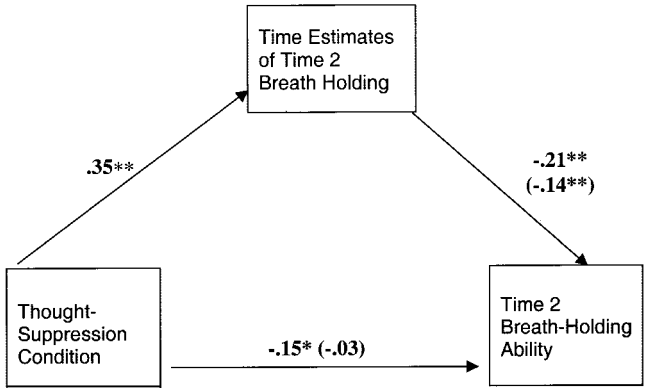

Figure 4. Path diagram of hypothesized model, with standardized beta weights, Study 4. "Thought-Suppression Condition" stands for conditions in which participants were given either instructions to suppress thoughts of a white bear or no such instructions. "Time 2 Breath-Holding Ability" represents Time 2 (postmanipulation) breath-holding scores, controlling for Time 1 (premanipulation) breath-holding scores. "Time Estimates of Time 2 Breath Holding" represents participants' estimates of the duration of time they held their breath during the second measurement (the dependent measure) when controlling for the first measurement. Self-regulatory resource conditions were dummy coded, such that 1 = no suppression and 2 = suppression. The values without parentheses are standardized regression coefficients (β); the value inside the parentheses is the standard corrected regression coefficient. $^*p < .05$. $^{**}p < .01$.

Discussion

Study 4 provided a full account of the detrimental effects of self-regulatory depletion on subsequent self-regulatory abilities via differences in time perception. Depleted participants estimated that they had held their breath longer than nondepleted participants, but they actually held their breath for less time than nondepleted participants. Moreover, participants' perceptions of breath-holding duration fully mediated the effect of self-regulatory resource depletion on later self-regulatory ability, such that when time perceptions were statistically controlled, the effect of prior self-regulation on subsequent self-regulation disappeared.

General Discussion

Across four experiments, we found that people's perceptions of the duration of an activity were significantly affected by self-regulatory resource depletion. Studies 1 and 2 demonstrated that when looking back at an emotion-eliciting task, people who engaged in emotion regulation believed the task lasted much longer than did people who did not actively regulate emotions. Study 3 found that duration estimates of a task were predicted by whether the task involved self-regulation, with self-regulation once again predicting longer duration estimates. Furthermore, this study showed that longer time perceptions led to less continuation of self-regulation on the experimental task and that time perceptions statistically mediated the depletion effect of prior self-regulatory efforts on later self-regulatory achievement. Study 4 used a two-task design in which self-regulatory depletion effects (i.e., hangover effects from one regulatory task to another) were directly related to subjective time perceptions. This study demonstrated that despite believing that they held their breath (self-regulated) for a very long time, participants low in self-regulatory resources showed the poorest breath-holding ability. This study also supported our mediational prediction that differences in time perception statistically account for differences in self-regulatory capacity after exertion of regulatory resources.

In sum, our data suggest that a taxing self-regulatory activity is remembered as being overly long, and this perception renders people less likely to sustain self-regulation efforts. The convergence of our results, which involved emotional (Studies 1 and 2), behavioral (Study 3), and cognitive (Study 4) self-regulatory resource manipulations, as well as behavioral dependent measures of self-regulatory ability (Studies 3 and 4), supports the reliability and validity of the proposed process.

The results of these studies shed light on the difficulty of self-regulation maintenance, which involves the continuance of a self-controlled behavior. Extended duration perceptions may affect self-regulation maintenance because of the influence of an extended-now experience. In this state, the subjective experience of time seems elongated far beyond that which is normally felt, and

consequently, there may be diminished ability to continue with a behavior aimed at a future or abstract goal. In an extended-now state, the urge to give in to immediate stimuli and impulses may overwhelm the psychological system, leading to an abandonment of self-regulation. The present studies demonstrate that experiencing an extended now led participants to give up more quickly on a test of breath-holding ability (Study 4) and a task that required self-regulated behavioral expression (Study 3). Presumably, the impulse to exhale and to terminate the emotional reading task, respectively, became too strong and interfered with the ability to continue regulating these tasks. Like nonhuman animals that are forever bogged down in the present (Roberts, 2002), humans in an extended-now state may not have the temporal horizon to see beyond their current place and orient their actions toward an external or distal goal.

The extended-now explanation may add to the understanding of how resource depletion leads to self-regulation failure. As noted in the introduction, the resource model of self-control has not given much indication as to what is being depleted, and we do not claim that we have the answer here. However, the present research does suggest that the phenomenological experience of an extended now, which occurs with regulatory resource depletion, is an important component of self-regulation failure. This finding may lead researchers toward a fuller understanding of the resource that underlies self-regulation, active choice making, and other self-control abilities.

Our findings prompt the question of why self-regulation should lead to perceptions that much time has elapsed, especially when such perceptions have the effect of reducing subsequent self-regulatory efforts. One explanation is that if the ability to self-regulate is governed by a common—but finite—resource, then perhaps elongated perceptions of time serve a conservation purpose. The perception that the time spent on a regulatory task is overly long, and the decrements in subsequent self-regulation that follow from this (mis)perception, may help to preserve limited regulatory resources and stave off total depletion. In this way, precious self-regulatory resources may be available for new and unanticipated challenges.

Another explanation for our findings of extended time perception due to active self-regulation is that active self-regulation fosters attention to time. Paying attention to time has been shown to predict extended duration perceptions, relative to retrospective or no-attention-to-time states (see Block & Zakay, 1997). The internal state of self-regulators may be close to that of participants in a prospective time experiment in their tracking of time and feeling that longer duration has passed.

These studies also suggest implications for areas of social psychology outside of self-regulation. For instance, perceptions of time related to self-regulation attempts may influence self-perceptions. Consider a scene in which a woman has a quarrel with her husband, during which she becomes upset and angry. Remembering admonitions to "wait awhile" to try and cool off, she leaves the situation. After a period of time, she checks her emotions again, believing that it has been "long enough" for her to have been able to calm down. However, when thinking of the argument again, she finds herself still angry. She may then infer that she must be extremely upset with her husband, which leads her to return to him and renew their argument. We would predict that the time she allowed herself to cool off was not nearly as long as she perceived it to be, because she was engaging in emotion regulation. Her misjudgment of time, unfortunately, would lead her to mistakenly place more attributional weight on her anger, which simply may not have had ample time to dissipate. The consequences of this misperception of time may be a later failure to control one's emotions (perhaps because the emotions became amplified by returning to the emotion-provoking situation or by perceiving that they were too strong to be reined in) that would ultimately be counterproductive to the initial goal of waiting in order to regain self-control (for similar processes in attributions and inferences, see also Storms & Nisbett, 1970).

The extended temporal perceptions due to self-regulation found in the current studies may reflect the antithesis of people's perceptions of duration while experiencing "flow" (e.g., Csikszentmihalyi, 1996). Recent research supports this idea in showing that when people are in a flow state, they are much more likely to report feeling that much less time has passed than actually has (Conti, 2001). That the present research stands in contrast to research on the feelings and consequences of flow experiences suggests that these topics may represent two sides of the same coin. We encourage future research to assess the moderators that result in these divergent states.

Conclusion

The findings of the current studies indicate that participants who had engaged in an initial act of self-regulation recalled the amount of time spent on the regulatory activity as much longer than the duration felt by participants who had not engaged in a regulatory activity. Moreover, perceptions that a regulatory task lasted overly long reduced subsequent self-regulatory capacity. These data lend credence to the idea that being in a state of regulatory resource depletion results in an extended-now state. We postulate that in this state, current thoughts, feelings, impulses, wishes, and desires predominate, to the detriment of more remote and abstract ideals.

The studies presented in this paper are the first to propose a mechanism for the deleterious effects of self-regulatory resource depletion; moreover, these data hint at the phenomenological experience of elongated time perception that occurs with the exhaustion of this precious self-resource. Last, these studies highlight the importance of understanding the subjective experience of time as it shapes and is shaped by situational factors. Time, it seems, is a considerable source of influence in determining whether self-regulatory endeavors will continue to be pursued.

References

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

Baumeister, R. F., & Heatherton, T. F. (1996). Self-regulation failure: An overview. *Psychological Inquiry, 7*, 1–15.

Baumeister, R. F., Heatherton, T. F., & Tice, D. M. (1994). *Losing control: How and why people fail at self-regulation*. San Diego, CA: Academic Press.

Baumeister, R. F., & Vohs, K. D. (2003). Self-regulation and the executive function of the self. In M. R. Leary & J. P. Tangney (Eds.), *Handbook of self and identity* (pp. 197–217). New York: Guilford Press.

Block, R. A., Hancock, P. A., & Zakay, D. (2000). Sex differences in

duration judgments: A meta-analytic review. *Memory and Cognition, 28,* 1333–1346.

Block, R. A., & Zakay, D. (1997). Prospective and retrospective duration judgments: A meta-analytic review. *Psychonomic Bulletin & Review, 4,* 184–197.

Brooks, J. L. (Producer). (1983). *Terms of endearment* [Motion picture]. United States: Gracie Films, Paramount.

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

Conti, R. (2001). Time flies: Investigating the connection between intrinsic motivation and the experience of time. *Journal of Personality, 69,* 1–26.

Csikszentmihalyi, M. (1996). *Creativity: Flow and the psychology of discovery and invention.* New York: HarperCollins.

Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. *Review of General Psychology, 2,* 271–299.

Heatherton, T. F., & Baumeister, R. F. (1996). Self-regulation failure: Past, present, and future. *Psychological Inquiry, 7,* 90–98.

Jacopetti, G. (Producer). (1961). *Mondo cane* [Motion picture]. United States: Video Dimensions.

Keough, K. A., Zimbardo, P. G., & Boyd, J. N. (1999). Who's smoking, drinking, and using drugs? Time perspective as a predictor of substance use. *Basic and Applied Social Psychology, 21,* 149–164.

Metcalfe, J., & Mischel, W. (1999). A two-system analysis of delay of gratification. *Psychological Review, 106,* 3–19.

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

NIH Technology Assessment Conference Panel. (1993). Methods for voluntary weight loss and control. *Annals of Internal Medicine, 199,* 764–770.

Polivy, J., & Herman, C. P. (2002). If at first you don't succeed: False hopes of self-change. *American Psychologist, 57,* 677–689.

Richards, J. M., & Gross, J. J. (1999). Composure at any cost? The cognitive consequences of emotion suppression. *Personality and Social Psychology Bulletin, 25,* 1033–1044.

Richards, J. M., & Gross, J. J. (2000). Emotion regulation and memory: The cognitive costs of keeping one's cool. *Journal of Personality and Social Psychology, 79,* 410–424.

Roberts, W. A. (2002). Are animals stuck in time? *Psychological Bulletin, 128,* 473–489.

Rothman, A. J. (2000). Toward a theory-based analysis of behavioral maintenance. *Health Psychology, 19,* 64–69.

Schachter, S. (1982). Recidivism and self-cure of smoking and obesity. *American Psychologist, 37,* 436–444.

Schmeichel, B. J., Vohs, K. D., & Baumeister, R. F. (2003). Intellectual performance and ego depletion: Role of the self in logical reasoning and other information processing. *Journal of Personality and Social Psychology, 85,* 33–46.

Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equation models. In S. Leinhart (Ed.), *Sociological methodology 1982* (pp. 290–312). San Francisco: Jossey-Bass.

Storms, M. D., & Nisbett, R. E. (1970). Insomnia and the attribution process. *Journal of Personality and Social Psychology, 16,* 319–328.

Vohs, K. D., Ciarocco, N., & Baumeister, R. F. (2003). *Interpersonal functioning requires self-regulation.* Manuscript submitted for publication.

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

Wade, N. (1995). *Psychologists in word and image.* Cambridge, MA: MIT Press.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54,* 1063–1070.

Wegner, D. M. (1994). Ironic processes of mental control. *Psychological Review, 101,* 34–52.

Wegner, D. M., Schneider, D. J., Carter, S. R., & White, T. L. (1987). Paradoxical effects of thought suppression. *Journal of Personality and Social Psychology, 53,* 5–13.

Zakay, D., & Block, R. A. (1997). Temporal cognition. *Current Directions in Psychological Science, 6,* 12–16.

Zimbardo, P. G., & Boyd, J. N. (1999). Putting time in perspective: A valid, reliable individual-differences metric. *Journal of Personality and Social Psychology, 77,* 1271–1288.

Zimbardo, P. G., Keough, K. A., & Boyd, J. N. (1997). Present time perspective as a predictor of risky driving. *Personality and Individual Differences, 23,* 1007–1023.

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