THE EFFECT OF AGE ON THE RELATIONSHIP BETWEEN SELF-REGULATION AND THE SUBJECTIVE EXPERIENCE OF TIME

by

Ryan Kenneth Keen

(Under the Direction of David Shaffer)

ABSTRACT

The effects of age and self-regulation on duration judgments are both previously explored parameters (e.g., Block, Zakay, & Hancock, 1998; Vohs & Schmeichel, 2003). However, age has not been examined as a potential moderator of the relationship between self-regulation and the experience of time. It was hypothesized that older participants would experience the passage of time as being faster than younger participants when self-regulating, but that no differences would be found between age groups in the control condition. Older (M = 52.4 years) and younger participants (M = 18.9 years) assigned either to a self-regulation or a control condition each completed four tasks and were asked to estimate when specified lengths of time had passed (i.e., duration judgments) for each task. Results indicate that age differences in the experience of time have not emerged by middle age, and that the effect of self-regulation on the experience of time may depend upon an important methodological factor - the type of duration judgment being made.

INDEX WORDS: Self-regulation, time, subjective experience of time, age differences in the experience of time

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TABLE OF CONTENTS

Introduction

The relativity of the experience of time is a given for all of us. Throughout our day, many of our experiences will tend to have the effect of either slowing down, or speeding up the passage of time. Time simply passes at an excruciatingly slow pace during a boring meeting, and flies by when spending time with friends. Experiences such as these raise several important questions. What are the mechanisms responsible for altering our experience of time, as well as allowing us to track the passage of time? Furthermore, what factors influence the experience of time? What speeds time up or slows it down? This study is concerned with this latter issue, namely, what are some of the variables that influence the subjective experience of time?

The subjective experience of time has been documented along several different dimensions. One such dimension is aging. Age differences in the experience of time have traditionally been confined to the realm of the intuitive. James (1890) stated that "the same space of time seems shorter as we grow older…that is, the days, the months, and the years do so; whether the hours do so is doubtful, and the minutes and seconds to all appearances remain the same" (p. 284). Psychology has since focused in on the experience of time on the order of seconds and minutes and discovered that older adults, in fact, do experience the seconds and minutes differently than younger adults. Block, Zakay, and Hancock (1998) published a meta-analysis of age differences in duration judgments in which they reported that, overall, older adults appear to experience the passage of seconds more *slowly* than their younger counterparts, a finding that runs contrary to common wisdom about time flying by as the years do. However, this finding does not hold true if a cognitive load is added to the duration judgment. The addition of a cognitive load, for example, having to judge a shape on several dimensions as the passage of

time is concurrently tracked, reverses the trend (Craik & Hay, 1999); that is, older adults experience the passage of time on the order of seconds as faster than younger adults under these circumstances. Thus, it seems that older adults do indeed perceive time differently than younger adults, but how that difference is expressed will depend upon the situation in question.

Yet another manner in which the relativity of time manifests itself is through the act of self-regulation. Vohs and Schmeichel (2003) have reported that self-regulation extends, or slows, the passage of time. Self-regulation is defined as "operations by the self to alter its own habitual or unwanted responses to achieve a conscious or nonconscious goal" (p. 3). These operations can vary from attempts to curb various cravings to attempts to control your colloquial accent when speaking to a group of professionals. However, as Vohs and Schmeichel demonstrated, different types of self-regulation (i.e., regulating emotions and regulating thoughts) appear to slow the passage of time in the same way.

Age as a possible moderator of the effect of self-regulation

Development and time are clearly related; time is, after all, one way to enumerate development. This study is designed to explore the possibility that older adults can differ from younger adults in ways not just directly related to the perception of time, but in ways that indirectly affect time perception via the act of self-regulation. That is, if older adults differ markedly from younger adults in how they self-regulate, and self-regulation is related systematically to the perception of time, then is it possible that age can moderate the effect of self-regulation upon the perception of time?

In theory, self-regulation slows the passage of time for any self-regulator, regardless of their age. This is because, as Vohs and Schmeichel (2003) note, self-regulation involves a greater attention to time via what Wegner (1989) calls the ironic monitor. This monitor constantly

checks the state of things in the mind, asking questions such as “how am I doing now? And now? What about now? Am I still doing ok?” That is, in order to maintain and achieve the goal that we hope to by self-regulating, we are (on some level) constantly monitoring the progress of our self-regulatory efforts. Let us frame the idea within a simple example: if you are working to control your craving for a cigarette, somewhere in the back of your mind your ironic monitor is constantly checking to make sure that you’re still not smoking, and it does so by monitoring your progress over *time*.

The result of all of this self-monitoring is that an individual will naturally be more attuned to the passage of time. The Attentional-Gate Model of time perception postulates that greater attention to time will lead to the slowing of its passage (e.g., Zakay, 1993; Zakay & Block, 1996). Simple reflection confirms this idea: think of any time you have spent waiting on something to happen (e.g., your food to finish cooking in the oven) and found yourself checking the clock or a timer every few minutes; it can be agonizing. Research consistent with the hypothesis that attention is linked to the subjective experience of time is abundant (e.g., Block, Hancock, & Zakay, 2000; Block et al., 1998; Craik & Hay, 1999; Gruber & Block, 2003; Perbal, Droit-Volet, Isingrini, & Pouthas, 2002; Zakay & Block, 1997). Thus, one would predict that during self-regulation one’s experience of time would be *slowed*, regardless of their age.

However, self-regulation is certainly not performed equally by all. Kennedy, Fung, and Carstensen (2001) review the results of several studies that have found that older adults, as compared to younger adults are better at emotional self-regulation as evidenced by their reports of experiencing negative emotions less frequently. This increased ability to regulate one’s emotions with age comes, in theory, after having years of practice, and also after having placed greater emphasis on the importance of emotional goals (Carstensen, 1991; Kennedy et al., 2001).

All of this is to suggest that self-regulation is subject to age effects; as we age we begin to place greater emphasis on our emotions, and as a result we find ourselves regulating these emotions with both greater frequency and greater success (Kennedy et al., 2001). Given that emotional self-regulation changes with age, is it possible that the effect of self-regulation on the experience of time does also? The interplay of the effects of age and self-regulation on the experience of the passage of time is a primary focus of this study.

To sum up, previous findings regarding age differences in time perception (e.g., Block et al., 1998; Craik & Hay, 1999) would predict older adults in this study, who are presumed to self-regulate more efficiently, will experience the passage of time as being faster relative to younger adults, when participants are self-regulating. By contrast, when participants are not self-regulating, previous research implies that older participants may experience time as passing more slowly than younger participants (Block et al., 1998). On the other hand, self-regulation should slow the passage of time for the self-regulator, regardless of age (Vohs & Schmeichel, 2003). Thus, I predicted a main effect of self-regulation on time estimation, with self-regulators perceiving time passing more slowly than non self-regulators. Moreover, I predicted an interaction between age and self-regulation such that older participants will judge time as passing faster than younger participants when self-regulating, but more slowly (or not differing significantly) than younger participants when not asked to self-regulate.

Type of self-regulation and the perception of time

As the inclusive definition of self-regulation given above suggests, there is more than one type of self-regulation. Specifically, this study will be dealing with the division of self-regulation into two types: cognitive and emotional. Cognitive self-regulation involves focusing one's efforts on changing either the contents of consciousness, or actively controlling or correcting a behavior;

emotional self-regulation, on the other hand, focuses on altering the experience or expression of emotional states.

In two different experiments, Vohs and Schmeichel (2003) reported that participants engaged in an emotional self-regulation task experienced the same slowing of time as participants engaged in cognitive self-regulation tasks in another study. In this experiment, I directly compared the effect of the type of self-regulation on the perception of time using a within-subjects design. Based on Vohs and Schmeichel's commentary, I predicted that time perception will be affected equally by both emotional and cognitive self-regulatory efforts; that is, time would appear to be slowed for participants during both the emotional and cognitive self-regulation tasks, using a design that can actually test the relative "slowing" effects of these two classes of self-regulation.

Resource depletion effects

Self-regulation, like so many cognitive efforts, is hypothesized to draw upon available, but limited resources (see Baumeister & Heatherton, 1996). Thus, attempts to self-regulate diminish extant resources and lead to a reduced capacity to self-regulate shortly afterward. Because this pool of resources is theorized to be domain-general, any act of self-regulation should lead to poorer performance on subsequent attempts to self-regulate in other domains as well. Vohs and Heatherton (2000), as well as Vohs and Schmeichel (2003), have found that attempts to self-regulate are less successful when preceded by another act of self-regulation. Vohs and Heatherton reported that self-regulatory efforts aimed at controlling emotional expression had a detrimental effect upon subsequent attempts to control dieting behavior. This study attempts to replicate previous findings that self-regulation in one domain might have an effect on subsequent efforts to self-regulate in another domain by using a within-subjects design

with both cognitive and emotional self-regulation tasks. Thus, I predicted that over time, the slowing effect of self-regulation on duration judgments would diminish. In other words, self-regulators should experience time passing more rapidly with each new task performed, whereas non self-regulators should not show this "trials" effect.

Changes in primary and secondary control with age

A secondary question in this study concerns the Life-span Theory of Control (Heckhausen & Schulz, 1995). This theory proposes that, across the life-span, systematic fluxuations exist in how much a person is able to, or chooses to, directly control ones environment versus cope with the environment but make no direct attempts to alter it. For example, if you were to fail to achieve a goal that you had set for yourself, one option would be to take steps to achieve the goal in a different way (primary control behavior), whereas another option would be to devalue the importance of the goal and thus minimize any subjective loss (secondary control behavior). It is theorized that older adults rely more upon both cognitive and emotional coping behavior to effectively deal with their environment (secondary control), as more direct methods of coping (primary control) become less and less available; the empirical evidence available suggests that this is true (see Heckhausen & Schulz, 1995, for a review).

Shifts in coping behavior (e.g., from lesser to greater dependence upon secondary control strategies) should be related to shifts in self-regulatory ability. This would be the case assuming that the skills needed to self-regulate are highly similar to (or the same as) the skills used when engaging in secondary control behavior. As Heckhausen and Schulz (1995) describe secondary control behavior, they are largely coping mechanisms used to deal with the psychological and emotional consequences of events, as opposed to behavior used take direct actions. In other words, secondary control behavior is actions turned inward, and focused on changing the self,

rather than the environment. Acts of self-regulation seem to operate in a similar fashion: like secondary control behavior, they are actions that are focused inward, with the intention of controlling or altering the self in some way. Individuals who are using secondary control behavior more frequently, then, might have developed a greater ability to self-regulate by virtue of the fact that they have more practice in controlling and altering their thoughts, feelings, and reactions to the environment. In fact, the separate domains of research suggest that both emotional self-regulatory abilities (Kennedy et al., 2001) and the use of secondary control behavior (Heckhausen & Schulz, 1995) increase with age. Thus, the older adults in my sample, who should be more skilled at emotional self-regulation, should also indicate a greater preference for secondary control strategies than the younger adults in my sample. In turn, depending upon the age effects found (if any) in this study, coping behavior might mediate the relation between self-regulation and the perception of time, such that measured preference for secondary control may account for the effects of age on time estimation among participants who are self-regulating. Thus, a measure of coping behavior was included to help clarify age differences in self-regulation.

Summary of predictions

I was interested in the effects of age and self-regulation on the perception of time. This study builds upon previous research in self-regulation and the experience of time (Vohs & Schmeichel, 2003) by including age and differing self-regulatory domains in a within-subjects design.

Hypothesis 1A. I predicted that age would be a factor in the perception of time, with older adults experiencing the passage of time as being faster than younger adults when self-regulating, but slightly slower (or not significantly different) than younger adults when not asked to self-

regulate. This prediction was consistent with previous research on age differences in the perception of time (e.g., Block et al., 1998; Craik & Hay, 1999). Age differences in the perception of time should be evidenced by longer production intervals for the older sample compared to younger adults when self-regulating; for example, when asked to produce an interval of 5 minutes, older adults might produce an interval of 6 or more minutes, with younger adults coming closer to the 5 minute standard. When not self-regulating, older and younger adults should produce roughly equal intervals of time.

Hypothesis 1B. Furthermore, previous findings indicate that the act of self-regulation slows the passage of time (Vohs & Schmeichel, 2003). Consistent with this, I predicted a main effect of condition, with participants in the self-regulation condition, regardless of age, perceiving the passage of time as slower than participants in the control condition.

Hypothesis 2. Hypothesis 2 explores the possible impact of type of self-regulation on time estimation. Although there is reason to believe that time estimation is slowed equally by both cognitive and emotional self-regulatory efforts (which I expected to find), it is conceivable that age and the type of self-regulation involved will moderate the effect of self-regulation on perception of time. Older adults appear to have a greater ability to self-regulate emotionally (Kennedy et al., 2001). Thus, although older adults are predicted to experience the passage of time as being generally faster than younger adults when self-regulating, their greater skill in emotional self-regulation might serve to reduce age differences in time perception. This relation is hypothesized because although, generally speaking, the cognitive load involved in self-regulation speeds up the passage of time, elders' relatively greater skill (and potentially a larger degree of automaticity) in emotional self-regulatory tasks could counter this effect, reducing the cognitive load for older participants and mitigating the "speeding up" effect on their time

perception. Thus, under conditions of emotional self-regulation, I expected to find no age differences in duration judgments because emotional self-regulation does not tax elders' cognitive processes.

On the other hand, mature (i.e., middle-age and older) participants have not been the focus of investigation for self-regulation researchers, and age differences in cognitive self-regulation is an unexplored parameter. Thus, the basis for expecting large differences in cognitive self-regulation is not strong. However it was possible to predict that, based on the assumption that cognitive self-regulation would represent a significant cognitive load, older participants, who process information more slowly than younger adults, should experience the passage of time as faster than younger participants when cognitively self-regulating. Thus, I expected bigger age-related differences in perceived passage of time for cognitive rather than emotional self-regulation tasks. This study merely sought to explore the possibility of the existence of such a moderating effect.

Hypotheses 3A and 3B. Previous research (e.g., Baumeister & Heatherton, 1996; Muraven & Slessareva, 2003; Schmeichel, Vohs, & Baumeister, 2003; Vohs & Heatherton, 2001; Vohs & Schmeichel, 2003) has found that the act of self-regulation diminishes the capacity to perform well on subsequent self-regulatory efforts. This ego-depletion effect seems to be domain-general: attempts to self-regulate in one domain (e.g., emotional) affect later attempts to self-regulate in other domains (e.g., cognitive). I predicted that the same pattern of results would be found in this study: participants' performance would diminish with each new self-regulatory task, regardless of the domain of self-regulation (i.e., emotional or cognitive self-regulation) that preceded it (hypothesis 3A). Additionally, just as each new attempt at self-regulation should be less successful, each new duration judgment should be faster for

participants who were self-regulating. Thus, I further predicted that time estimation would become increasingly fast across trials for participants who were self-regulating, while time estimation would remain unchanged over the course of the experiment for participants not asked to self-regulate (hypothesis 3B).

Hypotheses 4A and 4B. Finally, the Life-span Theory of Control predicts systematic shifts in the utilization of primary and secondary control strategies in coping with daily life (Heckhausen & Schulz, 1995). These shifts in control strategies should be meaningfully related to changes in self-regulatory ability, such as those changes documented by Kennedy et al. (2001). Thus, I predicted that individuals who displayed a greater dependence upon, or preference for, secondary control strategies would also display greater levels of self-regulatory ability, a measure that will be described below (hypothesis 4A). Additionally, I predicted that for participants engaged in self-regulation, differences in preference for secondary control strategies would mediate the effect of age on time estimation (hypothesis 4B).

Method

Participants and design

Two age groups were used in this study. The younger group consisted of 20 undergraduate psychology students ranging in age from 18 to 21 years (*M* age=18.9 years, *SD* = .99 years) who received course credit for their participation. The older group consisted of 20 volunteers from university faculty, as well as community members in Georgia, Florida, North Carolina, and Colorado ranging in age from 35 to 96 (*M* age = 52.4 years, *SD* = 15.96 years). Half of the participants in each age group were randomly assigned to either the self-regulation or control condition, as well as being assigned to one of two different task orders. All participants, regardless of condition, completed all the tasks, resulting in a 2 (age) X 2 (condition; self-regulation versus control) X 2 (order) X 4 (tasks) design.

Materials and tasks

Participants in all conditions filled out the Optimization in Primary and Secondary Control Questionnaire (OPS; Heckhausen, Schulz, & Wrosch, 1999). The OPS (see Appendix E) is a 32-item instrument in which participants respond to declarative statements on a 5-point scale (1 = never true, 5 = almost always true). The OPS is designed to gauge differences in preferences for primary and secondary control behavior (see Heckhausen & Schulz, 1995, for a more complete discussion of how primary and secondary control behavior differs). Primary control behavior is directed toward the environment and is designed to reconcile the state of the world with one's own needs or wants (e.g., When I have a goal, I am willing to work hard at sharpening the skills in order to achieve it). Secondary control behavior is directed within,

toward the individual, and is designed to alter the individual's own beliefs or desires in order to minimize loss or enhance one's own subjective sense of control (When I get into a difficult situation, I remind myself that in many ways I am better off than other people). The levels of internal consistency for the sample used in this study on the primary (Cronbach's Alpha = .79) and secondary control (Cronbach's Alpha = .77) subscales were deemed acceptable. In this study, control behavior was examined as a possible mediator of the effect of age on emotional self-regulation and the subjective experience of time.

Time judgment tasks

All participants took part in four experimental tasks (albeit in different orders, described below) to estimate passage of time and to allow for either cognitive or emotional self-regulation for participants assigned to the self-regulation condition.

The two tasks designed to elicit *cognitive self-regulation* were as follows:

All participants were required to read aloud a passage from the book, *Psychologists in Word and Image* (Wade, 1995). The excerpt was about the life of philosopher Jean Jacques Rousseau. This book is used here in the same manner it has been in previous research (Vohs & Schmeichel, 2003), to force self-regulation condition participants to read boring material in an upbeat and interested manner (discussed in greater detail below).

The second cognitive regulation task used is known as the White Bear task (c.f., Wegner, Schneider, Carter, & White, 1987). In this task, participants were asked to write their thoughts for 30 seconds. Cognitive self-regulation was induced by asking participants in the self-regulation condition to not think of a white bear as they did so (described in greater detail below).

The two tasks designed to elicit *emotional self-regulation* were as follows:

The two emotional self-regulation tasks were identical to each other, with the exception that one task required participants in the self-regulation condition to suppress their negative affect, whereas the other task required that participants suppress their positive affect. Clips from the movies *Terms of Endearment* and *Big* were both used in this study. These clips were used in an attempt to elicit negative and positive affect, respectively. The first clip portrays a dying woman saying goodbye to her children; the second clip features two men smiling as they dance and play music on a giant piano keyboard. As previously stated, participants in the self-regulation condition were required to watch these clips while suppressing their emotional reactions to them (discussed in greater detail below).

Participants in both conditions also filled out the Positive Affect Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) before and after viewing each film clip used in this study. The PANAS is a 20-item scale which asks participants to indicate the extent to which they are experiencing various feelings (e.g., proud, afraid) on a 5-point scale (1 = very slightly or not at all, 5 = extremely). Data from the sample used in this study indicated high levels of internal consistency for both the positive affect subscale (Cronbach's Alpha = .97) and the negative affect subscale (Cronbach's Alpha = .88). The PANAS was used a manipulation check for the effectiveness of the videos in eliciting the expected affective response.

Procedure

Upon entering the room, participants were told that they would be participating in a study about how we experience the passage of time. As such, they would be asked to judge the passage of time during a few different activities, such as watching movie clips, reading aloud, and writing their thoughts. At this time, a video camera, which was positioned in plain view was pointed out

to the participant, and they were told that the camera was there to keep a record of the experiment. After this initial introduction, participants read and signed the consent form (see Appendix A) before proceeding.

Initially, each participant was asked to fill out the OPS to assess preferences for primary and secondary control strategies. Immediately afterward, a baseline measure of their temporal perception was taken by running through a standard prospective duration judgment task. Starting from the time he or she was told, "begin," the participant told the experimenter when he or she believed that 45 seconds had passed; at the end of the task, the experimenter noted the "objective" or actual amount of time that had passed according to a stopwatch (this was also the case for all the timed tasks used in this study). This baseline measure was included as a way to familiarize the participants with the setup of all time judgment tasks that were to follow, and was not analyzed further.

At this point, all participants were randomly assigned to either the control or self-regulation conditions, as well as randomly assigned to one of the two task orders used in this study. The two task orders were designed such that some participants received the first emotional regulation task first, whereas others received the first cognitive regulation task first (i.e, C1-C2-E1-E2 or E1-C1-E2-C2). The procedural description that follows represents the sequence of events that all participants in the first order (cognitive self-regulation task first) followed:

The first cognitive self-regulation task is referred to simply as the read-aloud task (Vohs & Schmeichel, 2003). Participants were presented with an excerpt from the book, *Psychologists in Word and Image* (Wade, 1995). All participants were told, "There are many professions that require people to read text aloud clearly and correctly." Participants in the self-regulation condition were further instructed that, "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" (Vohs & Schmeichel, p. 22). After these initial instructions, all participants were told to read the book aloud until they believed that 2 minutes had passed. The task ended when the participants indicated that two minutes had passed.

The second cognitive regulation task used is known as the white bear task (Wegner, Schneider, Carter, & White, 1987). Participants were instructed to "write out whatever you are thinking, keeping in mind that whatever you write will be completely anonymous. Continue to write your thoughts until you think that 30 seconds have passed. Once you think 30 seconds have passed say 'stop' and put the pen down" (Vohs and Schmeichel, 2003, p. 27). Participants in the control condition received no further instructions; participants in the self-regulation condition also were told, "To help guide you on this task, I am asking you to NOT think of a white bear. If you do have any thoughts or ideas about a white bear, please place a checkmark on the sheet of paper and then continue writing." The task ended when the participant indicated that 30 seconds had passed.

The first emotional self-regulation task required participants to view a sad, emotionally poignant portion of the film, *Terms of Endearment* (c.f., Vohs & Schmeichel, 2003). Before viewing the clip, all participants filled out the PANAS. Participants were then instructed, "Please watch the following film clip carefully. Pay close attention to the film and tell me 'stop' when you believe that five minutes have passed." No further instructions were given to participants in the control condition. Participants in the self-regulation condition also were told "during the movie your goal is 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 your internal emotional reactions suppressed" (Vohs & Heatherton, 2000, p. 253). The

task ended when the participant indicated that five minutes had passed. Following the task, the participant again filled out the PANAS.

The second emotional self-regulation task required participants to view a happier film clip from the movie, *Big*, which has been shown to elicit positive affect in previous research (Martin, Ward, Achee, & Wyer, 1993). Just as in the first emotional task, participants filled out the PANAS before viewing the clip, even in the cases where the second emotional regulation task was directly preceded by the first. After filling out the PANAS, participants were told, "Please watch the following film clip carefully. Pay close attention to the film and tell me 'stop' when you believe that 2 minutes and 30 seconds has passed." No further instructions were given to participants in the control condition. However, participants in the self-regulation condition were further instructed, "During the movie your goal is 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 your internal emotional reactions suppressed" (Vohs & Heatherton, 2000, p. 253). The task ended when the participant indicated that two minutes and thirty seconds had passed. Following the task, the participant again filled out the PANAS.

Participants assigned to the second order received the tasks in an order different than the one described above (i.e., they received the first emotional self-regulation task first; E1-C1-E2-C2), but the instructions to the participants remained the same (scripts for both orders can be found in Appendices C and D). After completing all of the tasks, participants were debriefed and thanked for their time (see Appendix B for the debriefing statement).

Measures

The major dependent variable for all tasks, time perception, was measured by creating a ratio of objective time to perceived time. Doing so allowed us to compare the perception of time between tasks that run for different lengths of time. For example, if a participant stops a task after 6 minutes and 23 seconds when asked to stop the task after five minutes had passed, the ratio would be 6.3833/5 or 1.2766. Thus, an absolutely veridical duration judgment would result in a ratio of 1, whereas a judgment that was too long would be greater than 1 and a judgment that was too short would be less than 1. A person for whom time is moving relatively more slowly should have a smaller duration judgment ratio than a person for whom time is moving relatively more quickly.

In order to assess how successful participants were at self-regulating on each task, video tape of each experimental session was coded by an undergraduate rater (trained by the author) who was blind to condition. Both movie tasks were coded for facial expressiveness, and the read-aloud task was coded for apparent interest in the reading material. All ratings were on a 7-point scale, with lower numbers indicating poorer self-regulation. For example, on the movie tasks lower numbers indicated greater facial expressiveness, and on the read aloud task lower numbers indicated less interest displayed in the material being read. For the white bear task, self-regulatory success was measured by the number of intrusive white bear thoughts reported (fewer thoughts indicates greater self-regulatory success). Control participants were also measured on these self-regulatory dimensions to serve as a comparison group for estimating the success of self-regulation by participants in the self-regulation condition.

I also wished to gauge individual differences in self-regulatory ability. In order to quantify self-regulatory ability, I standardized the self-regulation measures described above, so

that each individual had 4 (two movie task scores, a read-aloud score, and a white bear task score) self-regulation z-scores that indicated their self-regulatory success on each task relative to all other participants. These z-scores served as a measure of self-regulatory ability.

Results

Reliability Checks

As mentioned above, in order to measure self-regulatory success on both emotional self-regulation tasks as well as the read aloud cognitive self-regulation task, an undergraduate rater who was blind as to condition coded all of the videos for each participant. In order to assess reliability, a second undergraduate coder who was also blind to condition coded a subset of the data (17 participants). On each of the 3 ratings made (i.e., facial expressiveness for the two emotional self-regulation tasks, general interest for the read aloud task) reliability reached acceptable levels (Cohen's Kappa for movie 1 = .83; movie 2 = .78; read aloud = .82). These reliabilities were judged sufficiently high to warrant using the primary rater's assessments as data to be analyzed.

Manipulation Checks

In order to assess the whether the two movie clips shown were able to induce negative (first movie task) and positive (second movie task) affect, participants filled out the PANAS before and after each clip. Changes in affect induced by the films were evaluated by means of paired samples t-tests. The negative clip (from *Terms of Endearment*) lowered positive affect for participants, $t_{(39)} = -4.45$, $p < .05$; positive affect dropped from an average of 2.72 ($SD = .73$) before the clip to an average of 2.46 ($SD = .79$) after the clip. However, the negative clip did not significantly increase negative affect (pre-clip $M = 1.25$, $SD = .28$; post-clip $M = 1.30$, $SD = .33$; $t_{(39)} = 1.06$, $p > .05$). Thus, it appears that the first movie clip was only partially successful, lowering positive affect but not appreciably increasing negative affect.

The second film task (from *Big*), which was designed to elicit positive affect, did so (pre-clip $M = 2.47$, $SD = .84$; post-clip $M = 2.63$, $SD = .84$; $t_{(39)} = 2.54$, $p < .05$), in addition to decreasing negative affect (pre-clip $M = 1.27$, $SD = .31$; post-clip $M = 1.14$, $SD = .22$; $t_{(39)} = 3.84$, $p < .05$). Importantly, there were no differences in either positive or negative affect between the control and self-regulation conditions for either positive affect films (control $M = 2.57$, $SD = .77$; self-regulation $M = 2.58$, $SD = .85$; $F_{(1, 32)} = .000$, $p > .05$) or negative affect films (control $M = 1.22$, $SD = .25$; self-regulation $M = 1.26$, $SD = .32$; $F_{(1, 32)} = .264$, $p > .05$). Thus, the movie clips had the same effects on mood for both experimental conditions, making it possible to infer that any differences in time estimation between the emotional self-regulation condition and the control condition are not due to simple differences in mood experiences.

Primary analyses

Hypotheses about time perception were evaluated by initially entering time estimation scores into a 2 (age) x 2 (condition; self-regulation versus control) x 2 (order; c1-c2-e1-e2 versus e1-c1-e2-c2) x 2 (tasks; cognitive self-regulation tasks versus emotional self-regulation tasks) repeated measures ANOVA, with tasks being the within-subjects variable. The results of this analysis are presented in Table 1.

Tests of hypotheses

Hypothesis 1A. The first part of hypothesis 1 (i.e., 1A) was that older participants would experience the passage of time as being faster (i.e., they would have higher duration judgments) than the younger participants when self-regulating. On the other hand, no age differences in time estimation were expected when participants were not self-regulating. Thus, an age by condition interaction on duration judgments was predicted.

The age by condition interaction was not significant, however, $F_{(1, 32)} = .01$, $p > .05$. Older participants in the self-regulation condition did not experience the passage of time as faster than younger participants; in fact, older participants perceived time as passing nominally slower ($M = 1.34$, $SD = .40$) than younger participants ($M = 1.42$, $SD = .25$) in the self-regulation condition. Moreover, older ($M = .96$, $SD = .32$) and younger ($M = 1.02$, $SD = .21$) participants in the control condition also did not differ in their duration judgments. Thus, hypothesis 1A was not supported.

An unanticipated age by order interaction was found, however, $F_{(1, 32)} = 5.66$, $p < .05$ (see Figure 1). Although judgment ratios of older and younger participants did not differ in the first task order (i.e., c1-c2-e1-e2; $F_{(1, 32)} = 1.26$, $p > .05$), as shown in Figure 1, older participants had lower duration judgments ($M = 1.04$, $SD = .46$) than younger participants ($M = 1.33$, $SD = .37$) in the second task order (i.e., e1-c1-e2-c2), $F_{(1, 32)} = 5.03$ $p < .05$, indicating that time was moving more slowly for older participants than younger participants in order 2. This effect was not anticipated; we have no ready explanation for it, and it will not be discussed further.

Hypothesis 1B. A main effect of condition on duration judgments was also hypothesized, with the self-regulation group expected to experience the passage of time as being slower than the control group (i.e., the self-regulation group would have lower duration judgment ratios than the control group). A significant main effect was found, but in the opposite direction of the hypothesis, $F_{(1, 32)} = 17.35$, $p < .001$. Self-regulators actually experienced the passage of time as being faster ($M = 1.38$, $SD = .33$) than did participants in the control condition ($M = .99$, $SD = .27$).

Hypothesis 2. I was also interested in exploring the possibility that any differences in self-regulation might be moderated by the type of self-regulation participants were undertaking.

Specifically, I expected to find an interaction between age and type of self-regulation task such that differences in duration judgments between older and younger participants would be greater for cognitive than for emotional self-regulation tasks. However, this age x condition x task type interaction was not significant, $F_{(1, 32)} = 1.11$, $p > .05$. Older and younger participants did not differ in their duration judgments when cognitively self-regulating (older $M = 1.70$, $SD = .66$; younger $M = 1.78$, $SD = .47$), nor did they differ in their duration judgments when emotionally self-regulating (older $M = .97$, $SD = .28$; younger $M = 1.05$, $SD = .25$). As can be seen by examining the means, not only were there no differences between the younger and older participants for duration judgments when either emotionally or cognitively self-regulating, the magnitudes of the non-significant differences across age for the two kinds of self-regulation are identical. Thus, the prediction that greater differences in time estimation would be observed when older adults and younger adults were cognitively self-regulating, rather than emotionally self-regulating, was not supported.

Hypothesis 3A. This study also tested the hypothesis that subsequent to engaging in a self-regulation task, future efforts to self-regulate would be less successful. This hypothesis is consistent with the Ego-Depletion Model of self-regulation (Baumeister & Heatherton, 1996). One way of evaluating this ego-depletion hypothesis is to analyze indices of self-regulatory success. Recall that these measures included facial expressiveness for the movie tasks, general interest for the read aloud task, and white bear thought intrusions for the white bear task. These four self-regulation measures (smaller scores on each measure indicate self-regulatory success) were submitted to a 2 (age) x 2 (condition) x 4 (trials) repeated measures ANOVA. Hypothesis 3A would have been supported by a robust trials effect in which self-regulatory success decreased over trials. As can be seen in Figure 2, self-regulatory performance did generally

diminish over time ($F_{trials\ (3,\ 48)} = 4.23$, $p < .05$), and further trend analyses revealed that only the linear (and neither the quadratic or cubic) component of this trend was significant. However, there was a significant drop in self-regulatory performance only from trial 2 ($M = 4.00$, $SD = 2.85$) to trial 3 ($M = 1.84$, $SD = 1.19$; $t_{(18)} = 3.23$, $p < .05$). On the other hand, there were no significant decrements in self-regulatory performance between either trials 1 and 2 ($t_{(18)} = -0.95$, $p > .05$) or trials 3 and 4 ($t_{(18)} = -0.28$, $p > .05$); thus, support for the predictions of the Ego-Depletion Model was not as straightforward as might be implied by the significant trials effect.

Hypothesis 3B. In addition to examining changes in self-regulatory success over time, I also wished to examine how duration judgments would change across the course of the experiment. I predicted that if ego-depletion was occurring across trials, participants in the self-regulation condition would perceive time as moving faster with each trial, whereas participants in the control condition would not display any changes in their duration judgments as they progressed through the tasks. To test this prediction, duration judgments were reanalyzed in the context of a 2 (age) x 2 (condition) x 4 (trials) repeated measures ANOVA. Support for this hypothesis would have come from a general increase in duration judgments across trials for participants in the self-regulation condition, but no change across trials for participants in the control condition. However, this hypothesis was not supported, $F_{condition\ x\ trials\ (3,\ 108)} = .58$, $p > .05$. There was an overall trials effect, $F_{(3,\ 108)} = 11.22$, $p < .001$, that was perplexing. Trend analyses revealed that only the cubic trend of this trials effect was significant, $F_{(1,\ 36)} = 34.84$, $p < .05$. As can be seen in Figure 3, duration judgments increased from task 1 to task 2, declined from task 2 to task 3, and increased again from task 3 to task 4. Clearly, this unexpected pattern of judgments provides little support for the ego-depletion hypothesis as it relates to change in duration judgments over tasks.

Hypothesis 4A. Two hypotheses related to the Life-Span Theory of Control (Heckhausen & Schulz, 1995) were tested in this study. This theory predicts that as we age, we come to rely more upon secondary control behavior (e.g., finding ways to cope with goals that we have failed to reach) than primary control behavior (e.g., taking direct action to achieve a goal that we have failed to reach). In order to test this prediction, scores from the OPS were submitted to a one-way ANOVA, using age as the independent variable. Age differences in endorsement of secondary control behavior did emerge, with older adults (M = 3.35, SD = .51) reporting greater use of this type of behavior than younger participants (M = 3.08, SD = .30; $F_{(1, 38)} = 4.47$, $p < .05$). However, somewhat unexpectedly, older adults in this study also reported greater use of primary control behavior as well (older M = 3.89, SD = .41; younger M = 3.73, SD = .36; $F_{(1, 38)} = 4.12$, $p = .05$). Thus, the older adults in this study reported higher use of both primary and secondary control behavior than the younger adults.

Because secondary control behavior might draw upon the same skills as self-regulatory behavior, I predicted that a preference for secondary control behavior would be significantly related to self-regulatory ability, irrespective of age (hypothesis 4A). The ability scores (i.e., z-scores derived from the self-regulatory success measures) were used as predictor variables in a regression equation with secondary control behavior endorsement was used as the criterion variable. However, self-regulatory ability failed to predict preferences for secondary control strategies endorsement, $R^2 = .06$, $p > .05$. Thus, hypothesis 4A was not supported.

I also explored the possibility that self-regulatory ability would predict preferences for secondary control behavior only when the relationship was examined separately for either the younger or older participants (but not when the ages were analyzed together). However, this was

not the case; self-regulatory ability did not predict secondary control behavior preferences for either the older, $R^2 = .117$, $p > .05$, or the younger, $R^2 = .348$, $p > .05$, participants.

Hypothesis 4B. I also predicted that the relation between age and time estimation would be mediated by preference for secondary control behavior when participants were self-regulating. That is, age differences in time estimation when self-regulating would be due wholly or in part to preferences for self-regulatory control. However, as noted earlier, the predicted interaction between age and condition regarding time estimation was not found. Thus, no relation between age and time estimation was observed under conditions of self-regulation in this study, $R^2 = 0.17$, $p > .05$. Nor was any relation between endorsement of secondary control behavior and time estimation found under conditions of self-regulation ($R^2 = 0.002$, $p > .05$). Thus, I found no evidence that secondary control behavior mediated the relation between age and time estimation under conditions of self-regulation. In other words, there was no relation between age and time estimation to mediate, nor was there a relation between preferences for secondary behavior and time estimation that would be required to demonstrate mediation.

Unanticipated significant interactions

There were some significant interactions and one main effect that were not anticipated prior to the analyses; these results are discussed below.

Previous research (Vohs & Schmeichel, 2003) has shown that participants engaged in either cognitive or emotional self-regulation both experienced a slowing of time compared to a control group. I also hypothesized this same domain-general slowing effect. However, a significant and unexpected effect of task type was found, $F_{(1, 32)} = 69.95$, $p < .05$, with participants experiencing the passage of time as being faster during cognitive tasks ($M = 1.47$, $SD = .54$) than during the emotional tasks ($M = .90$, $SD = .27$). Yet, this main effect was

qualified by an unexpected type of task x condition interaction effect, $F_{(1, 32)} = 4.83$, $p < .05$, that is shown in Figure 4. As implied by the figure, the difference in duration judgments between cognitive and emotional tasks was greater for the self-regulation condition ($M_{\text{difference}} = .54$) than it was for the control condition ($M_{\text{difference}} = .23$).

Finally, this study also found an unanticipated age x condition x task type x order interaction, $F_{(1, 32)} = 5.193$, $p < .05$, that was clearly not expected, appears to provide little insight for interpreting the results of this study, and is not discussed further.

Discussion

Previous research on self-regulation and the subjective experience of time (Vohs & Schmeichel, 2003) suggests time is perceived to pass more slowly while one self-regulates or attempts to monitor one's thoughts or emotions.

However, as previous research (Kennedy et al., 2001) has suggested, the ability to emotionally self-regulate changes as we age. Moreover, psychologists who study time perception have found age differences in the experience of time (e.g., Block, Zakay, & Hancock, 1998), suggesting that older adults will experience time as generally passing faster than younger adults when under conditions of cognitive load. Therefore, any understanding of how self-regulation affects the experience of time must attempt to take into account age as a possible moderating variable. This study represents an initial effort to account for age effects on self-regulation and the subjective experience of time.

Hypotheses

The major hypotheses were generally not supported. However, as will be discussed, these results do suggest a need for further study regarding how self-regulation may differentially affect the experience of time based on when the duration judgment is made.

Impact of self-regulation. Despite the fact that self-regulation has been shown to slow the passage of time for the individual in other studies (Vohs & Schmeichel, 2003), in this study individuals in the self-regulation condition actually experienced the passage of time as being faster relative to the control condition (i.e., the reverse of hypothesis 1B). Why might we have obtained this unexpected result? One possible explanation lies in the methodology used.

In this study, a prospective design was used to solicit time estimation from participants. That is, each participant was told before each task that they would be making duration judgments. The result is a duration judgment that is made on-line, while participants attempt to produce durations of specific intervals (e.g., “tell me stop when you think that 5 minutes have passed”). This methodology can be contrasted with a retrospective design, in which participants are unaware of the fact that they will be asked to make a duration judgment. Instead, each participant completes a task and then is asked at the end of the task about how long the task took to complete. It is important to note that Vohs and Schmeichel (2003), in their work on self-regulation and the subjective experience of time, utilized a retrospective design, whereas this study used similar tasks, but in a prospective design. Why might using different designs result in opposing results?

It is widely accepted by researchers that prospective and retrospective duration judgments seem to be utilizing different types of mental processes (e.g., Block, Hancock, & Zakay, 2000; Craik & Hay, 1999; Gruber & Block, 2003; McGrath & Tschan; Perbal, et al., 2002; Zakay & Block, 1997). Specifically, retrospective duration judgments seem to rely more on memory, whereas prospective duration judgments, such as those made in the present project, rely more on working-memory capacity and processing speed.

Thus, one possibility is that, in a retrospective design, self-regulation affects the memory of durations, effectively slowing the passage of time via some currently unknown mechanism. In interpreting their results, Vohs and Schmeichel (2003) attribute the slowing of time via self-regulation to the ironic monitor, which works by focusing the individual’s attention on the passage of time (i.e., constantly checking how the individual is doing in his or her self-regulatory efforts over time), which has the effect of slowing the experience of time relative to control

participants. That is, the ironic monitor is inherently an on-line (prospective) timing mechanism. One problem with this interpretation has to do with the fact that, although Vohs and Schmeichel used a retrospective design, they invoked a prospective timing mechanism to explain it. Although it is possible that memories of durations are influenced by the functioning of on-line timing mechanisms, as mentioned previously, research suggests that retrospective duration judgments rely on markedly different cognitive mechanisms than prospective duration judgments. As Zakay and Block (1997) put it, "attention to time has little or no influence on retrospective duration judgments" (p. 15). Past researchers have suggested that the magnitude of retrospective duration judgments might rely upon the amount of cognitive activity completed (Ornstein, 1969), the attentional effort required (McGrath & Tschan, 2004), or the number of contextual changes that take place during the judged duration (Block, 1990). Therefore, it is possible that self-regulation has its "slowing influence" on retrospective duration judgments by effectively increasing the level of cognitive activity and complexity, resulting in participants reporting that more time has passed than was actually the case (i.e., slowing of time).

In a prospective design, self-regulatory efforts may speed the passage of time simply by absorbing cognitive resources that could otherwise be used to track the passage of time, resulting in duration judgments in which time seems to move faster. If this is indeed the case, then the results reported here make sense when interpreted using the Attentional-Gate Model of prospective timing (Zakay & Block, 1997). That is, when comparing tasks that require different levels of attention and processing, the task that requires the most working-memory resources will also tend to speed up the passage of time to a greater extent (because it reduces a person's ability to simultaneously attend to the passage of time while performing the task). In this way, the self-regulation instructions given in this experiment may have had their effect simply by increasing

the cognitive demands of the task (self-regulation itself need not have occurred successfully). Thus, the opposing results of this study and previous studies on self-regulation and duration judgment could be reconciled. As will be discussed later, future research could help to determine if this is the case.

Age effects. Overall, the age-related hypotheses of this study were not supported. That is, the anticipated age by condition interaction, in which older adults would experience the passage of time as being faster than younger adults in the self-regulation condition, but not the control condition (hypothesis 1A), was insignificant. Similarly, it was hypothesized that within the self-regulation condition, the type of self-regulation (i.e. cognitive versus emotional) would be differentially related to the experience of time based upon the participant's age. That is, greater differences between older and younger adults in duration judgments would be found for cognitive self-regulation tasks, as compared to emotional self-regulation tasks (hypothesis 2). Hypothesis 2 was also not supported. In this study, the older adults did not experience the passage of time differently than the younger adults in either the control or self-regulation conditions, or for either type of task. Thus, age was not a factor in the experience of time in this study, although it has affected duration judgments in previous research (Block, Zakay, & Hancock, 1998; Perbal et al., 2002; Craik & Hay, 1999).

It may be that the older participants in this study were simply not old enough to find an age effect. Other studies typically use septuagenarians as participants, whereas here the average age in the older sample was 52.4. One important difference between older samples in other studies and the one used here then, is that the older adults in other studies may have had noticable cognitive deficits in processing speed or short-term memory, whereas most adults in the 50 to 60 years-old range have neglible cognitive deficits compared to younger adults (Shaffer

& Williamson, in press). Therefore, age-related changes in processing speed and short-term memory, which have been used to explain age differences in prospective time estimation in previous research (e.g., Craik & Hay, 1999, Perbal et al., 2002), may well have been absent from the "older" sample used in this study.

Ego-depletion hypotheses. Two predictions related to the Ego-Depletion Model were made in this study. This model of self-regulation (Baumeister & Heatherton, 1996) has been widely tested, and predictions made by the model have largely been confirmed (e.g., Vohs & Heatherton, 2000; Schmeichel, Vohs, & Baumeister, 2003; Muraven & Slessareva, 2003). Typically, these studies employ a design in which one self-regulation task is followed shortly by another, and impaired regulatory performance is observed on the second task. This study used four different regulatory tasks, and although an overall (main effect) decrement in performance could be observed across trials, there was no significant drop in regulatory performance between the first and second tasks, or between the third and fourth tasks. Thus, hypothesis 3A, that significant, successive, task by task decrements in self-regulatory performance would be observed across tasks over the course of the experiment, was not supported. Furthermore, the prediction that, for self-regulating participants, time would pass faster as they progressed through the tasks (hypothesis 3B) was not supported. Thus, this study found equivocal evidence at best for ego-depletion effects.

Secondary control hypotheses. Two predictions related to the Life-Span Theory of Control (Heckhausen & Schulz, 1995) were made. This theory posits that changes in how we cope with the circumstances of our lives shift as we age, moving from more direct (primary control behavior) to more indirect (secondary control behavior) coping mechanisms. This study did find evidence to partially support that general prediction. As noted above, older adults did

display a greater preference for secondary control behavior than younger adults; however, older adults in this study also displayed a greater preference for primary control behavior as well. It is possible that, because the vast majority of the older sample was middle-aged, the older participants in this study could be considered to be at a peak in their coping abilities, comfortably able to utilize both primary and secondary control behavior to a larger degree than younger college-age adults.

Hypothesis 4A predicted that participants who reported a preference for secondary control behavior would also display higher levels of self-regulatory ability. This was predicted because the greater use of secondary control behavior, if viewed as taking advantage of the same skill set as self-regulation (i.e., inward actions aimed at controlling or altering thoughts, emotions), would naturally be related to greater self-regulatory ability. In this study, self-regulatory ability was measured by taking the various metrics of self-regulatory success used (i.e., facial expressiveness, white bear thought instructions, and general interest displayed in the read aloud task), and standardizing them so that each participant had a z-score that reflected his or her position relative to the rest of the participants. These self-regulatory ability scores, however, did not predict preference for secondary control behavior among either the older or the younger participants.

Hypothesis 4B predicted that preferences for secondary control behavior would mediate the relationship between age and time estimation. This hypothesis was not supported for several reasons. First, no relation between age and time estimation was found in this study (for reasons discussed above), and, therefore, there was no relation to be mediated. Moreover, a preference

for secondary control behavior was not related significantly to time estimation, a relationship which, of course, would also have had to emerge to support the mediation hypothesis.

Overall then, this study was unable to demonstrate any relation between secondary control behavior and self-regulation or time estimation. However, the general prediction of the Life-Span Theory of Control was partially supported by these data in that older participants displayed stronger preferences for both primary and secondary control behavior than younger participants (the theory predicts stronger preferences for secondary control only).

Did self-regulation occur in this study?

This study employed facial expressiveness for its main metric of self-regulatory performance (with the exception of intrusive white bear thoughts on the white bear task). In this study, both control and self-regulation groups were largely unresponsive facially to the films (although the films did affect participant mood). As a result, both the control group and the self-regulation group displayed similar patterns of expressiveness, making it difficult to determine whether self-regulation was indeed occurring for the self-regulation group.[1]

One possibility that needs to be considered is that the self-regulation measures used were insensitive to self-regulatory efforts. Vohs and Schmeichel (2003) employed the same measures used in this study and found differences between the control and self-regulation groups. Thus, a lack of sensitivity in the indices used in this study may not be the best explanation for the lack of differences in self-regulatory performance between conditions.

Another possible explanation is that self-regulatory efforts may not have been successful. There were no differences between the self-regulation group and the control group in general "interest" for the read-aloud task (i.e., rated excitement displayed while reading the text). Because participants in the self-regulation condition were given explicit instructions to appear

interested in the material they were reading, but failed to so, it is possible that they were simply unsuccessful in their efforts.

A third possibility is that participants in the self-regulation condition were not self-regulating at all. As mentioned, participants in both conditions were facially non-responsive to the movie clips. Because participants in the control condition did not react facially to the films, it is possible that regulating one's emotions may not have been necessary to remain largely facially unresponsive while viewing these clips. In that case, self-regulation need not have occurred in order to obtain the results found in this study. This would also explain the non-significant differences between conditions for the read aloud task.

Because mental processes are not directly observable, I am obviously unable to distinguish with certainty between these three possibilities. However, there were significant differences in duration judgments between self-regulators and control participants (i.e., self-regulators had longer duration judgments), suggesting that some phenomenological difference between the conditions must exist. As a final possibility, I suggest that participants in the self-regulation condition were attempting to self-regulate (although, perhaps, not successfully), and that these efforts to self-regulate operated as a cognitive load, effectively speeding up the passage of time for participants in the self-regulation condition relative to the control condition.

As I have discussed previously, increasing an individual's cognitive load while he or she concurrently tracks the passage of time has the effect of speeding up the passage of time for the individual. In this study, the self-regulation instructions essentially increased the cognitive resources required to complete the task by asking the self-regulation participants to perform an additional activity as they completed the task, and while they judged time's passage. For example, in the read aloud task, participants in the self-regulation condition had to not only read

the book out loud and monitor time, but also they were attempting to simultaneously monitor their delivery of the material and make changes based on whether they perceived that they were showing enough interest or excitement. Therefore, successful self-regulation (as indicated by greater expressed interest ratings) would not be required to induce differences in the experience time between the two conditions. Rather, the *attempt* to self-regulate alone would require greater amounts of working-memory resources, effectively reducing the available resources left over to attend to the passage of time. It seems, then, that one plausible explanation is that participants in the self-regulation condition were indeed attempting to self-regulate. However, their efforts operated as a cognitive load, speeding up the passage of time for the self-regulation condition, despite their lack of success.

Unanticipated effects

Although previous researchers (Vohs & Schmeichel, 2003) have reported that both cognitive and emotional self-regulation seem to slow the experience of time, this study failed to replicate those findings. It should be noted, however, that Vohs and Schmeichel reported separate experiments using cognitive and emotional self-regulatory tasks. Thus, although it was found that a slowing of time occurred in both experiments, cognitive and emotional tasks were not compared directly. In this study a within-subjects design was utilized, allowing for such comparisons to be made, and it was found that emotional and cognitive tasks of the type used here do differentially affect the perception of time (although both sped up the passage of time). In particular, the cognitive tasks used (i.e., white bear and read aloud tasks) sped up the passage of time to a larger extent than did the emotional tasks (i.e., watching movie clips). Arguably, the cognitive tasks employed in this study are much more engaging than the emotional tasks in terms of attention and mental resources required. As discussed previously, placing greater cognitive

demands on a participant as he or she simultaneously judges the passage of time will result in the perception that time is passing by relatively quickly. Interpreted in this framework, this study's finding that cognitive self-regulatory tasks affect the passage of time differently than do emotional self-regulatory tasks is not at all surprising.

Limitations

Some limitations of this study have already been suggested or implied above. The sample used here was probably not old enough to provide a sensitive test of age differences in duration judgments. Although it is useful to note that age differences in the experience of time may not emerge until later adulthood (70s), the age of the older sample in this study constitutes a major limitation, as age was an important factor under consideration.

Future research

Given the fact that this study was unable to confirm some of the results of previous research, future research involving a reformulation of this study's design is warranted in addition to incorporating some of the questions this study has raised into new experiments.

First, this study tested hypotheses related to the effect of self-regulation on the subjective experience of time. Notably, the expected effect was reversed in this study, with participants in the self-regulation condition experiencing time as moving faster than the control condition, despite predictions to the contrary based on previous research (Vohs & Schmeichel, 2003). As I have discussed above, this may be related to my using a prospective, as opposed to a retrospective design and to the different mental processes involved in these two kinds of judgments. Future research could reformulate the design of this study to use retrospective versus

prospective duration judgments as a between-subjects variable in an effort to test the hypothesis that the effect of self-regulation on time perception is dependent upon the type of duration judgment being made.

Furthermore, the type of task (i.e., cognitive versus emotional) turned out to have an impact on duration judgments, which was unexpected given previous findings (Vohs and Schmeichel, 2003). Vohs and Schmeichel's design was neither within-subjects or prospective, and these factors alone could account for the discrepancy. Logically, the cognitive demands of the task (which are of paramount importance in a prospective design) may differ between cognitive and emotional self-regulation tasks to the point that a difference might be expected when duration judgments are being made on-line. For example, having to write your thoughts for 30 seconds while attempting to suppress thoughts of a white bear (a cognitive self-regulation task), may require more mental resources than having to passively watch a sad film clip while attempting to suppress your emotional reactions. Indeed, many participants reported verbally after the conclusion of the experiment that the white bear task was extremely engaging and more difficult to perform than the other tasks. Thus, more research should be done to elucidate the relation between the subjective experience of time, the type of duration judgment being made, and the type of self-regulatory activity being performed. One way to accomplish this might be to use both cognitive and emotional self-regulation tasks in a study like the one described above, using retrospective versus prospective duration judgments as a between subjects variable.

Concluding remarks

Researchers have uncovered numerous factors that appear to influence the subjective experience of time (e.g., whether the duration was judged retrospectively or prospectively, self-regulation, age, gender, general arousal). One of the primary goals of research in this area is to

observe and test for underlying similarities or mechanisms between these variables that might grant us a better understanding of how individuals experience time. This study attempted to combine research on age differences and the effect of self-regulation on duration judgments into a single data set so that possible influences relevant to both areas of research could be uncovered. Although this study appears to have been unsuccessful in that endeavor, it has raised the possibility of re-examining previous interpretations of how self-regulation affects the experience of time. Because acts of self-regulation are arguably such a large part of the human experience, it would be most beneficial to understand under what circumstances self-regulation might slow down or speed up the experience of time so as to inform our knowledge of the influence of the subjective experience of time in our daily lives.

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Footnotes

[1]As mentioned previously, the same measures of self-regulatory performance were also used with the control condition for a basis of comparison with the self-regulation condition. No differences were found in self-regulatory performance between the two conditions on movie task 1 ($F_{(1, 29)} = 1.16$, $p > .05$), movie task 2 ($F_{(1, 29)} = 1.96$, $p > .05$), or the read aloud task ($F_{(1, 29)} = .183$, $p > .05$). The only difference between conditions in self-regulatory performance was for the white bear task ($F_{(1, 29)} = 18.11$, $p < .05$), where control participants were not primed to think about white bear and, thus, reported no such intrusive thoughts.

Table 1

Between and Within Subjects Results from the Primary Analyses of Duration Judgments

Type of Effect	F-Value	P-Value
Between Subjects		
Age	.63	.43
Condition (Self-regulation versus control)	17.35	.00
Order (c1-c2-e1-e2 versus e1-c1-e2-c2)	.00	.96
Age x Condition	.01	.91
Age x Order	5.66	.02
Condition x Order	.33	.57
Age x Condition x Order	1.00	.32
Within Subjects		
Task Type	69.94	.00
Task Type x Age	1.14	.29
Task Type x Condition	4.83	.04
Task Type x Order	.19	.67
Task Type x Age x Condition	1.11	.30
Task Type x Age x Order	2.93	.10
Task Type x Condition x Order	.45	.51
Task Type x Age x Condition x Order	5.19	.03

Figure Captions

Figure 1. Mean Duration Judgment Ratios as a function of age and order

Figure 2. Self-regulatory Performance Across Time

Figure 3. Duration Judgments Across Time

Figure 4. Mean Duration Judgment Ratios as a function of type of task and condition

Figure 1.

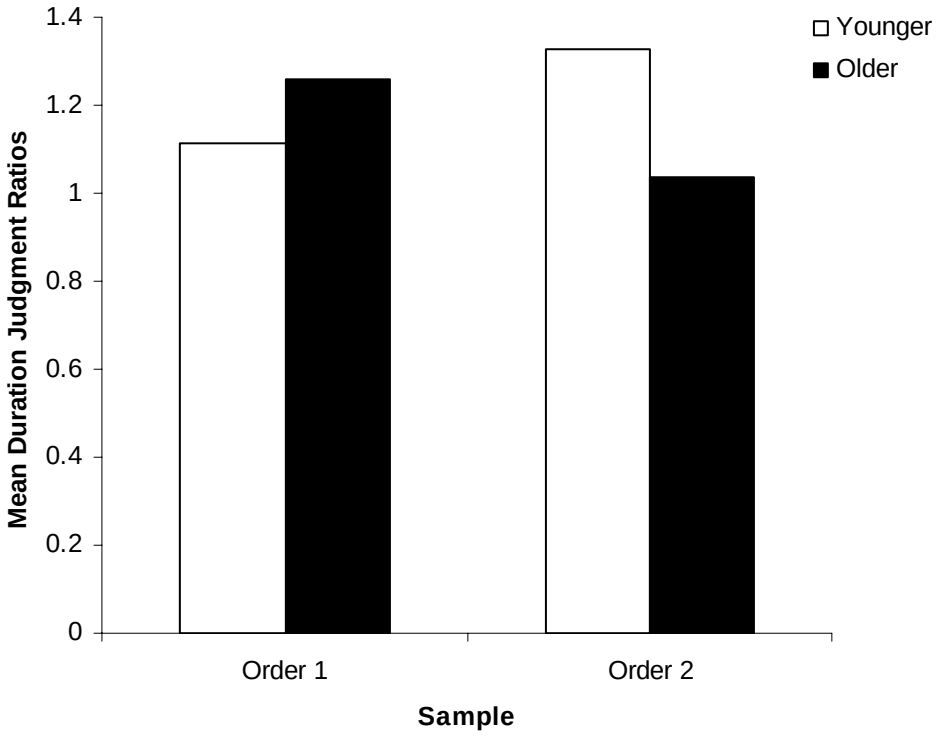

1.4
1.2
1
0.8
0.6
0.4
0.2
0
Mean Duration Judgment Ratios
Younger
Older
Order 1
Order 2
Sample

Figure 2.

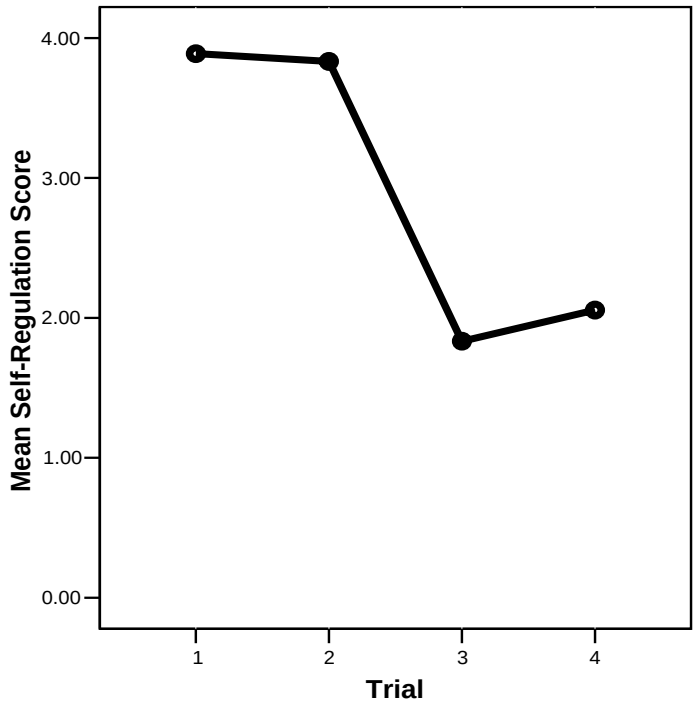


Figure 3.

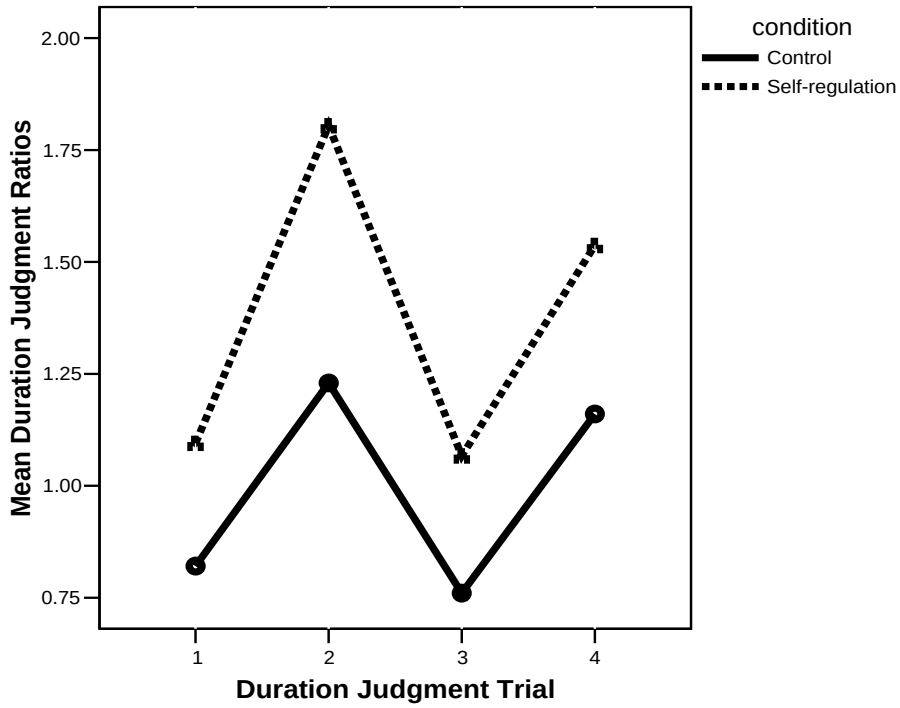
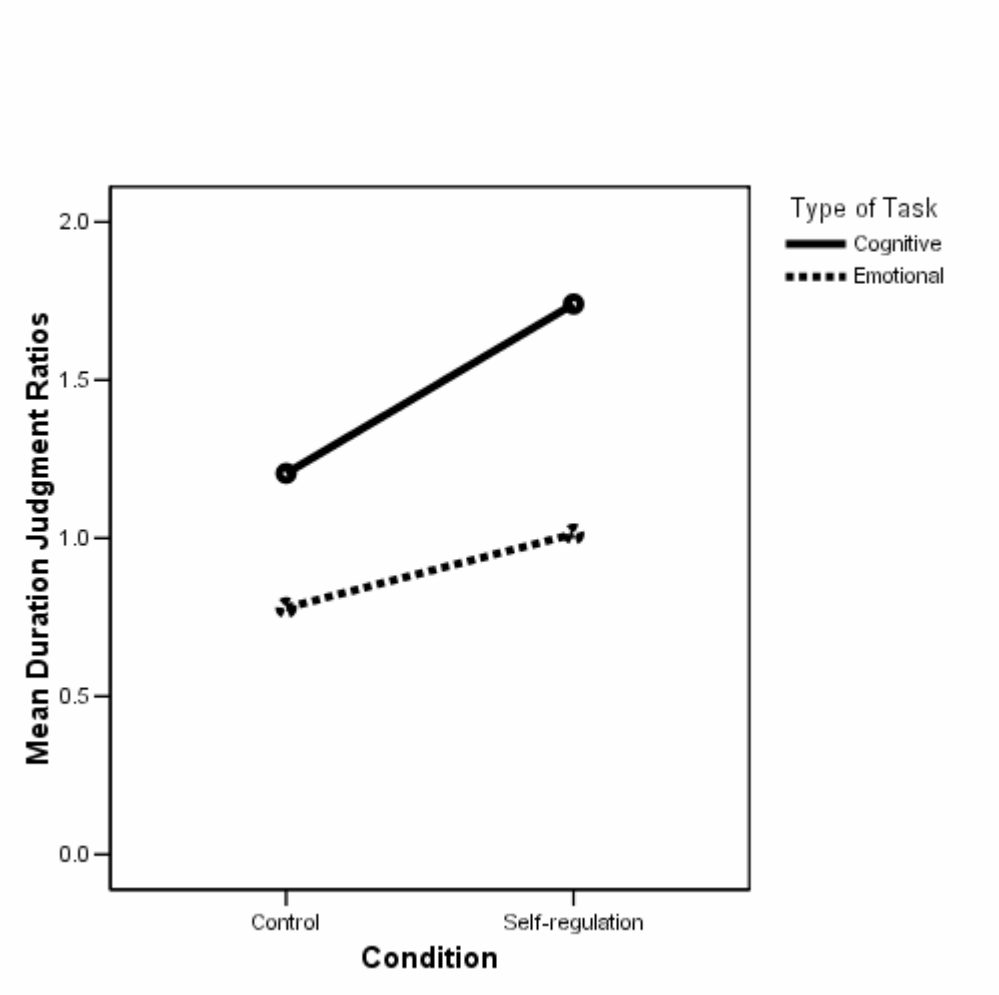

condition
Control
Self-regulation
Mean Duration Judgment Ratios
2.00
1.75
1.50
1.25
1.00
0.75
1
2
3
4
Duration Judgment Trial

Figure 4.


Type of Task
Cognitive
Emotional
Mean Duration Judgment Ratios
2.0
1.5
1.0
0.5
0.0
Control
Self-regulation
Condition

Consent Form

I agree to participate in the study, "The Experience of Time" which is being conducted by Ryan Keen (542-2174), Psychology Department. I understand that my participation is entirely voluntary; I can withdraw my consent at any time without penalty. The results of my participation may be returned to me, removed from the research records, or destroyed if I withdraw consent prior to leaving the experimental session. After the experimental session my results will not be identifiable as mine.

I understand that I will receive .5 credit towards my course requirement for psychology in exchange for my participation. I further understand that this experimental session will last approximately 30 minutes. I understand that participation is completely anonymous, and the researchers will not be able to link my data to my identity in any way.

The following points have been explained to me:

1) The purpose of this research is to understand how well people judge the passage of time
2) I will participate in 6 different tasks involving time. Another involves my experience of a stressful event.
3) No discomforts or stressors are foreseen.
4) There are no foreseeable risks due to participation in this study. However, in order make this study a valid one, some information about my participation will be withheld until after the study.
5) The results of this participation will be confidential, and will not be released in any individually identifiable form. The session will be video taped as a backup to our writing down your responses, and for data scoring purposes. These tapes will be kept indefinitely, for future research or educational purposes.
6) The investigator will be happy to answer any further questions about the research now, or during the course of the project.

FINAL AGREEMENT TO PARTICIPATE:

My signature below indicates that the researchers have answered all of my questions to my satisfaction and that I consent to volunteer for this study. I have been given a copy of this form.

_____

Ryan Keen
542-2174
RkKeen@uga.edu

_____
Signature of participant

_____
Date

PLEASE SIGN BOTH COPIES OF THIS FORM. KEEP ONE FOR YOUR RECORDS AND RETURN THE OTHER TO THE INVESTIGATOR.

Research at the University of Georgia which involves human participants is overseen by the Institutional Review Board. Questions or problems regarding your rights as a participant should be addressed to Dr.

Chris A. Joseph, Institutional Review Board, Office of the VP for Research, 606A Graduate Studies Research Center, Athens, GA, 30602. Telephone (706) 542-5614, E-mail address: IRB@uga.edu.

Debriefing Form

Self-regulation and the subjective experience of time
Participant debriefing

The purpose of this experiment was to examine the effects of self-regulation on how you experience time. Self-regulation is defined as any way that you attempt to alter your own unwanted or habitual responses to achieve a goal. Previous research has shown that when you attempt to regulate a response (for example, if you were in a particular condition of this experiment you attempted to regulate your emotions while watching a film) your experience of the passage of time is slowed. We asked the question of how this slowing of time for someone who is self-regulating is affected by age and type of regulatory behavior.

The questionnaire you filled out about coping with stress was designed to let us know whether you tend to handle your problems by actively bringing about a solution (i.e., going out and fixing the problem) or by trying to cope with the stress within yourself (i.e., managing your emotions and coping with the stress from the inside-out). Many people tend to favor one of these styles over the other; it has been shown in previous research that the greater practice that results from using one style over the other is related to greater success when coping in that way. Makes sense, right? Well, we believe that if you tend to manage your stress from the inside-out then you will probably be better at managing your emotions as well. Therefore, you will probably perform well on a task of emotional self-regulation (the movies task). This in turn could affect how you perceive the passage of time, although we are unable to say how exactly.

All of the self-regulation tasks (read aloud, white bear, and movies tasks) were designed to see how self-regulating would affect the passage of time for you. Other researchers have found that this tends to slow the passage of time. This is why, for example, quitting smoking can be so difficult. Imagine that you're trying to quit smoking, but are having a craving for a cigarette. During the time that you are actively working to keep control of your craving, time is actually moving more slowly for you than it is for me! The same 30 seconds for me might seem like a minute to you if you're self-regulating. This is just one of the many interesting effects researchers have uncovered in their studies of the relativity of time. The first duration judgment task you performed (just tell me when 45 seconds has passed) was simply a baseline measure of how accurate you generally are when judging the passage of time.

You were also asked to fill out brief mood questionnaires before and after each film. This helped us know if the movie clips actually affected you in any way, and depending on what condition you were in and how you reacted to the film, it let us know how well you were able to regulate your reactions to what you were watching.

We are also comparing how older and younger adults perform on these tasks to gain a better understanding of how age influences the ability to self-regulate and perceive the passage of time. Researchers have uncovered numerous age effects with time (remember how summers seemed to last forever as a kid, but just fly by these days?). This study will help the field gain a better understanding of the experience of time changes as we age.

If you have any questions or would like to learn more about this study or others like it, don't hesitate to ask. Thank you for your participation!!!

Order 1 Script (C1-C2-E1-E2)

Hi! In this study you will be participating in a variety of tasks designed to see how well you can judge the passage of time. You will read, watch movies, participate in a thought listing task, and track the passage of time. There are no risks that are foreseen, and the entire process should take about 30 minutes or so. We will be recording the experiment using this video camera [point to camera] so that we have a record of today's activities. It is important to understand that you may stop the experiment *at any time, without penalty*, should you become uncomfortable or unable to proceed. Do you have any questions?

[If not, proceed]

Ok, first I will need you to sign this consent form giving me permission to have you participate in the experiment and use your data. All the data we keep is confidential, meaning that your name will not be associated with it in any way. Please keep one copy for your records and return the other to me.

[Participant signs consent form]

Ok, let's get started. Before we get into the real tasks we're going to do a couple of things. First, I'd like you to fill out this short questionnaire. Basically, it is asking you to describe in a general way how you cope with the events in your life and approach and meet your goals. You'll need to read each question carefully and mark your answer on the paper. If you have any questions, just let me know.

[Participant fills out coping scale]

Thank you. Ok, before we get going, I need you to remove your watch and place it in this box for me if you would. [Participant removes any watch they might be wearing and places it in the box] Thank you. In a few moments I'm going to say the word "begin". When I do, I want you to begin keeping track of the time. When you think that 45 seconds has passed, tell me "stop". Do you have any questions? Ok, stop me after 45 seconds has passed. Begin.

[Participant cues experimenter]

Instructions for both conditions

Ok, great. Now let's try the same sort of thing, but with a twist. There are many professions that require people to read text aloud clearly and correctly.

Additional instructions for the self-regulate condition

Now, 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.

Instructions for both conditions

What I want you to do is read from this book out-loud until you think that 2 minutes has passed. So, when I say "begin" start reading out-loud. Once you think 2 minutes has passed, stop reading and tell me "stop". Do you have any questions? Ok great. Remember, stop me when you think that 2 minutes has passed. Begin.

[Participant reads from *Psychologists in Word and Image* (Wade, 1995) and indicates when 2 minutes has elapsed]

Thank you. Ok, this next task is different. What I would like you to do is, when I say "begin," write down all of your thoughts on this piece of paper [give piece of paper and pen to participant]. Write out whatever you are thinking, keeping in mind that whatever you write will be completely confidential.

Additional instructions for the self-regulate condition

To help guide you on this task, I am asking you to NOT think of a white bear. If you do have any thoughts or ideas about a white bear, please place a checkmark on the sheet of paper and then continue writing.

Instructions for both conditions

Continue to write your thoughts until you think that 30 seconds has passed. Once you think 30 seconds has passed say "stop" and put the pen down. Do you have any questions? Ok, remember, stop after 30 seconds. Begin.

[Participant completes the thought writing task]

Ok, great. This next task will be less work on your part. What I would like you to do is simply watch this movie. Before you do, however I want you to fill out this short check-list [hand participant PANAS]. Be sure to read the instructions carefully. Basically, what it is asking you to do is to indicate what you're feeling right now, at the present moment. There is a list of words that you see here. Next to each word there is a blank. In the blank next to each word put a number indicating the extent to which you feel interested, for example [point to "interested" on PANAS], or afraid [point to "afraid" on PANAS] for example.

[Participant completes PANAS]
Ok, great. Now the movie. Please watch the following film clip carefully.

Additional instructions for the self-regulate condition

During the movie your goal is to remain completely emotionally 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 your internal emotional reactions suppressed.

Instructions for both conditions

Pay close attention to the film and tell me “stop” when you believe 5 minutes has passed. Do you have any questions? Ok, remember to tell me “stop” when you believe 5 minutes has elapsed. [Experimenter begins the film]

[Participant indicates that 5 minutes has passed]

Ok, thanks. Now, before we move on. I’d like you to fill out the same short checklist that you filled out a few minutes ago. Again, you’ll be indicating how you feel right now, at the present moment.

[Participant fills out PANAS]

Great. There’s just one more task. Once again, you’ll be watching a movie. This will be a different movie, but the idea is the same. You’ll need to watch the film carefully and tell me when 1 minute and 30 seconds has passed. But first, I need to you fill out this short checklist again to indicate how you feel right now, at the present moment.

[Participant fills out PANAS]

Additional instructions for the self-regulate condition

During the movie your goal is to remain completely emotionally 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 your internal emotional reactions suppressed.

Instructions for both conditions

Pay close attention to the film and tell me “stop” when you believe 1 minute and 30 seconds has passed. Do you have any questions? Ok, remember to tell me “stop” when you believe 1 minute and 30 seconds has elapsed. [Experimenter begins the film]

[Participant indicates that 1 minute and 30 seconds has passed]

Ok, thanks. Finally, if you would please fill out this short checklist one last time, indicating how you feel right now, at the present moment.

[Participant fills out the PANAS]

Thank you very much for your time and help with this study. I have a debriefing form here that will explain everything we did in this study and why. If you have any other questions you’d like to ask me, feel free. Again, thank you!

[Participant is given debriefing form]

Order 2 Script (E1-C1-E2-C2)

Hi! In this study you will be participating in a variety of tasks designed to see how well you can judge the passage of time. You will read, watch movies, participate in a thought listing task, and track the passage of time. There are no risks that are foreseen, and the entire process should take about 30 minutes or so. We will be recording the experiment using this video camera [point to camera] so that we have a record of today's activities. It is important to understand that you may stop the experiment *at any time, without penalty*, should you become uncomfortable or unable to proceed. Do you have any questions?

[If not, proceed]

Ok, first I will need you to sign this consent form giving me permission to have you participate in the experiment and use your data. All the data we keep is confidential, meaning that your name will not be associated with it in any way. Please keep one copy for your records and return the other to me.

[Participant signs consent form]

Ok, let's get started. Before we get into the real tasks we're going to do a couple of things. First, I'd like you to fill out this short questionnaire. Basically, it is asking you to describe in a general way how you cope with the events in your life and approach and meet your goals. You'll need to read each question carefully and mark your answer on the paper. If you have any questions, just let me know.

[Participant fills out coping scale]

Thank you. Ok, before we get going, I need you to remove your watch and place it in this box for me if you would. [Participant removes any watch they might be wearing and places it in the box] Thank you. In a few moments I'm going to say the word "begin". When I do, you I want you to begin keeping track of the time. When you think that 45 seconds has passed, tell me "stop". Do you have any questions? Ok, stop me after 45 seconds has passed. Begin.

[Participant cues experimenter]

Instructions for both conditions

Ok, great. Now let's try the same sort of thing, but with a twist. What I would like you to do is simply watch this movie. Before you do, however I want you to fill out this short check-list [hand participant PANAS]. Be sure to read the instructions carefully. Basically, what it is asking you to do is to indicate what you're feeling right now, at the present moment. There is a list of words that you see here. Next to each word there is a blank. In the blank next to each word put a number indicating the extent to which you feel interested, for example [point to "interested" on PANAS], or afraid [point to "afraid" on PANAS] for example.

[Participant completes PANAS]
Ok, great. Now the movie. Please watch the following film clip carefully.

Additional instructions for the self-regulate condition

During the movie your goal is to remain completely emotionally 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 your internal emotional reactions suppressed.

Instructions for both conditions

Pay close attention to the film and tell me "stop" when you believe 5 minutes has passed. Do you have any questions? Ok, remember to tell me "stop" when you believe 5 minutes has elapsed. [Experimenter begins the film]

[Participant indicates that 5 minutes has passed]

Ok, thanks. Now, before we move on. I'd like you to fill out the same short checklist that you filled out a few minutes ago. Again, you'll be indicating how you feel right now, at the present moment.

[Participant fills out PANAS]

Ok, now let's try something different. There are many professions that require people to read text aloud clearly and correctly.

Additional instructions for the self-regulate condition

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.

Instructions for both conditions

What I want you to do is read from this book out-loud until you think that 2 minutes has passed. So, when I say "begin" start reading out-loud. Once you think 2 minutes has passed, stop reading and tell me "stop". Do you have any questions? Ok great. Remember, stop me when you think that 2 minutes has passed. Begin.

[Participant reads from *Psychologists in Word and Image* (Wade, 1995) and indicates when 2 minutes has elapsed]

Ok, great. For this next task, you'll be watching another movie. This will be a different movie, but the idea is the same. You'll need to watch the film carefully and tell me when 1 minute and 30 seconds has passed. But first, I need to you fill out this short checklist again to indicate how you feel right now, at the present moment.

[Participant fills out PANAS]

Additional instructions for the self-regulate condition

During the movie your goal is to remain completely emotionally 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 your internal emotional reactions suppressed.

Instructions for both conditions

Pay close attention to the film and tell me "stop" when you believe 1 minute and 30 seconds has passed. Do you have any questions? Ok, remember to tell me "stop" when you believe 1 minute and 30 seconds has elapsed. [Experimenter begins the film]

[Participant indicates that 1 minute and 30 seconds has passed]

Ok, thanks. Finally, if you would please fill out this short checklist one last time, indicating how you feel right now, at the present moment.

[Participant fills out the PANAS]

Thank you. Ok, this final task is a little more work on your part. What I would like you to do is, when I say "begin," write down all of your thoughts on this piece of paper [give piece of paper and pen to participant]. Write out whatever you are thinking, keeping in mind that whatever you write will be completely confidential.

Additional instructions for the self-regulate condition

To help guide you on this task, I am asking you to NOT think of a white bear. If you do have any thoughts or ideas about a white bear, please place a checkmark on the sheet of paper and then continue writing.

Instructions for both conditions

Continue to write your thoughts until you think that 30 seconds has passed. Once you think 30 seconds has passed say "stop" and put the pen down. Do you have any questions? Ok, remember, stop after 30 seconds. Begin.

[Participant completes the thought writing task]

Excellent. Thank you very much for your time and help with this study! I have a debriefing form here that will explain everything we did in this study and why. If you have any other questions you'd like to ask me, feel free. Again, thank you!

Optimization in Primary and Secondary Control Scale (OPS)

(1) When I have decided on something, I avoid anything that could distract me.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(2) When I have chosen a difficult task for myself, I imagine how proud I will be when I have solved it.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(3) When I get stuck on a task, I don’t hesitate asking others for advice.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(4) When I get into a difficult situation, I remind myself that in many ways I am better off than other people.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(5) When I cannot get to a goal directly, I sometimes choose a roundabout way to achieve it.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(6) When I have a goal, I am willing to work hard at sharpening the skills in order to achieve it.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(7) When I have not accomplished something important, I console myself by thinking about other areas where I had more success.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(8) When I have decided on something, I know that I will achieve it.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(9) When I really want something, I am able to work hard to achieve it.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(10) When I doubt myself, I keep in mind that I have already accomplished a lot in my life.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(11) When obstacles get in my way I put in more effort.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(12) When I have decided on something I always remind myself that it was the right decision.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(13) When I have set my mind on something, I put it before everything else.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(14) When I can no longer make progress on something, I look for new ways to reach my goal.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(15) When it turns out that I can not attain a goal in any way I let go of it.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(16) When I can not solve a problem by myself I ask others for help.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(17) For goals that are difficult to achieve, I keep in mind how proud I will feel, when I have reached them.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(18) When obstacles get in my way, I find another way to get what I want.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(19) When something really matters to me, I invest as much time as I can in it.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(20) When I do not reach a goal, I often tell myself that it wasn't my fault.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(21) Once I decide on something, I am not easily distracted by other things.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(22) When I have set a task for myself, I try to learn the skills necessary to do it well.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(23) When something bad happens to me, I think of all the others who are much worse off than I am.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(24) When difficulties become too great, I ask others for advice.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(25) When I have set a goal for myself, I keep in mind that I also have the abilities to achieve it.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(26) Once I have decided on a goal, I do whatever I can to achieve it.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(27) When obstacles get in my way, I try to think of other ways of reaching my goal, even if they are unusual.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(28) When something becomes too difficult, I can put it out of my thoughts.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(29) When a goal is more difficult than expected, I try harder to achieve it.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(30) When obstacles get in my way, I try to get help from others.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(31) When I have decided on a goal, I always keep in mind its benefits.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5

(32) When things don’t work out for me, I tell myself that it was just bad luck.

never true	seldom true	sometimes true	often true	almost always true
1	2	3	4	5